CABA

25 YEARS

MONETIZATION OF THE CONNECTED HOME

LANDMARK RESEARCH STUDY

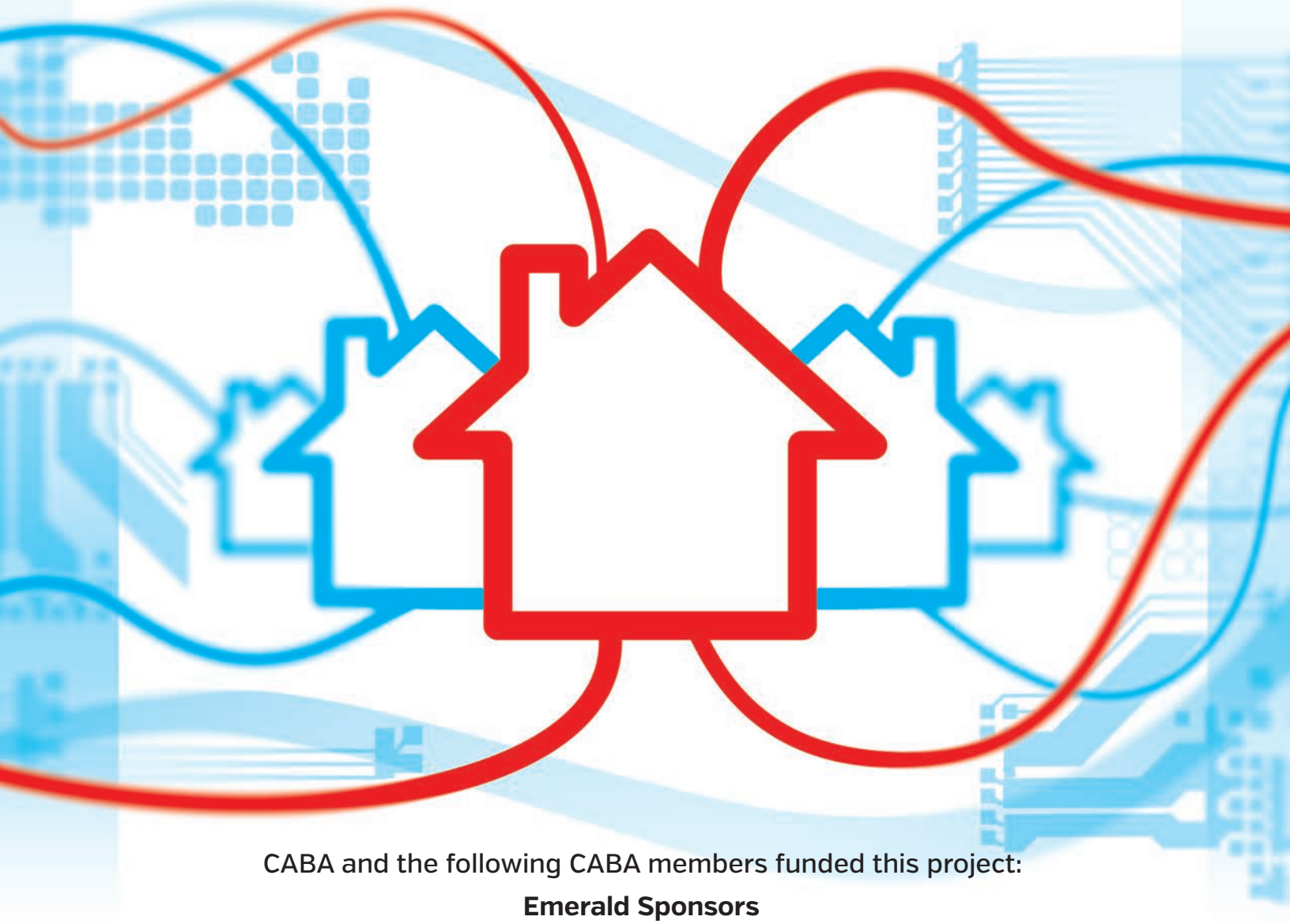

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TABLE OF CONTENTS

TABLES

FIGURES

EXECUTIVE SUMMARY

ES1 INTRODUCTION

This report has been created by IHS, a leading analyst research firm, for the Continental Automated Buildings Association (CABA). CABA is a leader in initiating and developing cross-industry collaborative research, under the CABA Research Program. Following the CABA Digital Home Forum at Qualcomm, San Diego, CA (October 2012), attendees selected the topic of Monetization for the Connected Home Landmark Research Study for 2013.

ABOUT CABA

CABA is an industry association dedicated to the advancement of connected homes and intelligent buildings technologies. CABA is an international association, with over 350 major private and public technology organizations committed to research and development within the intelligent buildings and connected home sector. Association members are involved in the design, manufacture, installation and retailing of products and services for home and building automation.

IHS was commissioned by CABA, as a result of an extensive competitive bid process, to provide bespoke research and support in strategy development, by conducting this research for CABA as part of the Connected Home Council (CHC) Landmark Research Study for 2013.

ABOUT IHS

IHS is the leading source of information, insight and analytics in critical areas that shape today's business landscape. Businesses and governments in more than 165 countries around the globe rely on the comprehensive content, expert independent analysis and flexible delivery methods of IHS to make high-impact decisions and develop strategies with speed and confidence. IHS has been in business since 1959 and became a publicly traded company on the New York Stock Exchange in 2005. Headquartered in Englewood, Colorado, IHS is committed to sustainable, profitable growth and employs 6,700 people in 31 countries around the world.

IHS combines market, technology and supply chain analysis and forecasts at every operational step of the electronics value chain from strategy, planning and analysis to product design and development and supply chain management.

ES2 REPORT METHODOLOGY

Two main primary research processes were conducted for this report: extensive interviews with industry participants and an online end-user survey of North American consumers.

INDUSTRY PARTICIPANT INTERVIEWS

A series of detailed interviews were conducted by telephone with key decision-makers at a number of different types of organizations, across the following company types: device suppliers, existing service providers, dedicated service providers, specialist home automation providers, contractors and installers, dealers and distributors, utility companies, retailers and platform and software providers.

IHS conducted 21 in-depth interviews during the process of this specific study. These interviews were informed by IHS's extensive knowledge of conducting research in this area, including a large scale study, 'Connectivity Opportunities in the Smart Home – World – 2012' [IHS: 2012] which involved conducting more than 40 interviews with a wide range of relevant industry participants located in Europe, North America and Asia Pacific.

NORTH AMERICAN END-USER SURVEY

IHS, in conjunction with the CABA project steering committee members, developed an end-user survey to assess consumer attitudes towards the connected home and associated features, pricing models, and other interesting issues (such as data privacy and value-added services). This consumer survey was completed online by 1,000 North American respondents.

PREVIOUS IHS RESEARCH STUDIES

Importantly, the analysts responsible for this report used IHS' extensive library of both internal and published research studies in related areas. For a full list, please see Appendix 5 - Bibliography.

ES3 CONNECTED HOME MARKET OVERVIEW

North America is projected to continue to be the largest market for connected home devices over the coming years, despite growing signs of deployment in both Asia and Europe. Within North America, home monitoring is expected to continue to be primary driver of system installation within the mass market. However, energy management, as well as comfort and convenience applications, are expected to grow significantly in North America as secondary value propositions [Source: IHS, Connectivity Opportunities in the Smart Home – World – 2012].

Cloud-based home control systems for mass market consumers are set to be the key catalyst for much of the growth in the connected home market [in terms of device shipments]. A number of key trends expected to mold the connected home competitive landscape over the coming three years:

- The range of existing companies offering connected home systems and services to consumers will continue to increase. In the past, most cloud-based home control systems have been offered through dedicated connected home players, such as Alarm.com. However, over the past few years, existing service providers – such as ADT, Verizon and Comcast – have moved into this market. Now, other types of companies – such as retailers – have started to enter, offering their own platform-based systems. The provision of connected home systems and services is open to a wide variety of companies; in many cases there is an opportunity for

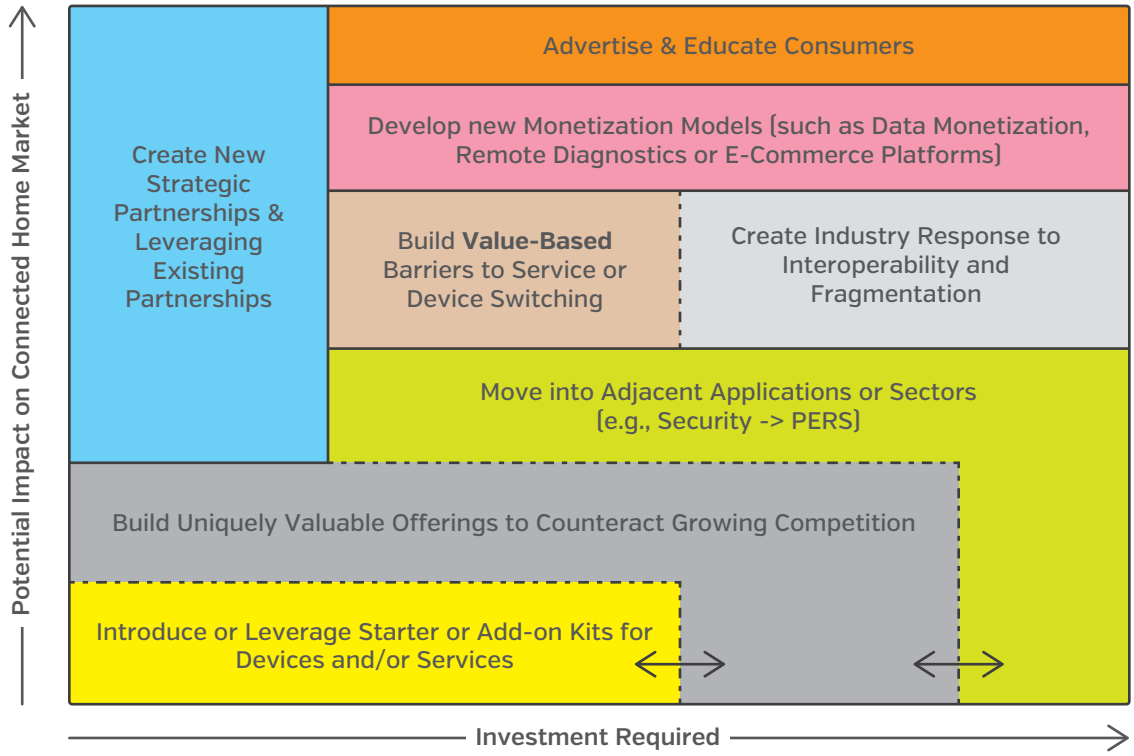
partnerships which can enable the monetization of different aspects of the connected home for different parties.

- Suppliers of standard or 'non-connected' devices will increasingly release connected alternatives of traditional product ranges (such as thermostats or appliances), as well as connected home-specific products, such as smart plugs. In addition, a range of new device OEMs will emerge aimed at the creation of unique product offerings specific to the connected home, as Nest has done with its smart thermostat and smoke alarm products.
- More device suppliers will start to offer their own customer-facing connected home systems, using a variety of pricing models. In some cases, the associated service costs could be included as part of the upfront hardware cost, in order to differentiate from other systems available from existing service providers, which typically have an on-going service element. Interestingly, results from the end-user survey suggested this may be a viable alternative, with a significant proportion of respondents indicating a preference for higher upfront costs rather than subscription contracts. Should this latter pricing model occur on a widespread scale, this could prove highly disruptive to a market which many are already monetizing based on recurring service revenues.
- Many consider platform providers to be the backbone of the connected home value chain, enabling much of the functionality which is driving connected home value from a consumer perspective, such as the ability to receive automated alerts and to manage in-home devices from a smartphone or tablet. As other company types start to enter the market – from retailers to existing service providers or device OEMs – many of these companies will utilize third-party platform developers. Current dedicated service providers (such as Revolv or Nest) may leverage the software and platform requirements from the growing number of entrants to the market and reposition themselves as platform providers, developing the backend platform supporting third-party connected home initiatives, as AlertMe and Alarm.com have previously done.
- As the market evolves, a number of related opportunities will become more evident, spanning multiple company types and associated markets. This could range from telehealth monitoring (creating a platform to enable device data to be shared remotely with institutional healthcare networks), to demand-response (assisting utility companies in the deployment of residential load management programs, including dynamic pricing programs) or commercial building automation (leveraging connected devices and the associated data to ensure efficient building operation).

It is important to note, however, that features which have a wider audience outside of those interested in home automation and remote home control are projected to play an increasing role within the future connected home market, such as remote diagnostics and e-commerce options (for example, automatically ordering new device peripherals, like filters, when required). These value added services represent a method of monetization beyond the initial upfront system costs or on-going service fees.

ES4 IDENTIFYING OPPORTUNITIES IN THE CONNECTED HOME

The following diagram presents an overview of key opportunities relevant to multiple industry players within the connected home market. Analysis of the opportunities facing specific company types are presented in Section 2 of the full report.



Source: IHS – Monetization of the Connected Home Study (2013)

Introduce or Leverage Starter or Add-On Kits for Devices and/or Services: The majority of connected home systems developed for the mass market are offered in a modular format, with basic hardware and services and the opportunity to expand the system functionality. The section of the value chain which exhibits the highest ability to drive new valuable new connected home applications and associated hardware or service offerings will have the advantage in eventually controlling the direction of the markets and also, potentially, the available margins. Innovative add-on kits for connected home systems can not only represent new revenue streams from hardware sales, but also enable the connected home concept to become more entrenched in consumers' lifestyles.

Build Uniquely Valuable Offerings to Counteract Growing Competition, and then Move into Adjacent Sectors: Today, awareness of the availability of mass market connected home systems is still not ubiquitous, as highlighted by the recent consumer survey from IHS. As consumers become more aware of these systems, and a larger number of companies offer such systems, this will lead to growing competition based on both price and functionality. Connected home solution providers will need to invest to build uniquely valuable offerings in order to compete. Once these have been established, companies will also have the opportunity to become active in adjacent or developing application areas, ranging

from independent living solutions to demand-response. In many cases, the same core competencies (such as data analytics, device connectivity or backend platform expertize) can be applied across multiple existing and emerging application areas.

Build Value Based Barriers to Device or Service Switching: Value-based barriers need to be created to avoid dissatisfaction at vendor lock-in, where a consumer can be dependent on a specific vendor for products and services, unable to switch to another vendor without significant switching costs. While it may initially be seen as advantageous to a connected home system provider to lock consumers in to a specific system, this comes with its own challenges, which if managed ineffectively can lead to dissatisfied consumers that cannot switch providers or consumers that switch as soon as they get the opportunity. As new and existing connected home providers continue to innovate, this heightens the risk of dissatisfaction at vendor lock-in if a particular device or function offered by a competitor is deemed attractive by a user that is locked in to an alternative system. With many of today's connected home systems being relatively similar in terms of hardware and associated applications, for connected home suppliers (including device and service providers alike), this drives the need to invest in developing unique system or user interface functionality that can act as a differentiator as system availability grows, or at least keep up with the new features offered by competitors, and replicate these at attractive price points.

Create New Strategic Partnerships and Leverage Existing Partnerships: Partnerships enable companies to leverage other companies' specific capabilities to develop a more compelling, effective or efficient solution. Service providers, for example, typically partner with platform providers to develop the software behind their connected home systems, rather than invest in the development of this expertize internally. They also partner with device suppliers to provide the hardware, leveraging the core capabilities of several types of companies to create a comprehensive connected home solution. As the need to offer more unique and valuable connected home devices and services grows, this will create a new range of partnership opportunities.

Create Industry Response to Interoperability and Fragmentation: Respondents with an interest in connected home systems (56% of the original sample frame) selected, on average, six connected home applications they would like to be able to perform. As more companies enter the connected home market, and importantly as more device suppliers (such as HVAC controller or appliance suppliers) start to offer their own service platforms, there is the risk that a fragmented user experience could develop, where consumers need to use different control devices or apps to interact with different connected devices. This is not expected to be an attractive user experience for the consumer, with the recent survey from IHS revealing that 37% of respondents would find the ability to control all use-cases or functions from a single interface or 'app' very valuable, only choosing a system which allows them to do this. A further 34% selected that they would find this valuable, and would prefer a single app or program. This highlights how valuable a seamless user interface is, and the risk facing the industry should this issue not be addressed.

There are a number of initiatives aiming to reduce the issue of user interface fragmentation. One of the potential ways to resolve this is to move towards more open APIs which allow easier cross-system integration. Whilst in principal a solution such as this is ideal, in practice it may be tricky to implement. Inevitably, the range of companies involved in the connected home will each wish to protect and drive awareness of their brand, which may ultimately culminate in longer term fragmentation. There are a number of industry initiatives aiming to resolve this issue in a variety of different ways, focused on

various parts of the connected home ecosystem. However, before this becomes more prevalent, there will need to be an industry shift from the current stance adopted by many connected home providers which are trying to silo their systems to maintain customer control. In addition, as industry initiatives are developed by various parties in different ways and at different rates, there is the potential for multiple approaches to resolving fragmentation starting to gain traction, without working within a single framework.

Develop New Monetization Models: Emerging approaches to industry-based monetization, i.e., generating revenue beyond the initial hardware or service cost from the consumer, are expected to play a key role in the future of the connected home. This includes new revenue streams, such as data monetization, as well as offering new services such as remote diagnostics functionality or peripheral product replacement platforms, each highlighted later in this Executive Summary (Section ES.5).

Advertise and Educate Consumers: Advertising and education will undoubtedly play a key role in bringing the connected home to the mass market, with 30% of respondents to the recent consumer survey from IHS that indicated that they would like to be able to perform connected home functions only becoming aware of the connected home premise in the survey itself. Advertising and education programs need to be focused not only at building awareness of the availability of connected home systems, but also at breaking down the perception that such systems are complex. It is key that advertising is based on the valuable functions driven by connected home systems, marketing the solutions at an application-level (i.e., what they enable consumers to do), rather than at a device level (i.e., what hardware systems include).

ES5 CONNECTED HOME APPLICATIONS

Inevitably, a key component in assessing connected home offerings is not only their desirability to end-users, but also whether the user is willing to pay for that feature, or if it needs to be monetized in another way.

Analysis of the end-user survey yielded some interesting and promising results when considering the desirability of various connected home functions. Respondents to the recent consumer survey from IHS were provided with a list of applications (see Section 4.5 for the full list) and asked to select those that they would like to be able to perform. The table below presents the top five most common responses.

# Rank	Connected Home Function	% of Respondents
1	Intruder Notifications	35
2	Hazard Detector Monitoring	34
3	Climate Control	31
4	Window/Door Lock Status	29
5	Lighting Control	27

Indeed, 56% of the 1,000 North American survey respondents indicated that they would like to able to perform at least one of the connected home use-cases presented in the survey.

Overall, use-cases around connected home monitoring functions, including intruder notification, hazard detection, and awareness of the status of door or window locks, received the highest aggregate response when compared with other top-level applications, such as energy management or health monitoring. This is in-line with packages seen in the North American market today, where home monitoring represents the key value proposition for the consumer, with features such as energy management offered as secondary or 'add-on' packages.

ES6 CONNECTED HOME PRICING ANALYSIS

DEVICE COSTS

The survey went on to explain to respondents the types of devices they would need to enable each use case. For connected home devices where non-connected variants already exist (such as appliances or thermostats), respondents were asked how much extra they would pay for connected versions of each device, if it could enable them to perform the use-case they have previously selected. The top five most common responses are shown in the table below:

The table below presents the cost and cost premiums that received the highest aggregate responses when respondents were presented with a list of connected variants to standard devices (e.g., a connected door lock compared to a standard door lock).

# Rank	Connected Device Cost Premium Preference	% of Respondents
1	$0 - would not be willing to pay extra	26
2	Under $11 extra	23
3	$21-$40 extra	14
4	$11-$20 extra	13
5	$41 - $60 extra	11

The cost of connected home devices needs to be determined based on a number of factors, including profit margin expectations, consumer willingness to pay, and whether the connected home hardware directly leads to other monetization models (such as a recurring monthly fee). The recent consumer survey from IHS indicated that, in many applications, the majority of consumers that wanted to be able to perform a specific connected home function would be willing to pay a premium for connected devices. However, additional device premiums are not the only way to monetize connected devices, with other revenue channels – such as data monetization or the creation of e-commerce platforms – also able to contribute direct revenue streams.

RECURRING SERVICE FEES

The end-user survey went on to explain that some connected home systems required on-going service fees. Respondents that had indicated they would like to be able to perform connected home functions were asked how much, per month, they would be willing to pay both by application and for the total package.

The table below summarizes the top five most common responses when respondents were asked how much they would be willing to pay, per month, for a service including all the different applications they had previously selected they would like to be able to perform.

# Rank	Preferred Monthly Cost for Bundled Package	% of Respondents
1	$0 - Would Not Pay a Monthly Fee	20
2	$1-$5	17
3	$16-$20	14
4	$6-$10	12
5	$21-$30	11

A fifth of respondents indicated they would not be willing to pay a monthly fee for this, highlighting the importance of assessing other ways of monetization of connected home service provision. When this response was cross-analyzed against the number of connected home applications that respondents would like to be able to perform, respondents that wanted to perform more connected home functions were typically more likely to be willing to pay higher monthly fees, indicating the importance of bundling appropriate functions and services to create a strong value proposition across multiple applications.

There was, however, some variation by specific application. The following tables present the functions that applicable respondents were most and least likely to pay a monthly fee for. It is important to note that there was therefore not an equal sample frame for each application (as different proportions of consumers had indicated that they would like to be able to perform each), and the functions with the highest percentage of respondents below are not necessarily the most popular functions overall. The percentages shown in the tables below indicate that, of the respondents that would like to be able to perform the function, that percentage would be willing to pay a monthly fee for it; they do not necessarily indicate the overall popularity of the application.

# Rank	Functions Most Favoured for Monthly Cost	% of Respondents
1	Elderly Relative Monitoring	77
2	Intruder Notification	69
3	Hazard Detector Monitoring	68
4	Viewing Camera Feed	66
5	Relative Notification	65

# Rank	Functions Least Favoured for Monthly Cost	% of Respondents
1	Home Entertainment Monitoring	40
2	Window Dressing Control	46
3	Pool Pump Monitoring	47
4	Lighting Control	50

The applications respondents were most inclined to pay a monthly fee for were generally based around home or relative monitoring solutions. Elderly monitoring, while not one of the most popular connected home applications overall, achieved the highest proportion of respondents that would be willing to pay for it.

Intruder notification, hazard detection monitoring, remote camera access and relative notification (providing alerts when children or spouses return or leave the home) all scored well in both overall desirability and willingness to pay a monthly fee.

Interestingly, the applications that respondents were least likely to pay an ongoing monthly fee for include those which have significant in-home control application, as well as being valuable when respondents are away from the home. For example, window dressing and lighting control is useful when consumers are either in or away from the home, and may be part of closed home automation networks; whereas other applications, such as home monitoring, are most valuable when respondents are away from the home.

PREFERRED PROVIDERS OF SUBSCRIPTION-BASED SERVICES

Respondents that would like to be able to perform connected home functions were asked what type of company they would be prefer to pay any associated service fees to. Please note the sample included those who indicated they would prefer not to pay for some connected home services. The top five most popular responses are presented in the table below.

# Rank	Favoured Service Provider	% of Respondents
1	Specialist Home Automation Company	37
2	Specialist Security Provider	24
3	Telephone Provider	11
4	Electricity Provider or Utility	9
5	Cable/Satellite Provider	6

When considering connected home service providers, respondents were most likely to select a specialist connected home company. Interestingly, more than half of respondents selected a company that already charges a subscription fee. Security providers were the second most commonly selected company. When the various telecommunications and cable providers are combined to take into account multi-play operators, their collective score was also high. However, with awareness of connected home system availability still relatively low, IHS expects multiple company types to enjoy success in the connected home market, based on the attractiveness of their overall offering in terms of applications, price or other value driver. This is supported by previous consumer surveys conducted by IHS (outside of this specific project): where respondents were not limited to selecting only one company type, multiple company types were selected.

TOTAL SYSTEM COSTS

Respondents that wanted to be able to perform connected home functions were presented with a pre-defined list of upfront and monthly pricing combinations. The question deliberately did not highlight the specific functionality or hardware that would be included in this system, and was designed to assess general attitudes to the various skews of upfront versus subscription cost ratios, as opposed to assessing the specific costs themselves. The table below presents the five price combinations for connected home systems most commonly selected by respondents that would be willing to pay for this type of system.

# Rank	Connected Home Price Combination	% of Respondents
1	$0 per month / $700 upfront	32
2	$20 per month / $500 upfront	13
3	$10 per month / $600 upfront	9
=4	$30 per month / $400 upfront	7
=4	$70 per month / no upfront cost	7

As mentioned, this table is not intended to provide a specific price combination that should be targeted when developing a connected home system. However, the findings indicate that the majority of respondents who would be willing to pay for connected home systems would rather pay for the system upfront than on a subscription/monthly basis. However, this is likely to depend on the specific upfront cost of the system, and the functionality enabled. With more companies, such as device suppliers, anticipated to start to offer systems where the cost of the on-going service element is included in the upfront cost, this highlights the need to investigate further monetization channels, such as data monetization or e-commerce solutions, or to build unique differentiators or value added services to justify the on-going monthly charge.

PURCHASING INFLUENCES

In addition to asking about pricing and functionality requirements, the recent consumer survey from IHS also asked respondents that wanted to be able to perform various connected home functions to select they key factor influencing their purchase. This was asked separately for different top-level applications (energy management, security, health and entertainment or convenience), depending on the functions the respondent had selected an interest in. The four tables below present the top five factors influencing respondents in the survey across each of the four pillars.

# Rank	Top Influences of Purchasing Connected Devices: Energy Management	% of Respondents
1	Energy Efficiency	28
2	Durability	20
3	Ease of Use & Set-U	17
=4	Remote Control (away from home)	15
=4	Automated Efficiency	15

# Rank	Top Influences of Purchasing Connected Devices: Security	% of Respondents
1	Durability	23
=2	Ease of Use & Set-Up	22
=2	Remote Control (away from home)	22
4	Automated Efficiency	14
5	Energy Efficiency	13

# Rank	Top Influences of Purchasing Connected Devices: Health	% of Respondents
1	Ease of Use & Set-Up	27
2	Automated Efficiency	24
=3	Durability	18
=3	Remote Control (away from home)	18
5	Energy Efficiency	8

# Rank	Top Influences of Purchasing Connected Devices: Entertainment & Convenience	% of Respondents
1	Ease of Use & Set-Up	34
2	Energy Efficiency	17
=3	Automated Efficiency	15
=3	Durability	15
5	Remote Control (away from home)	14

Ease of use and ease of set-up received the highest aggregate ranking for respondents in this survey. Interestingly, energy efficiency received the lowest aggregate ranking, but – as expected – received high ranking for energy management devices. Aggregate ranking was derived from the number of respondents selecting the purchasing influence as most important.

CONNECTED HOME USER INTERFACES

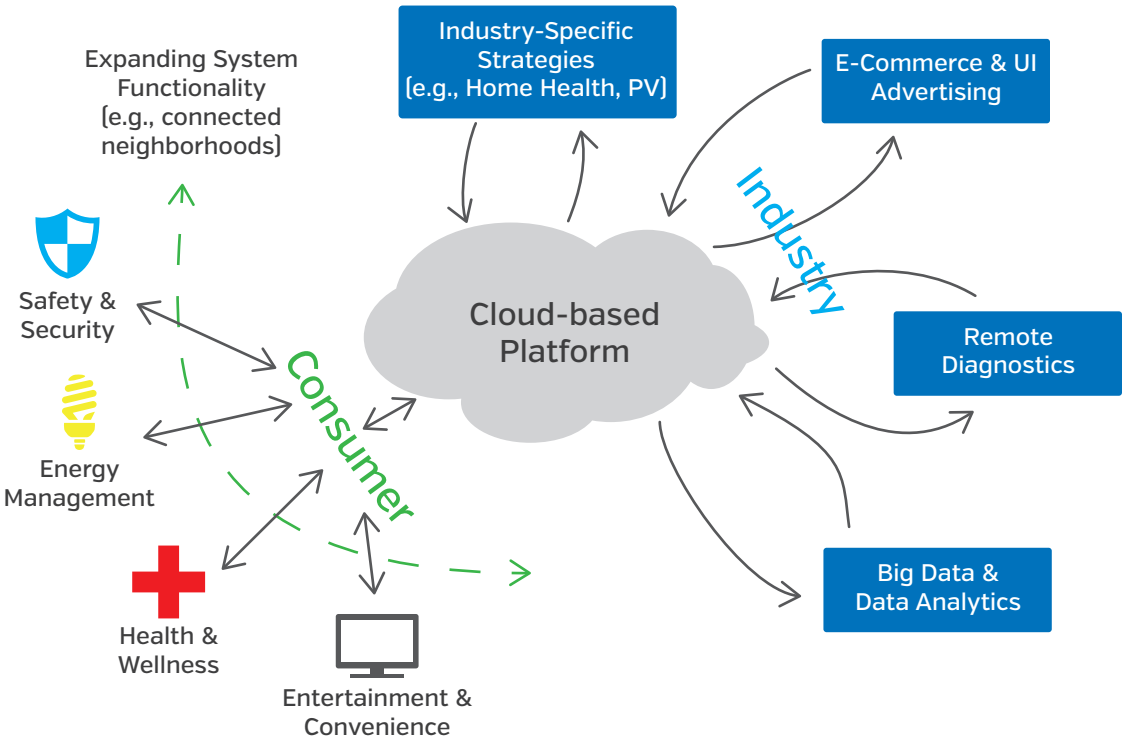
Respondents to the recent consumer survey from IHS that wanted to be able to perform connected home functions were asked which devices they would like to be able to use to control or interact with each application. Respondents could select multiple devices. The five most commonly selected responses are shown in the table below:

# Rank	Host Devices for Connected Home Applications	% of Respondents
1	Smartphone	77
2	Tablet	38
3	Web Portal	25
4	Central Control Panel	19
5	Television	10

For each use-case selected, at least 70% of respondents indicated that they would like to use their smartphone to display information or control their connected home devices. Tablet and Web portal were second and third most prevalent in each use-case, except in lighting control where a control panel was preferred to a Web portal. This highlights the importance of a strong mobile 'app' strategy in the connected home market.

ES7 CONNECTED HOME MONETIZATION MODELS

There is a wide variety of ways to monetize the connected home. This includes not only revenue streams driven by consumers (such as hardware costs or service fees), but also other industry-driven revenue opportunities, such as the monetization of connected home data or e-commerce platforms. The figure below presents an overview of some of the different ways to monetize the connected home.



CONSUMER-FACING REVENUE STREAMS

The following table provides an overview of the two most common customer-facing monetization models exhibited in the connected home industry today: upfront costing and recurring revenue.

	Upfront Costing Models	Recurring Revenue Models
Overview	- Single, one-off cost, generally based around system hardware - In some cases, additional services are included as part of this upfront cost - Systems differentiated in a number of ways, including price, route-to-market and system type	- Typically centered around ongoing subscription fees for cloud-based home control or home monitoring - Generally includes basic hardware/system fee plus monthly charges - Multiple ways to structure recurring fees (standard, tiered, etc.)
Effect on the Vendor	- Unless a service is included, only sporadic consumer touch points. - No ongoing billing relationship, reducing upsell/cross-sell opportunities - Without contracted revenue streams, vendor may be more sensitive to external events or fluctuations	- Continuous revenue generation - users typically contracted for a minimum period supporting future cash projections - High number of consumer touch points as a result of monthly billing / advertising: opportunity to upsell/cross-sell - Vendor lock-in - not just for connected home but for other business areas as well, such as broadband or telephony.
Effect on the Consumer	- Easy for the consumer to understand and budget for, without recurring repayments, terms and conditions, or contractual obligations - However, in some cases, cost can be prohibitively high as vendor needs to generate profit exclusively through upfront fee, which can represent a substantial capital outlay for the consumer. However, with more lower-cost, often DIY devices available, this is making connected home systems more affordable across a range of customer segments, despite lack of contractual obligations - The use of 'closed' systems can still 'lock' consumers in to a specific vendor	- Potentially more convenient for some consumers: easier to afford, with upfront costs typically relatively low - Consumers may already have accounts set up with these service providers for other subscriptions (e.g., electricity, security, or telecommunications) - May vendor lock-in; a consumer can be dependent on a specific vendor for products and services, unable to switch to another vendor without significant switching costs. This could be detrimental to the vendor's brand credibility if the consumer feels 'obligated' to continue the service
Future Opportunities	- Expansion from hardware alone to ongoing services included in original hardware price to differentiate from recurring subscription providers e.g., building in estimate lifetime pricing or offering the service at no add-on cost in order to pursue increased sales, competitive advantage, customer loyalty, or monetize the service in another way. This provides the vendors with more ways to reach the customer (such as via a Web portal or app) and potentially upsell to other products, or improve their prospects in the replacement market. - Device suppliers have a major opportunity to provide easy-to-integrate, interoperable devices to the growing connected home system subscriber base, or develop systems which can integrate with closed systems, such as by the use of gateways	- Opportunity to adjust the pricing and margin by leverage pre-existing business lines in order to gain market share or generate profit elsewhere. e.g., offer home control services at a lower cost than competitors which only offer home control services, as the reduction in margin could be offset by an increased margin on broadband services - Upsell consumers to additional devices or services from basic 'starter-packs', and to reduce customer churn by becoming increasingly entrenched in a customers' lifestyle by using tiered subscription models - Reducing contractual barriers to switching, but aiming to maintain competitive advantage through a superior offering, such as a wider range of compatible products, lower costs, or better levels of service.

	Upfront Costing Models	Recurring Revenue Models
Future Challenges	- Potential threat from new entrants pursuing subscription models with lower cost upfront charges - If device suppliers move more heavily into the connected home market with upfront pricing, consumers may have more choice about which devices from other vendors they want to add to their system, leading to issues of connectivity interoperability. This is also a greater risk of fragmentation, leading to a number of disparate connected home devices, without a seamless user interface or the ability to interoperate. - As more companies enter the connected home market, some connected home devices, such as smart plugs, could become commoditized very quickly, severely eroding margins.	- Threat from companies (such as retailers) offering ongoing services included in upfront costs, potentially reducing consumer willingness to pay ongoing charges for services they perceive to be 'free' elsewhere - Growing number of service providers expected to enter this market; potential for price competition if services are not differentiated in a way consumers are willing to pay a premium for - As more companies enter this market – many focusing on specific aspects of the connected home, such as appliances, home monitoring, or energy management – the consumer could become faced with a home which is more fragmented than connected. This is a risk across all business models.

Recurring revenue models in the marketplace today are varied, and can be adopted by a number of different company types. Three to five years ago, it was predominantly dedicated connected home services providers involved in this market, with companies such as Alarm.com or Vivint paving the way. However, in the past few years, existing service providers, such as telecommunications companies or security providers, have started to take connected home services more mainstream. These existing service providers are considered well-placed to offer connected home services; in part because it offers them a means of reducing customer churn (the rate at which subscribers leave a particular product or service provider for a competitor) and increasing average revenue per user. In addition, these types of companies have strong backgrounds in services marketing, maintaining subscriber relationships, and also already have a target list of potential customers in their current subscribers.

Recurring revenue-based systems are arguably most-suited to systems with relatively low upfront costs, as opposed to high-end home automation systems. Within the high-end automation systems, profits are often generated by the margin built into the cost of the hardware itself, with expectations from some customers that with high upfront fees, the ongoing remote management aspect of the system should be included in the initial investment.

Traditionally, connected home device vendors have been the main users of the upfront costing model. Examples are varied from device suppliers which make their devices available through dedicated retail channels, such as the Internet-based Smarthome.com, which sell a wide range of typically DIY connected home devices from multiple device vendors, to high-end connected home specialists which have established strong brand names and go to market via contractors, such as Crestron or Lutron. As the trend towards cloud-based home control continues, companies which have previously followed the upfront costing model will need to decide whether to offer the ongoing service element with no recurring revenues (e.g., built into the existing cost of the system), whether to move to a recurring revenue model, or whether to monetize this trend through other means.

The upfront costing model may not be suited to companies which are using connected home systems as a means of tying users into other services, particularly where there is no element of ongoing service (such as complimentary cloud-based home control).

INDUSTRY-DRIVEN REVENUE OPPORTUNITIES

There are a number of ways to monetize the connected home outside of the fees charged directly to consumers. These include:

EXPANDED CLOUD SERVICES AND 'BIG DATA' ANALYTICS

Typically, cloud services and 'big data' analytics underpin many of the monetization strategies outlined below.

Cloud services are pivotal to the development of connected home solutions: by their very nature, connected devices require a central point of connectivity and data storage in order to operate 'intelligently' – i.e., to learn patterns, use online information such as weather forecasts, or interact with other devices in a pre-defined and adjustable manner. The cloud is an effective way to enable this type of functionality in an effective manner. Utilizing the cloud for data storage and back up can help companies realize the monetization of 'big data', which can help to monetize the data from the connected home consumer – such as device functionality, times of use, length of cycle – to help target marketing and advertising campaigns and enable the remote diagnostics and e-commerce applications highlighted later in this section of the report. In addition to the examples outlined below and later in this report, data analytics can be used in a multitude of ways to monetize the connected home, ranging from sharing data between connected home systems, centralizing data to allow for access or comparison, and integrating publicly available information from the Internet into the operation of connected home systems. These are only limited examples of the value of cloud services and big data analytics within the connected home. However, both themes are common across the vast majority of further monetization strategies outlined in the remainder of this section.

MONETIZATION OF CONNECTED HOME DATA

Consumer data can be used in-house by connected home device suppliers in order to assist in cross-selling or up-selling to other products or services from that suppliers range. Alternatively, connected home data could, within the realms of country-specific data laws, be sold to third-party companies, in order to enable them to target advertisement or marketing plans to specific groups of individuals. The vast amount of data provides a significant opportunity for service providers looking to expand product lines, or third party companies looking to monetize the connected home space via value added services. Connected home data can also be used to improve the performance or operation of connected home devices.

Initially, some connected home device or service providers view this as a means of increasing revenue from existing smart home users. However, other companies are expected to use the potential revenue generation from connected home data as a way to offer connected devices at no additional premium to unconnected devices; reducing profit margin on the upfront hardware sale, but creating a wider installed base of connected home users to generate data from. This approach could have a number of implications for the market: if connected home devices are offered at no premium to unconnected variants by some device suppliers, this is likely to squeeze the ability of other vendors to obtain a premium.

It is very important to note that the use of, and particularly the sale of, personal data is subject to a range of privacy laws. With some consumers already wary of the vast amount of personal data generated in the connected home, the industry will have to very carefully manage the ways in which it monetizes this data moving forwards.

USER INTERFACE ADVERTISING & E-COMMERCE SOLUTIONS

One of the key trends anticipated for the future connected home is the ability for companies to use user interfaces, such as control panels, smartphones, or tablets to advertise additional products and services, warranty discounts, and other up-sell services to the consumer. Vendors could monetize this by leasing or renting advertising space on connected home user interfaces to third-parties to promote relevant products, as well as use these displays to cross-sell their own products and services. Alternatively, connected home system providers could advertise devices or services from partner companies in exchange for a proportion of direct revenues.

An extension to the monetization of connected home data is the use of this data to enable e-commerce as part of the system for add-on or auxiliary devices, so that device offers can be linked to payment details stored on the system to enable easy, or even automatic (based on preset preferences) ordering of devices. For example, a rule might be set up by the consumer, such as, if their pool pump filter is about to wear out, the system will automatically order a replacement to be delivered a few days before it needs to be replaced, using pre-entered credit card details.

Consumers have the opportunity to pre-order ancillary or complementary products directly from the in-home system, provided a credit or debit card is associated with the system itself. Based on pre-specified consumer preferences, certain products can be ordered automatically. This can lead to better convenience and improved brand loyalty. For example, if a connected home system automatically orders a specific type of washing powder after a pre-specified number of washes, the consumer may be less likely to be swayed by other brand offers they see in physical stores.

As highlighted in section 4, peripheral product replacement was considered valuable by more than 65% of respondents to the recent survey from IHS that wanted to be able to perform connected home functions. In addition, further respondents outside of this sample frame (i.e., those that did not want to be able to perform the connected home applications outlined in the survey) also indicated that peripheral product replacement would be valuable, which indicates significant interest in this feature outside of those interested in the typical home automation based features of connected home systems.

Connected home vendors and partner companies can benefit from increased contact with the consumer by repurposing the user interface to display messages, notifications, advertisements or offers. This also creates improved revenue generation opportunities through cross-sell and up-sell messaging, and the monetization of the advertising space or associated data.

REMOTE DIAGNOSTICS, FIRMWARE UPGRADES & MAINTENANCE

Connected devices can, with the owner's permission, use remote diagnostics features to allow information about the device performance to be communicated back to, for example, an appliance manufacturer. Vendors can remotely pre-empt expensive repairs by analyzing device diagnostic information, letting the consumer know that a device needs servicing or a part may need to be replaced. It could also be used as an upsell tool to extend warrantees or service contracts, for example by highlighting the parts of the device at risk of failure over the coming warranty period. In addition, remote diagnostics can enable the consumer to stay informed about the status of their device, warranty and other potential information. This enables consumers to make informed decisions about purchasing new devices or renewing warranties. When a device is reaching the end of its life cycle and not performing at full capacity, the vendor can use this information to promote a new device, for example by offering a trade-in bonus.

In addition, remote diagnostics capabilities can save time and associated costs for both the vendor and the consumer by automatically diagnosing a fault, without needing to send out a repairman to

assess the problem before ordering and returning on a separate day with the required parts or tools. This type of information could be beneficial in developing further revenue generation opportunities by contracting out repair work.

As with some of the other features outlined above, such as e-commerce, remote diagnostics can create an additional link between the consumer and the vendor. In some cases, the additional functionality and convenience can help to differentiate the device vendor, and also build further brand loyalty. In the recent consumer survey from IHS (analyzed in chapter 4 of this report), more than 80% of respondents that wanted to be able to perform other connected home functions considered remote diagnostics to be a valuable function. In addition, further respondents that had not reacted positively to the home automation-like functions typically associated with the connected home considered this feature to be valuable, indicating a wider target market outside of standard connected home customers.

DEMAND-RESPONSE OR PEAK LOAD CONTROL

It is not the role of this report to focus extensively on the prospects for utility-driven demand-response programs, for which patchwork approaches have developed across North America's fragmented utility industry. However, it is interesting to note that with a growing installed base of connected devices, this represents an increasing amount of energy demand which could, with the permission of the user, theoretically be harnessed for demand-response activities.

There are a number of ways in which connected home programs could develop in this direction. For example, connected home service providers could purchase consumer permission to remotely, incrementally, adjust device operation at times of peak demand through offers such as rebates or discounts as part of direct load control programs. A similar model is today employed for certain industrial and commercial applications. The connected home service provider could then partner with local utility companies to offer the use of this service in times where the grid is reaching capacity or to avoid the use of inefficient, expensive 'peaker' plants which are sometimes fired up for a matter of hours per year. Alternatively, as the installed base of connected devices grows, utility companies could directly approach their customers (for example by partnering with a connected home provider to obtain a list of customers with connected devices) in order to agree such services with consumers directly, for example in exchange for lower electricity rates.

OTHER MONETIZATION CONSIDERATIONS

There is a variety of other functions or features of connected home systems which may contribute to the monetization of this market. This could be directly, through creating clear revenue streams from consumers (e.g., commanding higher pricing) or indirectly, for example by creating a unique value proposition which will drive sales volumes and market share. The means of doing this are wide-reaching and will evolve as the market develops. Potential examples are highlighted below.

INSURANCE PROVIDER PARTNERSHIPS

Home insurance providers could play a key role in the deployment of connected home systems.

Home insurance providers often already offer reduced insurance premiums for households with a monitored home security system. Typically, this discount can be up to 20% (Source: ADT Website, www.adt.com, November 2013). Considering the number of homes worldwide with monitored security systems, this represents a significant potential aggregate cost saving. These savings could contribute to the cost of the monitored system. Connected home system providers could work with insurance

companies to provide similar discounted rates for further connected home features, such as connected hazard detectors (e.g., smoke alarms) or leak detectors.

OFFER WARRANTIES AND INSURANCE

The topic of warranties is important to consumers. In the recent survey from IHS, almost 90% of respondents expected their connected home systems or services to come with a warranty, with 32% expecting a lifetime warranty, indicating that warranties could be a potential system differentiator as mass market connected home system availability grows.

The majority of industry participants interviewed in the process of this research were dismissive of the suggestion of dedicated connected home system insurance, partly as it may to some extent be covered under existing programs. However, the recent consumer survey from IHS revealed that more than 63% of respondents that would like to be able to perform connected home functions would like to option to purchase insurance on a connected home system, with younger age groups more likely to select this response. This presents a further monetization avenue for companies in the connected home market, from device suppliers to system or service providers, through to retailers or installation companies.

EXTEND SYSTEM CONNECTIVITY: CONNECTED NEIGHBORHOODS

As connected home systems become more common, this presents an opportunity to expand the connected home network to create a connected neighborhood, driving a number of value-adding features and associated service revenues (e.g., through a service premium). This can be approached in a number of ways. For example, consumers can opt to share certain data on a common platform, for comparative or competitive purposes. Connected home systems could be extended to enable users to create 'connected home networks' with their friends, family or neighbors, such that an alert is also shown on other pre-defined connected home users' interfaces (whether a smartphone, tablet, Smart TV, etc.) if an alarm is triggered. The creation of these types of systems could also help to leverage 'word of mouth' promotion and be deployed in conjunction with 'recommend a friend' offers, as connected home users consider who they would like to be part of their neighborhood networks.

The above example involves consumers creating a named network within a neighborhood or community. However, the growing installed base of connected homes also presents the opportunity for the creation of an anonymous system which leverages the growing rate of data gained through connected home systems to improve individual system functionality. As long as the data is made available by individuals in the neighborhood, the service provider can utilize the data to improve the service provided to less 'smart' connected home systems. For example, where a connected home system features a flood alert, if this is triggered, the service provider could correlate this information with Internet-based weather information to assess whether this is likely to be household specific (e.g., a burst water pipe) or a more general hazard (e.g., a flooded river) in order to alert other connected home users in a similar area that might not have a flood alert, without indicating the household or location where the original alert was triggered. This sort of 'unknowing' neighborhood intelligence could be offered as a value-added service for consumers.

LEVERAGE TRENDS IN OTHER MARKETS

Connected home systems will need to evolve to take into account growing consumer trends, integrating new applications and functions as lifestyles, behaviors and households change. For example, as the trend towards renewables grows, and certain parts of North America provide attractive incentives, connected home providers can leverage consumer interest in residential PV systems.

As another example, many countries continue to face an aging population. Connected home providers can leverage this trend to develop solutions that suit this demographic. Independent living systems are considered by IHS to be an appropriate extension of current connected home capabilities as much of the core hardware and software functionality can be enabled with familiar solutions. For example, home monitoring hardware shares a lot of commonality with the devices used in independent living systems (such as motion sensors or window/door contacts which can be applied to anything from pill cabinets to toilet seats), and existing backend platforms already typically include data analytics which can be extended to detect and monitor daily routines, sending notifications to relatives or caregivers if there is a deviation, in much the same way that intruder alerts can be sent to multiple system users. As a result, the level of re-investment to move into this market is considered to be relatively low, as it builds heavily upon current connected home expertize. In addition, these systems can be targeted not only at the individuals themselves, but more likely at their family, typically their adult children, who can also obtain piece of mind from such a system.

Additionally, the 'connected car' concept may present further opportunity through leveraging the car to automate further connected home systems, or utilizing the in-car infotainment system to receive notifications or interact with connected devices.

As the awareness of connected home systems grows, and more companies move into this market, it will be increasingly important to effectively differentiate solutions; by offering value enhancing applications or features, this can avoid companies needing to compete based solely on price.

1 INTRODUCTION

1.0 INTRODUCTION

This report has been created by IHS, a leading analyst research firm, for the Continental Automated Buildings Association (CABA). CABA is a leader in initiating and developing cross-industry collaborative research, under the CABA Research Program. Following the CABA Digital Home Forum at Qualcomm, San Diego, CA (October 2012), attendees selected the topic of Monetization for the Connected Home Landmark Research Study for 2013.

1.1 REPORT STRUCTURE

Following this introductory chapter (Chapter One), this report includes the following chapters:

Chapter Two provides an overview of key analysis, drawing on consumer survey results, ecosystem analysis and recommendations to provide a comprehensive summary of monetization opportunities in the connected home.

Chapter Three covers the ecosystem and business model analysis of the report; this includes a matrix of the connected home ecosystem; a comprehensive analysis of the connected home ecosystem segmented by key industry players (determined in conjunction with project steering committee members); and an overview of the current and developing business models within the connected home market.

Chapter Four comprises the analysis of a consumer survey conducted by IHS, and designed in conjunction with CABA project steering committee members. This covers aspects ranging from attitudes and demands of those who already own connected devices, the use-cases desirable to those who do not own connected devices today, and further considerations such as pricing, installation preferences, data privacy concerns and value added services.

Appendix 1 comprises the company profiles for remote home management service providers as referenced in section 3.2.

Appendix 2 presents demographic analysis of the respondents to the IHS consumer survey (including age, gender, housing and more).

Appendix 3 comprises additional end-user survey analysis not highlighted in the main body of this report.

Appendix 4 presents an overview of the North American electricity infrastructure and energy market.

Appendix 5 includes a brief overview of the main sources used in the process of this report.

The following table provides information on the key deliverables of the project and where in the report the associated analysis is located.

Primary Deliverable	Secondary Deliverable	Relevant Report Content
Evolution of the Connected Home Ecosystem	Value chain matrix	Section 3.1
	Industry recommendations	Section 3.1
	Industry participant ecosystem	Section 3.2
	Business model analysis	Section 3.3
	Future opportunities and challenges of business models	Section 3.2 Section 3.3
	Analysis of current monetization models	Section 3.1 Section 3.2
	Profiles	Appendix 1
Identification of End-User Value Propositions	Analysis of responses by key demographic	Section 4 Appendix 2
	Connected home feature and device preference	Section 4.1 Appendix 3
	Device cost preference and system fees	Section 4.2 Appendix 3
	Connected home future use-cases	Section 4.2 Appendix 3
	Potential product and service demand	Section 4.3 Appendix 3
	Connected home service features	Section 4.3 Appendix 3
	Connected home service considerations	Section 4.3 Appendix 3
	Demographic analysis	Section 4 Appendix 2

Primary Deliverable	Secondary Deliverable	Relevant Report Content
Conclusions and Recommendations	Future opportunities and difficulties	Section 3.1 Section 3.2
	Implementing new monetization models	Section 3.1
	Critical success factors	Section 3.1 Section 3.2
	Identification of well-placed companies to take advantage of specific segments	Section 3.1 Section 3.2
	Strategic recommendations for vendors approaching new business model developments	Section 3.1 Section 3.2 Section 3.3

1.2 REPORT METHODOLOGY

Two main primary research processes were conducted for this report: extensive interviews with industry participants and an online end-user survey of North American consumers.

INDUSTRY PARTICIPANT INTERVIEWS

A series of detailed interviews were conducted by telephone with key decision-makers at a number of different types of organizations, across the following company types. Specific company names are provided as examples only, and do not indicate that these were the specific companies interviewed.

- **Device suppliers** – include both those companies dedicated to supplying connected devices, such as Nest or EcoBee, as well as device suppliers with established non-connected device product lines, such as GE, Emerson, Tyco and Honeywell.
- **Existing service providers** – companies or organizations that have an existing customer base through offering a service other than connected home services, such as broadband, cable or security services.
- **Dedicated service providers** – companies which offer connected home systems and services, and do not have a pre-existing customer base from other business lines outside of the connected home. Typically, though not always, these companies are start-ups.
- **Specialist home automation providers** – companies exclusively offering connected home devices or systems aimed at multiple applications; typically these would be relatively high-cost, whole-home, end-to-end systems, where the specialist company would provide the hardware, software and back-end services.
- **Contractors and installers** – Some connected home device or system providers use installation or contractor companies to go to market. These range from nationwide organizations to typically small, local outfits.
- **Dealers and distributors** – Dealers and distributors contract with device suppliers to supply to other channel partners, such as installation companies or contractors.
- **Utility companies** – Utility companies provide resources such as electricity, water or gas to the consumer, and are typically governed by state or nationwide regulations. The structure of the market and operation varies significantly by location.

- **Retailers** – In the connected home industry, these are typically specialist online providers (such as smarthome.com), but also include general bricks-and-mortar retailers recently entering the market (such as Lowe's or Best Buy).
- **Platform and software providers** – Typically those who enable the service element of the connected home specifically relating to cloud-based home control or other services such as remote diagnostics by providing the back-end of the network, the associated platform service and portal or app development, such as iControl, Arrayent or AlertMe.

The names of the companies interviewed cannot be revealed. Interviewees were assured confidentiality as they were often discussing product or service plans and detailed strategic information.

However, the following table provides an overview of the types of companies that were interviewed during the course of the research for this specific report. The company names shown below are not indicative of the actual companies interviewed; they are merely used to explain how IHS has categorized the different ecosystem players.

Company Type	Canada	U.S.
Industry Interview Participants	28%	72%
Dedicated Service Provider (e.g., Nest, EcoBee, Revolv)	50%	50%
Specialist Home Automation Provider (e.g., Crestron, Lutron, AMX)	50%	50%
Device Supplier (e.g., Bosch, Honeywell, Schneider Electric, Emerson)	50%	50%
Contractors & Installers (e.g., KEEC electrical	0%	100%
Dealers & Distributors (e.g., FrontPoint Security, SageAlarm)	0%	100%
Utility Companies (e.g., SCE, PG&E, Hydro One, BC Hydro)	100%	0%
Retailers (e.g., Home Depot, Lowe's, Best Buy, Staples)	0%	100%
Software/Platform Providers (e.g., Arrayent, iControl, AlertMe, Alarm.com, IBM)	0%	100%

The table below presents an overview of the locations of the companies that were interviewed during the course of the research for this specific report.

Company Type	Canada	U.S.
Industry Interview Participants	28%	72%

IHS conducted 21 in-depth interviews during the process of this study. These interviews were informed by IHS's extensive knowledge of conducting research in this area, including a large scale study, 'Connectivity Opportunities in the Smart Home – World – 2012' (IHS: 2012) which involved conducting more than 40 interviews with a wide range of industry participants located in Europe, North America and Asia Pacific. For a bibliography of other sources used in this report, please refer to Appendix Five.

NORTH AMERICAN END-USER SURVEY

IHS, in conjunction with the CABA project steering committee members, developed an online end-user survey to assess consumer attitudes towards the connected home and associated features, pricing models, and other interesting issues (such as data privacy and value-added services). This consumer

survey was completed by 1,000 North American respondents. For more information on the demographics of this sample frame, please refer to Appendix Two.

The following states were included in each United States region:

- East: Connecticut, Massachusetts, Maine, New Hampshire. New Jersey, New York, Pennsylvania, Rhode Island and Vermont.
- Midwest: Iowa, Illinois, Indiana, Kansas, Michigan, Minnesota, Missouri, North Dakota, Nebraska, Ohio, South Dakota and Wisconsin.
- South: Alabama, Arkansas, District of Columbia, Delaware, Florida, Georgia, Kentucky, Louisiana, Maryland, Mississippi, North Carolina, Oklahoma, South Carolina, Tennessee, Texas, Virginia and West Virginia.
- West Coast: Alaska, Arizona, California, Colorado, Hawaii, Idaho, Montana, New Mexico, Nevada, Oregon, Utah, Washington and Wyoming.

SAMPLE AND RESPONSE VALIDITY

The sample frame for the end-user survey recently completed by IHS as part of this study was generated with a third-party survey company with 2.4 million members in over 30 countries.

Respondent are put through a rigorous screening process where they are asked a number of profiling questions that assess their interests. These interests are then used as part of the screening for each survey they undertake: if the respondent provides a metric that is considered unsuitable for a specific survey, they will be immediately removed from that process.

Email addresses used in registration require verification; the system automatically checks for duplicates, numerical variations on existing email addresses, and against a blacklist of banned email addresses, before registration is confirmed.

Response quality is ensured through over-recruiting respondents by 10% to provide a margin for the removal of poor quality responses. Respondents are removed for answering the survey too quickly, and for providing incoherent answers; whilst algorithms can detect 'straight-liners' (respondents providing the same answer for each question) who can then be subsequently removed.

PREVIOUS IHS RESEARCH STUDIES

Importantly, the analysts responsible for this report used IHS' extensive library of both internal and published research studies in related areas. For a bibliography of sources, please refer to Appendix 5.

1.3 USE OF DEVICE EXAMPLES

Throughout this report, real-world examples of select devices are included to help illustrate the explanation of specific product categories or functions. The devices are selected solely to exhibit a feature being discussed or to help the reader understand a definition or analysis. For example, using AT&T's Digital Life service to exemplify a connected home service from an existing service provider. Their choice neither implies that the device is a leader in its field unless specifically stated nor is it any way being promoted by IHS, and is used solely for illustration.

2 CONNECTED HOME OVERVIEW AND SUMMARY OF FINDINGS

2.0 INTRODUCTION

This chapter of the report provides an overview of the connected home market and a summary of some of the key report findings covered in more depth later in the report.

Chapter Two of this report utilizes a number of sources to help form and develop the analysis presented, as follows:

- Industry interviews – Interviews conducted by IHS analysts as part of the "Monetization of the Connected Home" project. The content shared and discussed by individuals taking part in these industry interviews is used to enhance IHS' understanding of companies and products within the industry, and to help inform or shape analyst's views on the market and related issues.
- End-user survey – The survey conducted by IHS, with input from the CABA "Monetization of the Connected Home" project steering committee, forms the basis of the analysis of consumer perception or attitudes toward the various issues facing the connected home. This survey is referenced on numerous occasions, to provide valuable context.
- Industry knowledge within the IHS project team obtained as part of the research process for recent reports, such as "Connectivity Opportunities in the Smart Home", "Smart Home Energy Management Systems" and "Smart Home Consumer Survey – US, Brazil, UK, Germany & China".

Recommendations and findings included in this section of the report represent the view of IHS, formed in conjunction with the above research methods.

CONNECTED HOME DEFINITION

Within the context of this report, IHS defines a connected home as one that features an in-home network (often low-bandwidth, but not in all cases) to facilitate the control of, interaction between, or sharing of data from in-home devices, typically though the inclusion of some form of gateway. This encompasses a variety of sub-segments, ranging from home automation or demand-response activities using a smart meter gateway or other form of metering infrastructure network. It is important to

note that the transmission and delivery of high-bandwidth content, such as video, is not considered within the scope of this report.

2.1 CONNECTED HOME MARKET OVERVIEW

North America is projected to continue to be the largest market for connected home devices over the coming years, despite growing signs of deployment in both Asia and Europe. Within North America, home monitoring is expected to continue to be primary driver of system installations within the mass market. However, energy management, as well as comfort and convenience applications, are expected to grow significantly in North America as secondary value propositions (source: IHS, "Connectivity Opportunities in the Smart Home – World – 2012 Edition"). In addition, as indicated in the recent consumer survey from IHS (completed as part of this project), new features which have a wider audience outside those interested in home automation and control are projected to drive the connected home market forwards, such as remote diagnostics and e-commerce options (for example, automatically ordering new device peripherals, like filters, when required).

Cloud-based home control systems for mass market consumers are set to be the key catalyst for much of the growth (in terms of subscriber numbers) in the connected home market. Existing service providers, such as security companies, cable operators or telecommunications companies, are anticipated to drive a significant proportion of this growth due to their ability to leverage an existing subscriber base and services marketing expertise, supporting goals of reducing customer churn, tying consumers to existing business line offerings, and increasing average revenue per user. Existing service providers which have entered the connected home market project subscriber numbers to increase rapidly over the coming five years; with new entrants also aiming to increase market penetration. Existing service providers target connected home services not only at their existing customer base, but also intend to drive new customer contracts. For example, over 30% of ADT's new residential customers are said to have subscribed to the ADT Pulse system.

Existing service providers will not be the only companies driving mass adoption of connected home systems. In the recent consumer survey from IHS, over a third of respondents with an interest in connected home applications selected 'specialist companies' as their top-choice connected home service provider, indicating a continued opportunity for dedicated service providers to offer systems directly to consumers. Equally, however, where these companies have developed their own proprietary software platforms, there is the opportunity to alternatively white-label these platforms to take advantage of the growing range of companies, such as device suppliers, existing service providers and retailers, entering the connected home market.

The growing availability of connected home systems aimed at the mass market is creating obvious opportunities for associated device suppliers. As well as benefiting through growing demand for connected devices (through a wide range of companies, from retailers to service providers), there are additional opportunities through associated services, including remote diagnostics and peripheral product ordering. The recent consumer survey from IHS indicated that these features are valuable not only to consumers with an interest in connected home applications, such as controlling HVAC systems or interactive home monitoring, but also to consumers that are not interested with the 'home automation-like' aspects of connected home systems.

However, not all connected home systems will be in the mass market segment, and the market for high-end systems will continue to grow, albeit at a slower rate than the mass market systems, as home automation specialists continue to serve this market. These systems will still remain a niche luxury market, focused on whole-home system provision, customization and service levels for both

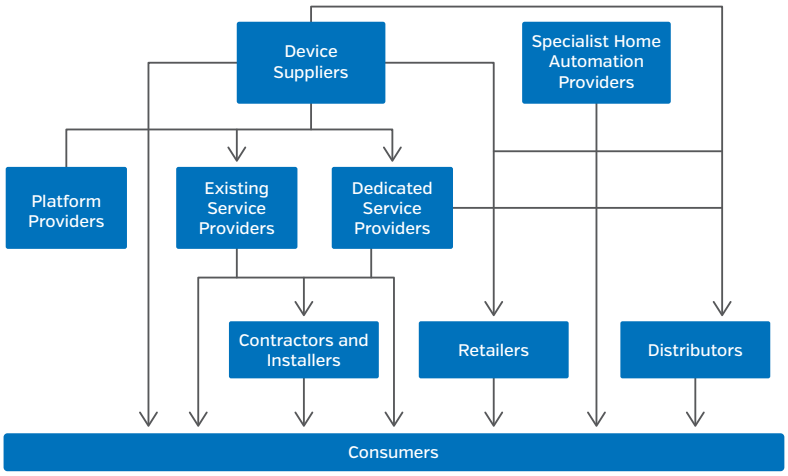
retrofit and new-build markets, working with a combination of customers, including end-users, distributors, dealers, architects, and property developers.

2.2 CONNECTED HOME ECOSYSTEM

The connected home ecosystem is examined in detail in Chapter 3 of this report, with the factors impacting each company type analyzed in Section 3.2.

OVERVIEW

The diagram below summarizes key relationships within the current connected home ecosystem.



Source: IHS © 2013 IHS

EVOLUTION OF THE CONNECTED HOME ECOSYSTEM

IHS expects a number of key developments within the connected home ecosystem over the coming three years.

- Suppliers of standard or 'non-connected' devices will increasingly release connected alternatives of traditional product ranges (such as thermostats or appliances), as well as connected home-specific products, such as smart plugs. In addition, a range of new device OEMs will emerge aimed at the creation of unique product offerings specific to the connected home, as Nest has done with its smart thermostat and smoke alarm products.
- An increasing number of existing service providers, such as security companies, telecommunications providers and even utility companies, will move into this market in various ways. In the majority of cases, this is expected to be in partnership with platform providers (i.e., those companies focused solely on providing connected home or other software and connectivity platforms) in order to offer cloud-based home management systems as a means of increasing subscriber revenues, reducing customer churn (i.e., the rate at which subscribers leave one service provider for a competitor) or tying consumers into core business lines. Arrayent or iControl are good examples of companies focused on connected home platform provision.
- In response to this growing competition, dedicated service providers that don't today have an existing subscriber base will need to demonstrate clear value (e.g., through pricing,

functionality or service) in order to compete effectively. Some will leverage the growing number of companies wanting to enter the connected home market and reposition themselves as platform providers, developing the backend platform supporting third-party connected home initiatives.

- Utility companies are expected to attempt to play a growing role in the development of the connected home. This will range from residential load management systems to consumer-driven energy management programs, such as building awareness of electricity consumption through the use of smart plugs with energy measurement capabilities, or the enablement of whole-home electricity consumption to be displayed on smartphones or tablets by creating a consumer-accessible portal or app. In the North American market, energy management is increasingly viewed as an extension to the initial home monitoring packages, presenting an opportunity for utility companies to partner with existing connected home providers to offer energy management as an 'add-on', for example through enabling electricity data to be available through the connected home system. The most successful of these programs are expected to leverage partnerships with existing connected home system or service providers. These types of partnerships are somewhat scarce at present, although the relationship between ADT and Southern California Edison to deliver energy management and reporting capabilities is a good example of the concept. Furthermore, the Green Button initiative, aiming to provide individuals with their own energy usage information in a simple format, will help to foster these relationships though the use of a common data format. Developers are able to create consumer-facing offerings which can leverage the data released by participating utility providers, such as Pacific Gas & Electric or San Diego Gas & Electric, creating innovative applications that use this data.
- The range of existing companies offering connected home systems and services to consumers will continue to increase. Already, there has been a significant shift in this market. In the past, most connected home services (namely cloud-based home control) have been offered through dedicated connected home players, such as Alarm.com. However, over the past few years, existing service providers – such as ADT, Verizon and Comcast – have moved into this market. Now, other types of companies have started to enter. For example, retailers such as Lowe's and Staples have both moved into connected home service provider positions, offering their own platform-based systems. This can offer a number of benefits, such as increased customer contact (e.g., through the online home management portal or app) and recurring service revenues. In addition, a retailer offering its own system can pre-test compatible devices which it stocks in its stores, and promote these for use with its own-brand system.
- Another trend set to become more prevalent is the move from device suppliers to offer their own customer-facing connected home systems. A variety of pricing models are anticipated to be employed by device suppliers. For example, offering a service could be a means of moving from a one-off cost model to a recurring subscription revenue model, with associated on-going service fees. Alternatively, this service could be provided as part of the upfront hardware cost, in order to differentiate from other systems available from existing service providers, which typically have an on-going service element. Interestingly, results from the end-user survey suggested this may be a viable alternative, with a significant proportion of respondents indicating a preference for higher upfront costs rather than subscription contracts. Should this latter pricing model occur on a widespread scale, this could prove highly disruptive to a market which many are already monetizing based on recurring service revenues. In addition, should more device manufacturers start to move into the provision of remote management services,

there is the risk that a fragmented connected home scenario could develop where consumer have multiple devices from multiple suppliers, each with their own management system, without a seamless single user interface.

- As the connected home market develops, a range of partnership opportunities will continue to evolve. The key strategies behind the partnerships will vary. For example, partnerships could be developed in order to enable companies to enter the connected home market, or to increase the functionality provided by existing companies already in the market. Alternatively, as more companies move into the connected home market, there are growing opportunities for platform providers to form partnerships. As other company types start to enter the market – from retailers to existing service providers or device OEMs – many of these companies utilize third-party platform providers. Many consider platform providers to be the backbone of the connected home value chain, enabling much of the functionality which is driving connected home value from a consumer perspective, such as the ability to receive automated alerts and to manage in-home devices from a smartphone or tablet. In addition, as more connected devices have the ability to integrate with connected home systems there will be an increasing opportunity to create more innovative "scenarios" creating further value, where specific actions or events can trigger an automated event, for example turning lights off as the individual leaves the house. Further, e-commerce platforms or remote diagnostics have the ability to offer further value to the user (and provider). The growing connected home market represents a massive opportunity for platform providers. While moves along the value chain have been made by some existing providers to acquire platform development capabilities (e.g., AT&T), the R&D associated with in-house platform development or costs associated with acquisition means that the majority are expected to partner with third-party platform providers in order to go to market with connected home solutions.
- The continued evolution of the connected home raises considerable opportunity for device manufacturers. Device OEMs have the opportunity to be extremely innovative regarding the use cases and day-to-day life problems that they can solve through the development of connected home devices, something service providers would rely on device OEMs to help enable them to do. Therefore, there is an opportunity for the device node of the value chain to drive the enablement of new connected solutions and, in doing so, potentially help to maintain healthy margins in the face of increased price pressure from new market entrants. However, service providers also have the opportunity to take a leadership role in this market through defining their own key applications enabled through services and associated hardware, working with a range of device suppliers to enable this. Large-scale service providers have the ability to dictate specifications and capabilities due to their scale and, as a result, may also be able to drive new connected home use-cases and applications. The section of the value chain which exhibits the highest ability to drive valuable new connected home applications and associated hardware or service offerings will have the advantage in eventually controlling the direction of the markets and also, potentially, the available margins.
- As the market evolves, a number of related opportunities will become more evident, spanning multiple company types and associated markets. This could range from telehealth monitoring (creating a platform to enable device data to be shared remotely with institutional healthcare networks), to demand-response (assisting utility companies in the deployment of residential load management programs, including dynamic pricing programs) or commercial building automation (leveraging connected devices and the associated data to ensure efficient building operation).

The opportunities, challenges and recommendations specific to each company type are analyzed in more depth in Sections 3.1 and 3.2 of this report.

CONNECTED HOME SERVICE PROVIDERS

As more companies start to offer connected home services, this will lead to a market environment where consumers have an increasing level of choice across multiple service provider types, from telecommunications providers to device suppliers.

A recent survey from IHS asked respondents to select which type of company they would be most comfortable paying an on-going service fee to, in order to enable remote or online home management services.

Respondents could select only one type of company. Limiting the respondents to those with an interest in connected home applications, more than a third (36%) of respondents selected that they would prefer a specialist connected home company for this, with 23% selecting service providers and a similar level selecting one of the telecommunications or operators listed (broadband providers, mobile phone operators, telephone providers or cable operators). When asked why they had selected these particular companies, the most common responses were related to trust and familiarity. Familiarity was the most common reason for respondents to select broadband providers, cable/satellite providers, retail companies, consumer electronics providers, telephone providers, mobile phone or utility companies. Trustworthiness was the most common reason for respondents to select online services companies, security providers, specialist companies and electricity providers. This is analyzed further in section 4.3 of the report.

Interestingly, however, in a previous survey from IHS that allowed respondents to make multiple selections to highlight the companies they would be comfortable paying an on-going service fee to, in order to enable remote or online home management services, US respondents selected an average of two different company types.

With overall awareness of connected home applications still relatively low, and marketing campaigns often relatively new or small-scale from some providers, IHS expects marketing and education programs to play a key role in driving the role of different service providers in the connected home. However, no single company type is expected to 'win' the connected home. Instead, there will be increasing consumer choice from a wide range of companies offering connected home services and solutions. Some company types will have inherent advantages (such as a pre-existing subscriber base, in the case of existing service providers moving into the market), but no single company is expected to dominate within the coming years.

2.3 CONNECTED HOME MONETIZATION

This section presents an overview of some of the key findings from the recent consumer survey conducted by IHS, referencing current and future monetization opportunities.

Further information on the recent IHS consumer survey, including detailed findings, are presented in Chapter 4 of this report.

CONNECTED HOME APPLICATIONS

Inevitably, a key component in assessing connected home offerings is not only their desirability to end-users, but also whether the user is willing to pay for that feature, or if it needs to be monetized in another way.

DESIRABILITY OF CONNECTED HOME APPLICATIONS

FUNCTION

Analysis of the end-user survey yielded some interesting and promising results when considering the desirability of various connected home functions. Indeed, 56% of the 1,000 North American survey respondents indicated that they would like to able to perform at least one of the connected home use-cases presented in the survey.

A full and comprehensive explanation of the examples, summarized in the table below, presented to respondents is detailed in Section 4.2

Table 2.1: Question 2.2 – Connected Device Use-case Overview; % of Respondents

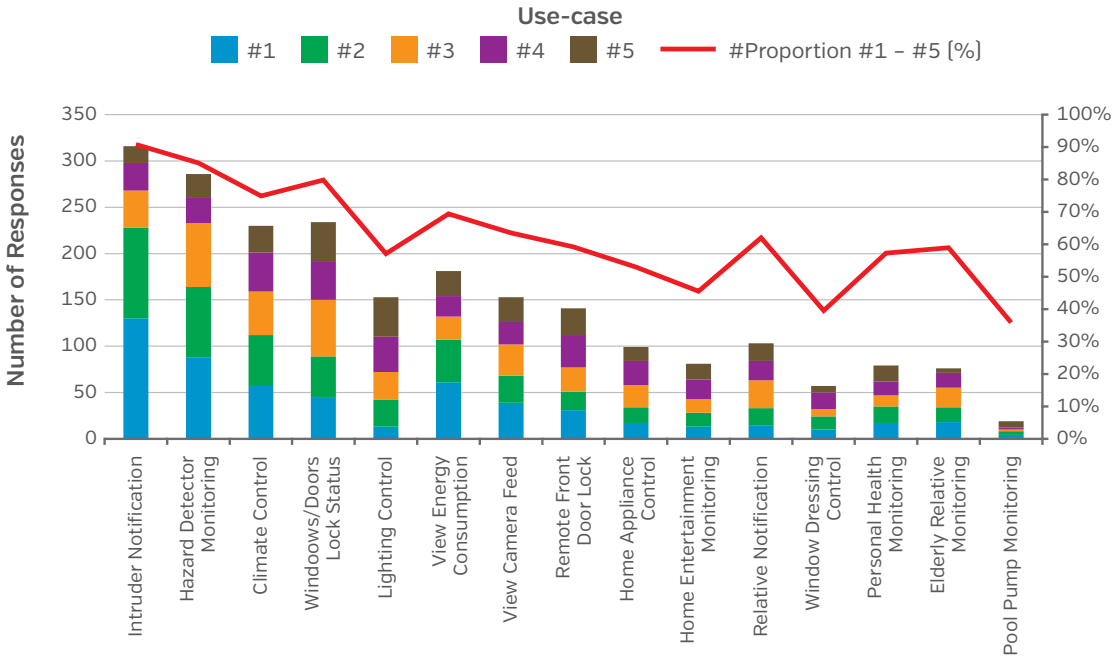
	% of Respondents
Intruder Notification	35
Hazard Detector Monitoring	34
Climate Control	31
Windows/Doors Lock Status	29
Lighting Control	27
View Energy Consumption	26
View Camera Feed	24
Remote Front Door Lock	24
Home Appliance Control	19
Home Entertainment Monitoring	18
Relative Notification	17
Window Dressing Control	14
Personal Health Monitoring	14
Elderly Relative Monitoring	13
Pool Pump Monitoring	5
None of the above	44
Total (n)	1,000

Source: IHS © 2013 IHS

Overall, use-cases around connected home monitoring functions, including intruder notification, hazard detection, and awareness of the status of door or window locks, received the highest aggregate response when compared with other top-level applications, such as energy management or health monitoring. This is in-line with connected home offerings in the North American market today, where home monitoring represents the key value proposition for the consumer, with features such as energy management offered as secondary or 'add on' packages. However, it is interesting to note that climate control, often a core component of energy management programs, was included in the top applications.

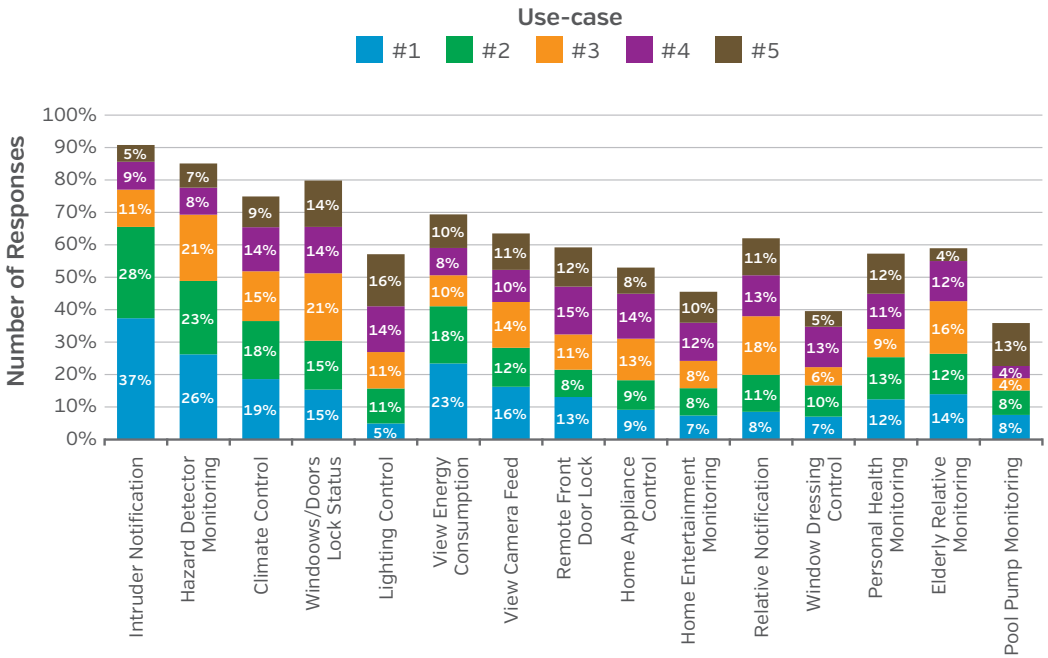
When asked to rank the importance of the previously selected connected home functions, proportionally, intruder notification was considered to be of highest importance by those that selected it. This was generally true of most of the home monitoring-related applications.

Chart 2.1: Question 3.5 – Use-case Ranking



Source: IHS © 2013 IHS

Chart 2.2: Question 3.5 – Use-case Ranking



Source: IHS © 2013 IHS

Note that in the figure above, in each use-case, the sum of responses does not equal 100% due to respondents being able to rank each use-case as lower than fifth most important.

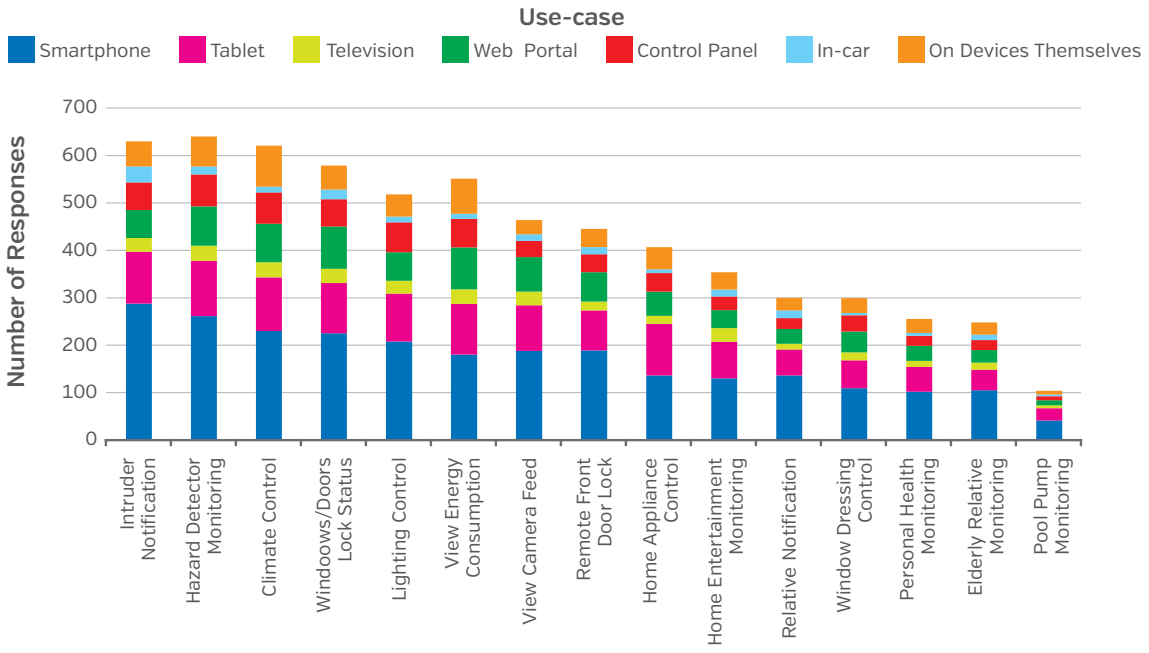
There is some variation in these responses by demographic criteria, which is analyzed further in Section 4.2. For example, respondents above the age of 51 showed significantly less interest in connected home functions, with more than half of these respondents not selecting any use-cases which they would like to do. However, the most popular use-cases overall generally also proved to be most popular among older respondents, for example intruder notification, hazard detector monitoring and climate control, indicating consistency in individual use-case desirability (albeit at a lower level from the older respondents). Equally, there was a strong relationship between household income and the percentage of respondents which wanted to be able to perform connected home functions. Overall, as household income increased, respondents were more likely to have selected at least one use-case, with 55% of respondents with household incomes under $25,000 selecting "none of the above" compared with just 29% selecting this option for respondents with household incomes of $150,000 or above (although this was not a directly linear trend).

Importantly, there was a significant relationship between security system ownership and the desirability of connected home applications. Whereas 76% of respondents owning a security system selected that they would like to be able to perform one or more connected home applications, this compared to only 49% of respondents without a security system.

USER INTERFACE

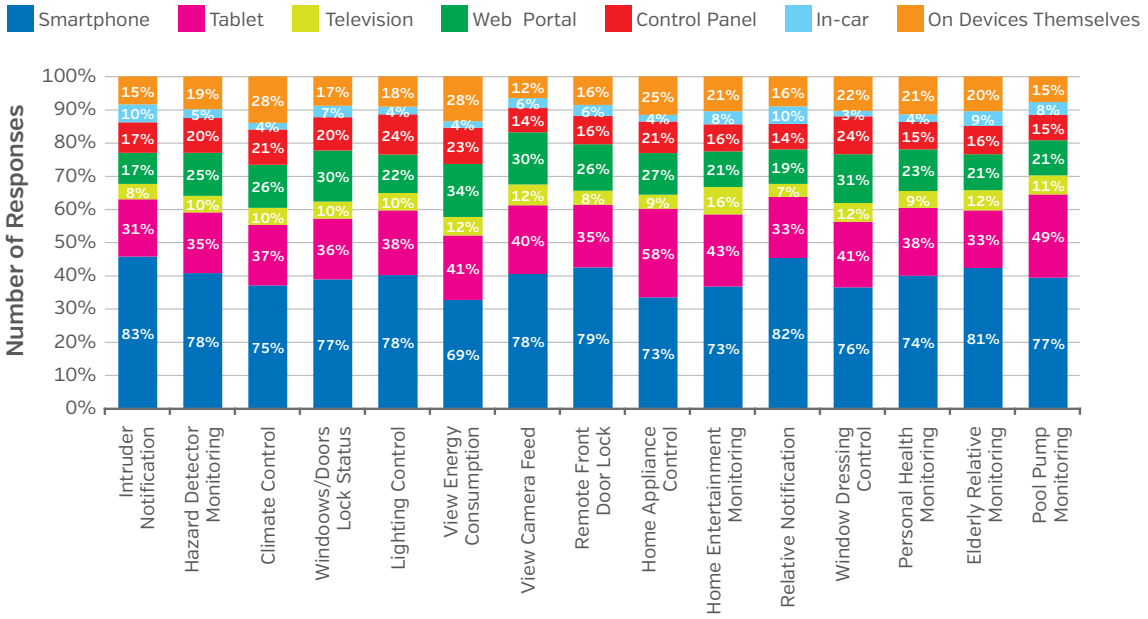
The way that a consumer interfaces with a connected home system can be a key factor to the end-user experience. In general, the prevalence and use of portable consumer electronics devices such as smartphones or tablets is increasing, often at the expense of dedicated devices such as laptop or desktop PCs and portable media players. As these portable consumer electronics devices become more entrenched in consumers' lives, they make natural user interfaces for the connected home.

Chart 2.3: Question 3.2 – Use-case Display



Source: IHS © 2013 IHS

Chart 2.4: Question 3.2 – Use-case Display



Source: IHS © 2013 IHS

Please note that in the figure above, the total data labels do not sum to 100% in each use-case due to the fact that respondents were able to select more than one device to display information.

The use of smartphones and tablets is already prevalent in most systems available today, along with Web portals, whilst control panels are typically found in higher end connected home systems. Currently, the television is not commonly used as an interface for connected home systems, but there is some interest from device suppliers in enabling Smart TVs to be used as an interface in a connected home system, with the television often being a key device in an individual's living room. In-car applications are more of an upcoming development that is not prevalent today, and so consumers may not be as aware of the benefits of integrating a connected home system within their in-car infotainment system. As the smartphone is increasingly used to enable in-car infotainment (for example, through tethering and other applications), the opportunity to extend the connected home experience into the car is expected to grow.

For each use-case selected, at least 70% of respondents indicated that they would like to use their smartphone to display information or control their connected home devices. Tablet and Web portal were second and third most prevalent in each use-case, except in lighting control where a control panel was preferred to a web portal.

Despite respondents being able to select multiple devices, use of an in-car infotainment system to display information or control devices only received a maximum of 10% of responses. Generally, this was higher in 'notification' applications than in 'control' applications, where less interaction with an in-car infotainment system might be needed.

WILLINGNESS TO PAY

When considering end-user survey responses regarding interest in connected home functions and

services, it is important to understand whether consumers are willing to pay a premium for these offerings, or whether other avenues of monetization need to be examined.

CONNECTED HOME DEVICE COSTS

The cost of connected home devices needs to be determined based on a number of factors, including profit margin expectations, consumer willingness to pay, and whether the connected home hardware directly leads to other monetization models (such as a recurring monthly fee).

The recent consumer survey from IHS indicated that, in many applications, where consumers wanted to be able to perform a specific connected home function, they would be willing to pay a premium for connected devices.

The tables below present respondents', which indicated an interest in at least one connected home use-case, responses to the price they would pay for a connected device or premium for a connected variant. Please note that there are significant variations in sample frame size, as this question was limited to respondents that had previously indicated that they would like to perform one or more functions enabled by these devices. For more information, please see Section 4.2.

Table 2.2: Question 3.6 – Device Cost
Overview; Number of Respondents

	Under $21	$21 - $100	Over $100	Not willing to pay	Total (n)
Window/Door Sensor	39%	36%	4%	21%	100%
Motion Sensors	37%	38%	4%	20%	100%
Network/IP Camera	27%	50%	6%	17%	100%
Meter Clamp	38%	30%	2%	29%	100%
Connected Lighting Device	35%	29%	3%	34%	100%
Smart Plug	47%	23%	2%	28%	100%
Media Connecting Device	30%	42%	1%	27%	100%
Pool Pump Switch	21%	47%	11%	21%	100%

Source: IHS © 2013 IHS

Table 2.3: Question 3.6 – Device Premium
Overview; Number of Respondents

	Under $21	$21 - $100	Over $100	Not willing to pay	Total (n)
Remote Control Window Lock	41%	27%	2%	31%	100%
Connected Door Lock	38%	40%	2%	20%	100%
Connected Door Lock	43%	41%	1%	15%	100%
Connected AC Unit	22%	24%	12%	42%	100%

	Under $21	$21 - $100	Over $100	Not willing to pay	Total (n)
Connected Thermostat	34%	37%	3%	26%	100%
Connected Home Appliance	27%	30%	14%	28%	100%
Health Device	30%	44%	5%	20%	100%
Connected Window Dressing	32%	25%	7%	37%	100%
Connected Pool Pump	16%	47%	16%	21%	100%

Source: IHS © 2013 IHS

For devices where the consumer is less willing to pay a premium for a connected version of the device, such as connected A/C units, there may be other ways to create revenue streams which justify the premium incurred for integrating connectivity – such as through monthly service charges, e-commerce platforms (e.g., automatically ordering a replacement A/C filter when the old one needed replacing or, in the future, dispatching service personnel to replace components based on a pre-agreed consumer service plan) or creating new revenue channels from the associated data generated by the connected device.

RECURRING SUBSCRIPTION CHARGES

The recent consumer survey from IHS indicated that, for most use-cases, the majority of respondents were prepared to pay a monthly fee to enable the function or service they had indicated an interest in. Crucially, pool pump monitoring, window dressing control, home entertainment monitoring and lighting control were the exceptions. This suggests that these applications may be best suited to systems without a recurring monthly fee. For example, where the ongoing service costs are factored into the upfront cost of a home automation system, or where the service is provided free or charge in order to gain other benefits, such as improving user experience where other monthly revenues may be involved (such as the case with home entertainment packages).

Interestingly, the applications that respondents were least likely to pay an ongoing monthly fee for include those which have significant in-home control application, as well as being valuable when respondents are away from the home, highlighting the importance of mobile applications on devices such as smartphones or tablets. For example, window dressing (i.e., curtains or blinds) and lighting control is useful when consumers are either in or away from the home, and may be part of closed home automation networks; whereas other applications, such as home monitoring, are most valuable when respondents are away from the home. This indicates that there *may* be a relationship between the ability to monetize connected home applications through ongoing service fees and the perceived ratio of in-home versus remote value, with consumers more willing to pay an ongoing fee for remote monitoring and control elements. However, this was not specifically tested in the recent consumer survey from IHS. If this is the case, this may help to determine the appropriate monetization models for various applications, where those functions with significant in-home applications may be well monetized through up-front device costs, as part of connected home systems.

Taking the willingness of respondents to pay, along with the number of respondents selecting each use case, this supports the idea that home monitoring applications, such as intruder notification, hazard detection monitoring and the ability to remotely view a camera feed, represent a major value proposition for many North American consumers. In each of these instances, approximately two thirds,

or higher, of respondents are prepared to pay a monthly fee for the function, with approximately a quarter indicating they would pay between $6 and $15.

Some applications, while selected by fewer respondents, had a significant proportion of those respondents indicating that they would pay for this feature. For example, of those 129 respondents that selected elderly relative monitoring as a function they would like to be able to do, more than three quarters indicated that they would be willing to pay a monthly fee for this.

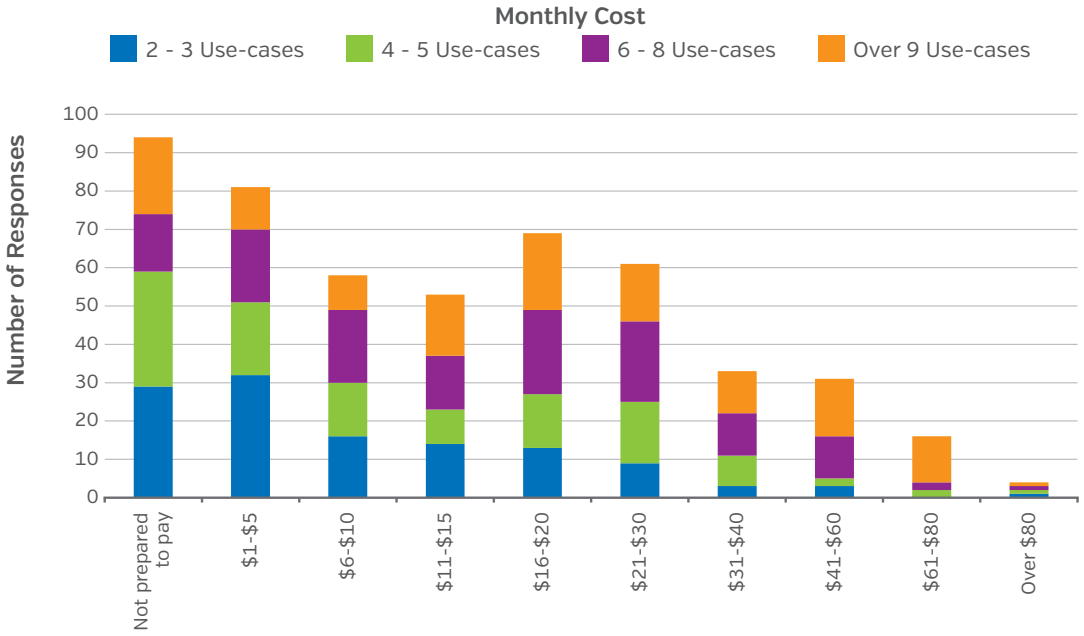
BUNDLED FUNCTIONS

Respondents that selected at least one use-case (i.e., did not select the 'none of the above' option), selected on average six use-cases that they would like to be able to perform, highlighting the potential for multi-function systems or 'bundling' opportunities.

In contrast to responses for each individual use-case monthly cost, a much lower percentage of respondents that selected more than one individual use-case (21%) indicated they would not be prepared to pay for all of their selections combined, while 41% of these respondents suggested they would be prepared to pay $16 or more per month. With an average of six use-cases selected by each of the respondents in this sample frame, this indicates the respondents would expect a level of discount for a bundled package, compared with purchasing multiple standalone services.

The chart below presents the bundle cost selected by respondents based on the number of use-cases they selected.

Chart 4.5: Question 3.1 – Use-case Monthly Cost: All Selections



Source: IHS © 2013 IHS

Respondents were willing to pay higher monthly fees and, crucially, the proportion of respondents selecting a larger number of use-cases increased as monthly fee did. Whilst the majority of responses are in favor of lower monthly fees, this shows there are people prepared to pay higher fees provided the features and use-cases included are appealing.

PURCHASE INTENTIONS

In all use-cases selected by respondents as a function they would like to be able to perform, at least 40% indicated that they intended to purchase a system or device to enable this in the next five years. Crucially, a large number of respondents selecting each use-case indicated an uncertainty regarding when or if they intended to purchase the associated devices or systems, and for some use-cases more than half of respondents indicated this was the case.

With such high levels of interest in connected home use-cases from respondents, coupled with a relatively high willingness to pay for these devices or services, the lack of purchase intention appears counter-intuitive. IHS believes that, to some extent, this could be attributed to the level of consumer awareness surrounding connected home systems. As highlighted further in section 2.3.8, the recent survey from IHS revealed that 30% of respondents that would like to be able to perform one or more connected home functions were only made aware of these devices or systems through the examples and explanations provided in the actual survey. This lack of awareness is expected to be a key factor behind the uncertainty of respondents regarding actual purchase intentions. If respondents were not aware of connected home systems before participating in the end-user survey it is unlikely that they would be aware of where to buy associated devices or systems from, or had a real opportunity to consider the purchase in more depth. Equally, they may not be aware of the actual costs associated with these systems; this awareness is likely to be a pre-requisite of deciding whether they intend to purchase such a system. In fact, when cross-tabulating answers to the questions on purchase intention with those to the question on awareness, it becomes apparent that a large proportion of respondents that were only made aware of connected home systems via the end-user survey indicated they were uncertain of their purchase intentions.

The lack of purchase intentions of some respondents may also be attributed to the perceived complexity of these systems. While respondents were not asked about this on an application level, it was assessed on a system level through installation preferences. The majority of respondents interested in connected home systems indicated they would opt for a professional install over self-install, despite the self-install system being specifically designed for this purpose. The primary driver behind this was a concern in setting the system up correctly, highlighting a perceived complexity inherent to obtaining a connected home system.

This result is of paramount importance to the connected home industry, indicating what while connected home features are desirable to many consumers, and there is a willingness to pay for such systems or services, many consumers are unaware of their next steps. This emphasizes the importance of increasing awareness amongst consumers, not only surrounding the benefits of such systems, but also to stimulate further awareness of the availability of these systems, to support by the mass market.

DEVICE ‘BUNDLING’ AND SCENARIO CREATION

Interestingly, 80% of respondents that already owned a connected device indicated that there were additional use-cases they would wish to be able to perform. This is crucial as it means there remains a significant opportunity to up-sell and provide additional services to those that may already own connected devices or subscribe to connected home services. The ability to provide an integrated service that seamlessly provides a range of functions would be a big differentiator for those that can offer it, utilizing a range of devices to trigger automated events.

Service providers should therefore look to offer and target existing customers and subscribers with simple modular upgrades to their existing services or systems, based on the use-cases highlighted as being most appealing and most important in the user-survey. Critically, this is where interoperability is

crucial to the service provider or device supplier's ability to successfully up-sell to existing connected home customers, particularly where they are not the original system provider.

As the number of devices which can interact with a connected home system grows, this increases the potential for innovative 'scenario creation', where device interactions are pre-defined, based on certain trigger points. The possibilities are vast, with a broad range of connected devices already available today, which is set to grow exponentially. The recent consumer survey respondents that had previously indicated an interest in the connected home highlight about six such scenarios, as summarized in the next table. For the full scenario outline provided to respondents, and further demographic segmentation, please refer to section 4.4.

Table 2.4: Consumer Attitudes to Scenario Creation
Overview; Number of Respondents

	Very Valuable	Moderately Valuable	Neutral	Not of Value
Using GPS in Car or Smartphone	29%	37%	22%	13%
Security System as Trigger	44%	36%	15%	4%
TV/Entertainment System as Trigger	17%	33%	29%	20%
Heating/Cooling System as Energy Savings Trigger	33%	40%	20%	7%
Use of Online Information as Trigger	33%	41%	18%	7%
Today's Manual Processes Automated	22%	38%	26%	14%

Source: IHS © 2013 IHS

IHS recommends that more work is done to assess the opportunities for device 'bundling' and specific up-sell opportunities. Due to the broad scope of the consumer survey recently undertaken, IHS was unable to make this a key focus of the study. However, some interesting insights were gained. For example, while the overall sample sizes are too low to draw very firm conclusions, it is interesting to note that over half of respondents which have basic elderly monitoring systems in place today (such as panic buttons or alarm pendants) would like a more advanced system using sensors or alerts to provide notifications if a user deviates from their standard routine. This highlights a potential up-sell or cross-sell opportunities amongst these existing users, and suggests that this is an area that is worth further assessing further.

CONNECTED HOME MONETIZATION MODELS

Today, most connected home systems are monetized through up-front only pricing or recurring revenue models. The below overview is presented for reference only; detailed analysis is presented in Section 3.3 of this report.

RECURRING REVENUE MODEL

Recurring revenue models are typically based around the charge of monthly subscription fees to enable cloud-based home control or home monitoring services. Typically it is the service features which are monetized on a monthly basis, following the initial hardware transaction.

There are a number of variations within recurring revenue models:

- Free basic level of service: some systems offer a basic level of service without a monthly fee, with the option to upgrade for additional features.
- Standard subscription fee: other systems include a standard subscription fee, irrespective of the number or types of devices included in the end system.
- Tiered subscription models: many cloud-based home management systems are offered under tiered subscription models which have a basic monthly fee for a 'standard' or 'starter' pack of services (in the North American market, these are typically based around basic home monitoring features), with additional hardware and service fees associated with adding further features, such as more extensive home monitoring packages, energy management, or lighting control.

UP-FRONT COSTING MODEL

The upfront costing model applies to companies which sell systems with a single one-off cost, generally based around specific hardware, although in some cases additional services (such as cloud-based home control) are also included.

Companies can differentiate their offerings in a vast number of ways, with products varying dramatically across a range of parameters. Examples include price, route-to-market and system type.

- **Price** – within this segment, there is a very broad price range for devices. Some companies, such as Crestron, Lutron and VIA are very focused on the high-end, premium segment of the market. Premium suppliers are often end-to-end solution providers (in some cases in conjunction with partner companies), rather than simply hardware providers. In contrast, others are more focused on competing based on value for money, at the lower end of the price scale.
- **Route-to-market** – there are multiple ways to bring connected home devices to market. In some cases, device suppliers will sell these directly to consumers, such as via their Web site. Consumers can also purchase systems via retailers, both online and physical. In addition, many devices are available via contractors or installation companies, as well as through other service providers, depending on whether they need to be professionally installed or are designed as DIY solutions.
- **System type** – connected home systems can vary in many ways, one of the notable ways is whether devices are designed as self-install (DIY) or need to be professionally installed. This will impact other factors, such as price and route-to-market. In addition, vendors must decide whether to implement 'open' or 'closed' networks. An open network would allow customers to add compatible devices from other vendors to the system; whereas a closed network would be designed to only enable devices from the original vendor to be integrated into the system (e.g., via the use of a proprietary protocol).

EXISTING MODEL IMPLICATIONS AND EVOLUTION

However, as the connected home ecosystem evolves, and a variety of company types enter this market, this is projected to impact the viability of today's connected home monetization models. For example, as more companies start to include on-going services in the upfront hardware cost, this may create a perception that these services are provided for 'free', making it harder for those tying customers into on-going recurring service fee contracts. These monetization models are examined in more depth in section 3.3 of this report.

As highlighted in Section 2.2.1, for most use-cases the majority of respondents indicated they would

be prepared to pay a monthly fee, suggesting a recurring revenue model may be appropriate. However, there was some variation in response, with use-cases centered on home monitoring or security more likely to be functions that respondents were prepared to pay a recurring fee for.

Respondents also indicated a willingness to pay for connected devices in order to enable additional functionality. This suggested willingness to pay both an upfront hardware premium and a monthly fee for associated services. Typically, younger respondents were more likely to suggest they would be inclined to pay a premium for connected devices to enable functionality. In the latter part of the end-user survey, the same respondents were asked to select their preference toward higher upfront costs and lower monthly fees or vice versa. Of those that indicated they were prepared to pay for a connected home system, younger respondents were typically slightly more inclined to opt for lower upfront costs and higher monthly fees than older respondents. This may be expected with younger respondents typically indicating they had lower household incomes, as outlined in Appendix Two.

Interestingly, later in the survey, respondents were asked for their preference towards a set of pre-defined combinations of monthly fees and up-front costs. Interestingly, almost 50% of respondents indicated they would have a preference towards lower monthly fees and higher up-front costs, with almost a quarter indicating a preference for no monthly fee and the highest up-front system cost presented. There was some variation in this by demographic, as analyzed further in section 4.3, indicating the need for appropriate targeting. For example:

- Generally, women were more likely than men to select that they would prefer paying higher monthly subscription fees with lower upfront costs; whereas men were more skewed towards the mid- and high-upfront costs with relatively lower ongoing fees. This may be explained through responses to the question on household income, where female respondents were more likely to indicate lower household incomes than male respondents (see point below). Interestingly, responses to the end-user survey indicated that women were more likely to hold a lesser household decision-making role, meaning that while it is important to ensure the service packages appeal to women, the ratio between upfront and recurring costs will need to appeal to male consumers.
- Respondents with lower household incomes are more likely than other respondents to select high monthly fees with low upfront costs. Respondents with a higher household income were more likely than others to select the mid-level monthly fee and upfront cost combination.

Equally, however, further connected home monetization models are developing aside from standard upfront hardware or recurring service fee models. One potential monetization model which is gaining sufficient interest in the industry is the potential to create revenue streams through the data generated through connected home interactions, as increasingly companies recognize the potential value of this data.

Increasingly, companies are beginning to understand the value of data. For example, in the connected home, data could be collected regarding a wide range of aspects, such as electricity consumption, the frequency or nature of device operation, and the performance or condition of in-home devices. This information could be sold to third parties, dependent on privacy law, to enhance targeting for advertising campaigns or to assist in the up-selling or cross-selling of devices or products from a supplier's range.

In the recent survey from IHS, respondents indicating an interest in connected home applications were surveyed on their attitude to data sharing. Positively, over 60% of these respondents suggested they would be willing to allow their service provider to share their data with its partner companies,

provided there was an incentive to do so. Incentives provided to the respondents as examples included reduced device or service costs, but other incentives may also be valued, such as improved access to their own data and the provision of a user interface which makes this data meaningful.

There was little variation between respondent demographics, although typically those with higher household income levels were slightly less inclined to provide data whilst younger respondents were more inclined. This may indicate that this approach would have a greater deal of success at the lower and middle range of connected home range of systems, where pricing may be more sensitive and incentives more warmly received.

ALTERNATIVE MONETIZATION STRATEGIES

In addition to the monetization models analyzed above, namely recurring revenue and up-front costing, IHS believes there to be a number of other opportunities available to connected home system or service providers. For example:

- **Data Monetization**: Utilizing the wealth of data collected by connected home devices to underpin and enhance internal and external marketing activities.
- **E-Commerce & User Interface Advertisement**: The development of e-commerce platforms to facilitate the replacement or sale of complementary connected home devices or components. This, combined with the delivery of targeted marketing material to the display interface of connected devices used to control or interact with connected home systems, may provide a seamless means of expanding the consumer's existing connected home system, subsequently generating additional revenue.
- **Remote Diagnostics and Remote Software Upgrades**: Remote diagnostics could be utilized by service or system suppliers to detect faults and pre-empt expensive system repairs by offering replacement devices or components to customers to maintain their systems. Additionally, it may be used to reduce costs involved in the dispatch of a technician to diagnose faults at a customer's premises, instead achieving this remotely. This, in conjunction with firmware upgrades and maintenance, could also be used to differentiate systems from others available.
- **Insurance Provider Partnerships**: Through partnerships with insurance providers, connected home service or system suppliers could help to reduce the total value of insurance claims made by customers. For example, an insurance provider could implement a water detection system in a lead-prone house in order to gain early warning of any issues and reduce the cost or scale of damage.
- **Warranty or Insurance Provision**: Additionally, service providers may look to provide insurance or warranties to satisfy consumer demand, as highlighted in IHS' end-user survey.
- **Connected Neighborhoods**: As connected home systems increase in prevalence, there is the opportunity for service providers to create additional services through the interaction of multiple connected homes. For example, a connected neighborhood watch offering. Such services could command a premium and generate additional revenues, as well as drive 'word of mouth' promotion.
- **Leverage Relevant Market Trends**: Taking advantage of trends in closely-related adjacent vertical markets, such as consumer health monitoring, demand-response, residential photovoltaic integration or the connected car, to provide further services to the consumer, may present a further revenue generating opportunity.

For further information on the opportunities outlined above, please see Section 3.3.3. Please note that some of the above opportunities are also considered in the below section which highlights potential 'value added features'.

VALUE ADDED FEATURES

The connected home presents a number of value-adding features outside of specific applications, such as remote home monitoring. This can include voice activation, remote diagnostics, remote software upgrades, peripheral product replacement or e-commerce, universal help features and warranties or insurance.

Each of these features is analyzed in more detail in section 4.5.

VOICE ACTIVATION

The recent consumer survey from IHS indicated that over 65% of respondents that had previously expressed a desire to be able to perform connected home applications would consider voice activation and control to be valuable (either very or moderately so), with less than 10% indicating this would not be of any value to them. Voice activation could be used to control a connected home system or device, for example the ability to control lighting without the need for a physical or digital button.

As more companies launch connected home offerings, features such as voice activation which are not widely seen today could prove to be a key differentiator, establishing value based on functionality to reduce the need to compete strictly on price.

REMOTE DIAGNOSTICS

Over 80% of respondents who had previously indicated an interest in connected home systems considered this feature to be moderately or very valuable. Interestingly, when the sample frame is widened to all respondents, 593 indicated that this feature was either very or moderately valuable; compared with 446 of respondents in the limited sample frame. This indicates that there are a significant proportion of respondents that were not interested in the previous connected home applications presented in Section 4.2 of this report who would find this feature valuable.

Offering remote diagnostics can offer benefits to both the consumer and the end-user. For the end-user, this can pre-empt or even avoid costly repair, and remove the need for a repair specialist to attend the consumer's premises just to diagnose the fault. Instead, where physical maintenance is required, the repair specialist can come to the job having already identified, ordered and received any required parts. For the vendor, there can be major advantages, particularly where the devices are under warranty. As mentioned, remote diagnostics would enable significant efficiencies for identifying a fault, as the physical presence of a professional would no longer be required, saving on both time and cost (which the vendor may be liable for, if the device is under warranty). Vendors are able to pre-empt expensive repairs, ensure parts are replaced with components from their portfolio, generating further revenues associated with the service. Finally, remote diagnostics can be used as a tool to up-sell extended warranties by highlighting parts of the device or system at risk of failure.

REMOTE SOFTWARE UPGRADES

Overall, 78% of respondents in the limited sample frame (respondents with an interest in connected home applications) considered this feature to be very or moderately valuable. A further 140 respondents from the wider sample frame also considered this to be very or moderately valuable, indicating market potential outside those with an interest in the specific connected home applications covered in Section 4.2 of this report.

The inclusion of automatic software upgrades may provide a level of differentiation from the competition, while helping to improve the end-user experience. There this is provided as part of an on-going service, which in turn may help to reduce churn. Additionally, the platform used to initiate remote software upgrades could indeed be utilized by the service provider or device supplier to market new or alternative products to customers.

PERIPHERAL PRODUCT REPLACEMENT AND E-COMMERCE

Of the limited sample frame (respondents with an interest in connected home applications), more than 65% indicated that this feature would be very or moderately valuable. Analyzing the wider sample frame (all 1,000 respondents), a further 123 respondents indicated that this feature would be valuable, indicating a potential target market for this feature outside of those with an interest in other connected home applications covered in Section 4.2 of this report.

The ability to either automatically order replacement or related products, or facilitate the use of an e-commerce platform to do so, has obvious benefits for the vendor. The improved convenience means that customers may be more likely to purchase these auxiliary devices via this platform, with the enhanced simplicity providing longer-term customer loyalty for these peripheral devices, and also increasing the opportunity for partnership with other peripheral device suppliers to promote their associated products. Additionally, an e-commerce platform may provide up-sell or cross-sell opportunity, where customers are presented with highly-targeted advertisements for new or alternative devices. The combination of an e-commerce platform with data collected from remote diagnostics would aid the targeting of this marketing material, creating a powerful proposition.

WARRANTIES OR INSURANCE

Warranties may also present a means of differentiation. Of the respondents that wanted to be able to perform a connected home function, over half expected a warranty on both the devices and the system; over a third expected a warranty on just the devices. Only 4% did not expect a warranty on either the devices or the system. The most selected warranty period was five years, followed by three years and 10 years. In addition, more than 60% of respondents who indicated an interest in the connected home would like the option to purchase insurance for their connected home devices or system. This is interesting for the potential monetization of the connected home: by either partnering with insurance companies or building internal insurance provision offerings, additional insurance options could be one way of adding value to the connected home service.

TECHNICAL SUPPORT

Almost 70% of respondents interested in connected home systems suggested it would be valuable to have a universal “help button” to facilitate connection with help centers or support hot lines. This improved access to technical support could offer a means of differentiation from competing systems.

Offering a seamless, simple way of interacting with professionals providing technical support is unlikely to be a feature to drive direct revenue. However, technical support is likely to significantly improve customer experience, particularly if it is implemented in a manner that provides a simple means of initiating contact. Improvements in customer experience may help to reduce churn for service providers, or improve brand loyalty, that will ultimately drive increased revenue in the long term.

Finally, technical support could be incorporated into the process for remote diagnostics and peripheral product replacement, combining these three elements will help to easily identify system issues and provide a convenient means to solve these issues.

CONNECTED HOME TARGETING

Throughout the end-user survey it is important to analyze any key recurring themes regarding particular demographics. This section outlines these themes. Please refer to Chapter 4 for more detailed analysis of the end-user findings.

LOCATION

While this survey was limited to North America, a number of sub-regions were considered, as highlighted in Chapter One. Location typically played a limited role in differentiating responses from respondents; variations were small with no large swings in opinion.

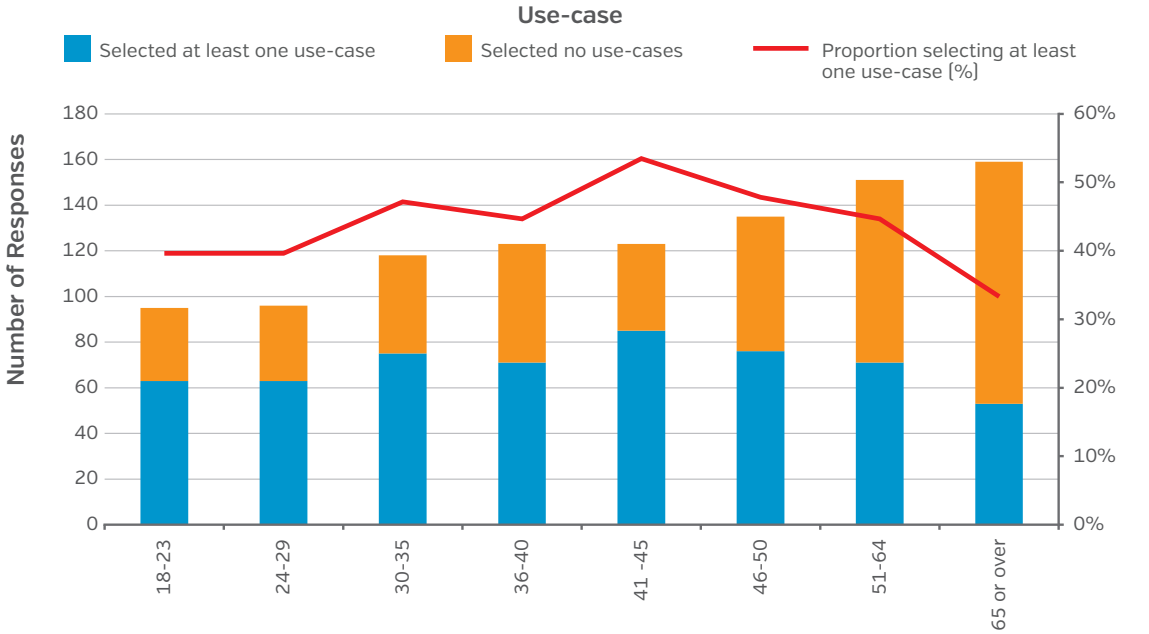
GENDER

As is the case with location, gender played a restricted role in terms of identifying variations in response. It should be noted however that male respondents were more likely to have a more positive technology adoption score.

AGE

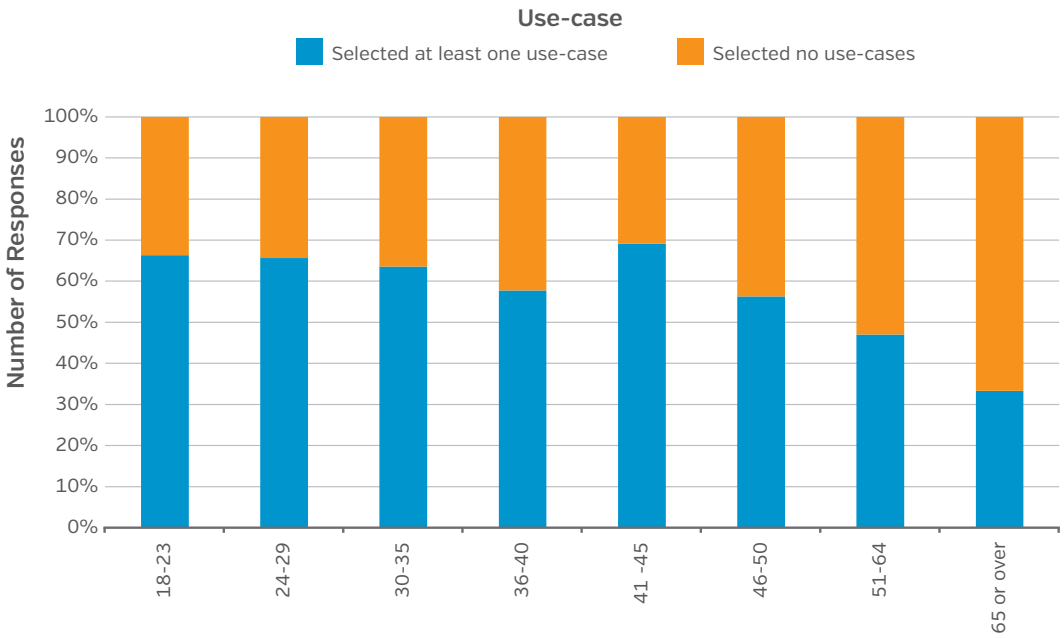
Age played a more clear role in identifying target segments, with respondents under 50 more likely to show an interest in connected home use-cases than the eldest age categories, more likely to pay for devices or services and more likely to see the value in additional 'value added' services. Interest appeared to peak in the 41 to 45 age category. Crucially then, this age category is likely to be a key target for connected home systems and services, with a large proportion of respondents in this segment indicating they held a 'major' decision-making role, critical in terms of the ability to monetize these solution. The figures below show an example of how responses varied by age, with this specific question addressing whether or not respondents would like to be able to perform any of a list of connected home functions.

Chart 2.6: Question 2.2 – Connected Device Use-case



Source: IHS © 2013 IHS

Chart 2.7: Question 2.2 – Connected Device Use-case



Source: IHS © 2013 IHS

HOME OWNERSHIP & DWELLING-TYPE

Typically, these two demographics were closely correlated, with the majority of homeowners owning houses, whilst respondents that rented their homes were more likely to live in apartments. Homeowners were more likely to be interested in at least one of the use-cases listed in the survey, with this also being the case for respondents living in houses.

HOUSEHOLD INCOME LEVEL

Respondents with higher household income levels were more likely to currently own a connected device, while also being more likely to have indicated an interest in one of the connected home use-cases listed in the survey. Although there was a relatively small sample frame, the data would suggest that those with higher household income levels are more inclined to pay higher up-front costs and a lower monthly fee than those with lower household incomes. The fact that respondents with higher household incomes were more likely to own their homes may impact on this result, with those that do not own their homes also considered slightly more reluctant to invest in a connected home system.

ENERGY EFFICIENCY ATTITUDES & TECHNOLOGY ADOPTION

Overall, 57% of respondents were considered to have 'positive' attitudes to energy efficiency, with 36% considered to have 'positive' technology adoption scores, as outlined in Appendix Two. Respondents with more positive attitudes to energy efficiency and higher technology adoption scores were, understandably, more likely to show an interest in connected home services. At the same time, those with higher technology adoption scores were far more likely to already own connected devices, as may be expected. Interestingly, technology adoption was not a factor in system installation method, where respondents with positive technology adoption scores were also likely to opt for professional installation.

Respondents with negative technology adoption scores indicated that a preference for simplicity was the key driver for their lack of interest in connected home use-cases, highlighting the perception that connected home systems may be considered complex. Respondents with negative technology adoption scores also were more likely to have only been made aware of connected home applications and systems in the survey itself, as opposed to having a pre-existing awareness, suggesting that a lack of awareness and education as to the benefits these systems hold could well be a significant barrier to broader adoption.

Despite this perception of complexity, of those respondents with a negative technology adoption rating which indicated they would like to be able to perform connected home functions, a significant proportion indicated that they would opt for self-installed systems, due to a concern over the price of professional installation. This is consistent with the relationship between household income and technology adoption. Additionally, the process of network on-boarding was considered to be an issue for respondents with a negative technology adoption score. For respondents with negative technology adoption scores, the provision of a "universal help button" to provide a simplified means of connection with technical support was considered particularly valuable. The implementation of features or processes to simplify a number of these issues may help in improving the appeal of these systems to this subsection of consumers. Critically, education and awareness will be a key factor in communicating this message and ensuring the broader adoption of connected home systems.

DECISION-MAKING ROLE

Respondents with a larger household decision-making role were both more inclined to show an interest in the connected home and be more likely to purchase devices. Inevitably, both of these issues are crucial to the success and deployment of connected home systems.

SECURITY SYSTEM OWNERSHIP

Respondents that owned a security system were more likely to own connected devices, and are therefore more likely to be able to perform connected home functions. This aligns with the type of use-cases that respondents selected an interest in, with many security-focused applications seeing broad appeal. An example is included below.

Table 2.5: Question 2.1 – Connected Device Ownership
By Security System Ownership; Number of Respondents

	Security System Owners	Non-Security System Owners
Selected at least one device	154 (61%)	124 (17%)
Selected none of the above	100 (39%)	622 (83%)
Total (n)	254	746

Source: IHS © 2013 IHS

2.4 OTHER KEY INDUSTRY CONSIDERATIONS

The recent consumer survey from IHS, and associated primary industry research processes, uncovered a number of other issues impacting companies in the connected home market.

PROFESSIONAL-INSTALL OR DIY SYSTEMS

A key method of differentiation between connected home device suppliers is the way in which the system is installed, namely 'self-installed' or 'professional-install'. Utilizing a self-install approach is more likely to be the case with lower-priced systems, with this being an obvious way to reduce costs. Interestingly, however, in the recent consumer survey from IHS, 70% of respondents that suggested an interest in connected home systems indicated that their preference would be for professionally installed systems. There was no significant variation with location or age category, but those respondents with higher technology adoption scores were more inclined to opt for a professionally installed system.

This may be a result of respondents with higher technology adoption scores being more willing to pay more for connected home systems, as professionally-installed systems are often synonymous with higher costs. Over half of the respondents that indicated they would opt for a self-install system suggested cost was the major driver behind this decision.

For respondents opting for a professionally installed system, the main driver behind this was the concern that they would not be able to install the system correctly, despite being made aware that these systems would be designed for 'do-it-yourself' (DIY) installation. As many service providers support DIY installation for their mass market connected home system, this highlights a need for further consumer education and potentially the offer of a higher level of support. For example, an option for self-install system providers would be to offer a service to guide the consumer through the installation

process without requiring the physical presence of a professional; this would significantly reduce the premium for installation compared with physically-present professional installers, while increasing consumer confidence in self-installation. However, the costs associated with these support services would need to be accounted for in the system cost and associated profitability margin calculations.

FRAGMENTED USER EXPERIENCE AND INTEROPERABILITY

Respondents with an interest in connected home systems (66% of the sample frame) selected, on average, six connected home applications they would like to be able to perform. As more companies enter the connected home market, and importantly as more device suppliers (such as HVAC controller or appliance suppliers) start to offer their own service platforms, there is the risk that a fragmented user experience could develop, where consumers need to use different control devices to interact with different connected devices. For example, professionally monitored security services could be offered by one company, interactive home monitoring by another, energy management by a utility company or energy specialist, with more device suppliers moving into the connected home space with additional features such as remote diagnostics or ancillary product ordering features. Each of these may have their own user interfaces, and the ability to inter-communicate between systems (part of the key value proposition of the connected home, driven by scenario creation) will be lost.

CONVERGENCE

Device convergence has the potential to both remedy this user experience issue, as well as create further fragmentation, depending on implementation.

Mobile devices such as smartphones or tablets have become increasingly important devices in the consumer's day-to-day life, incorporating functions that would previously have been performed by dedicated devices such as portable media players, digital cameras or laptop PCs. This highlights the need for connected home services to leverage these devices as interfaces between the end-user and the system itself, emphasized by the fact that at least 70% of respondents that selected each connected home use-case presented in the end-user survey suggested they wished to use their smartphone as the device with which to display connected home information or control associated devices.

Crucially, then, the smartphone is key to the connected home experience, holding the ability to interface with a range of connected home systems inside the home, as well as remotely, and removing the need to utilize specific devices for each connected home system.

While smartphones and tablets may help to reduce fragmentation by acting as a centralized connected home "hub", the rise of the mobile "app" (application) can lead to a fragmented intra-device experience. The need to make use of separate "apps" to control each type of system is unlikely to provide a seamless experience to the end-user, and is also likely to increase the difficulty in the ability to provide further value-added features such as connected home scenario creation through the use of multiple connected home systems, something highlighted as being valuable by respondents to the end-user survey.

This is emerging as a key industry issue. In the recent consumer survey from HIS, respondents were asked about their preferences for interfacing with connected home systems. Thirty-seven percent responded that they would find the ability to control all use-cases or functions from a single interface or 'app' very valuable, only choosing a system which allows them to do this. A further 34% selected that they would find this valuable, and would prefer a single app or program. This highlights how valuable a seamless user interface is, and the risk facing the industry should this issue not be addressed.

INDUSTRY INITIATIVES AND STANDARDS

One of the potential ways to resolve this is to move towards more open APIs which allow easier cross-system integration. The use of a single API across the entirety of the connected home industry offers one way of avoiding the damaging effects multiple user interfaces may have. Whilst in principal a solution such as this is ideal, in practice it may be tricky to implement. Inevitably, the range of companies involved in the connected home will each wish to protect and drive awareness of their brand, which may ultimately culminate in longer term fragmentation. Interestingly, provided the service providers make their APIs available, there may be an opportunity for a new entrant to provide this unified connected home experience. However, this will be highly dependent on the approach the service providers take with regard to their connected home APIs.

There are a number of industry initiatives aiming to resolve this issue in a number of different ways, focused on various parts of the connected home ecosystem. For example, there is a working group within the Smart TV Alliance focused on understanding the ways in which the Smart TV fits into the concept of the smarter home. This can help to alleviate some of the concerns over fragmentation by bringing together Smart TV manufacturers to support and foster the development of cross-platform applications and services, helping to ensure the user experience across Smart TVs is unified, reducing frustration and confusion amongst consumers.

To improve interoperability, the use of a common communications protocol to facilitate the sharing of notifications, controlling of devices and even the network on-boarding of these devices may be employed.

An example of such a framework is that offered by Qualcomm Innovation Center through its open source AllJoyn platform. AllJoyn creates a virtual distributed bus to ensure the interoperability and communication of various connected devices regardless of the device OS, chipsets and underlying proximal connectivity protocol employed. When implemented, device makers and application developers are able to use a software development kit (SDK) to enable connectivity and create interesting services utilizing these connected home devices, to share notifications and allow the end-user to seamlessly control their devices. This contrasts many of the approaches today, where connected devices from different manufacturers are unable to communicate with one another.

To minimize the additional cost of implementing such a platform, AllJoyn requires no licensing fees and ensures there is a low footprint for inclusion in embedded devices. This can result in AllJoyn being more cost effective to implement than the full TCP/IP stack.

Inevitably, for platforms such as these to be a success, it will require the support of device OEMs when designing their connected home products to ensure interoperability across a range of different device-types. To garner this support, these types of platforms must be free to implement and open sourced to ensure it meets the requirements of the many stakeholders in the connected home industry.

Forums where companies from multiple sectors within the industry can come together to address topics such as fragmentation can drive cross-collaboration and support for standards. For example, the Continental Automated Buildings Association (CABA) itself can operate as a platform for cross-sector and cross-company collaboration to address topics such as fragmentation in the connected home by helping to foster dialog and information exchange, as well as driving the creation of relevant and actionable research studies.

Other focused industry organizations include the Custom Electronic Design and Installation Association (CEDIA). CEDIA, which brings together home automation specialists, installers and custom designers, can also help to foster debate on the potential for fragmentation within this market, and other key industry concerns.

In addition, there are a wide range of application-specific industry organizations which could play

a role in shaping the connected home market and its approach to interoperability and fragmentation. An example is the Connected Lighting Alliance, which is focused on the wireless lighting sector. In-sector interoperability will be valuable in the promotion of interoperability in the wider connected home. Shared approaches to technology in lighting may help to promote the use of open standards across the wider connected home. On the 15th of July 2013, the Connected Lighting Alliance announced its endorsement of ZigBee LightLink, which could drive connected home system vendors that want to be either provide lighting or be interoperable with devices from other lighting vendors in the Alliance, towards solutions that can support ZigBee LightLink. This is just a single example; a wide variety of sector-specific alliances exist today, often with multiple alliances per sector.

Additionally, alliances such as the Open Standard Gateway Initiative help to ensure the interoperability of applications and services over a broad range of devices through the modularization of Java to remove some of the software complexity. Adoption of these component-based platforms can help not only to improve interoperability but also reduces time-to-market and development costs.

Recently (October 2013), ABB, Bosch, Cisco and LG announced their intent to set up a consortium to develop a common software platform that would resolve this issue of fragmentation amongst those adopting this platform, enabling a common standard for data exchange. The development of an open architecture for data exchange, if widely accepted by the industry, would represent a major step towards enabling the interaction of devices or systems from a range of providers working within a single customer experience.

In the automotive sector, the GENIVI Alliance is working to promote adoption of an in-vehicle infotainment open-source development platform. The widespread availability of in-car infotainment systems that support the downloading of apps, or the tethering of a smartphone and the support of its associated apps, can drive further integration of the car into a connected home system; for example to act as a user interface or trigger various scenarios based on location.

However, before these initiatives becomes more prevalent, there will need to be an industry shift from the current stance adopted by many connected home providers which are trying to silo their systems to maintain customer control. In addition, as industry initiatives are developed by various parties in different ways and at different rates, there is the potential for multiple approaches to resolving fragmentation starting to gain traction, and not working within a single framework. It should be noted the examples noted above are not intended to be an exhaustive list of initiatives, consortiums or organizations active in attempting to improve interoperability and reduce fragmentation of user experience, nor is its intention to indicate that these are the most developed.

COMMUNICATION PROTOCOLS AND IP ADDRESSABILITY

In addition, as more companies enter the connected home market, the issue of interoperability remains at the forefront of many companies' agenda. With different systems supporting a range of different standards, device suppliers are faced with a situation where they have to decide which connectivity technologies to adopt. Realistically, a widely accepted industry response to interoperability issues does not seem forthcoming. In the North American market today, ZigBee and Z-Wave are prevalent, and some suggest that the general trend towards node-level IP addressability will help to alleviate some of interoperability issues seen today. It should be noted that despite IP addressability, a gateway will still be required in order to translate the various communications protocols in use. In the meantime, system and device suppliers will need to work around these issues.

If device suppliers support only a single technology, devices will not be interoperable with other technologies without additional gateway hardware. However, if device suppliers support multiple technologies, this increases production costs as a result of the heterogeneous product line. In order

to overcome device interoperability issues, device suppliers should work together to maintain standardization across the board, even if this refers only to device suppliers using the same technology (e.g., ensuring a Z-Wave device from one manufacturer can interoperate with that from other suppliers). In some cases, the ability of device suppliers to do this is limited by requests from partner companies, namely service providers, to employ proprietary profiles on top of the core specification. IHS recommends further investigation of the potential for multi-protocol gateways and bridges to offer alongside devices, or the potential to easily offer a range of devices with multiple connectivity technologies (e.g., though the use of plug & play modules). In doing this, device suppliers can make their products more flexible and compatible with a wider range of different systems.

The number of use-cases selected by respondents indicates that interoperability will be increasingly important in the future if connected home services are to appeal to the mass market. This is particularly pertinent in the case of self-installed or self-managed systems, where the consumer may not be as aware of the multitude of technologies enabling connectivity, which may result in confusion or frustration as newly purchased devices are not interoperable with existing systems.

The adoption of open source messaging protocols specifically designed for low-bandwidth networks, such as Message Queue Telemetry Transport (MQTT), may also help to alleviate some of the interoperability issues found when attempting to communicate across a range of communications technologies.

CLOUD-BASED SERVICE DELIVERY PLATFORMS

Cloud-based service delivery platforms, such as IBM's Smart Cloud delivery platform, underpin many connected home applications and systems, enabling functionality such as remote home control, scenario creation and more.

The service delivery platform spans both technologies and the variety of services that may be provided by large-scale service providers. Where a variety of connected home platforms (such as those offering by iControl or Arrayent) are built on the same underlying open SDP, this would provide a single point of integration for the multitude of services an individual receives, and facilitate communication regardless of the protocol used by each service, depending on how the solution has been implemented, and the requirements of the service provider. This can transition much of the intricacies involved in ensuring communication between various systems away from the devices themselves and into the cloud, where it is more manageable. This type of solution may be of increasing importance as more and more devices become "connected", the trend towards growing connectivity and the 'Internet of Things' continues to grow, and an increasing number of communications technologies, application programming interfaces (APIs) and platforms are utilized to interact with devices.

The concept of the connected home is more than simply a means of controlling previously unconnected devices remotely, it is expected that the longer term and more significant value proposition will be achieved when systems across multiple facets of consumer life are integrated and have the ability to automate events based on data or notifications received from one another, removing some of the need for human input and enable new use-cases and applications. This is where the use of a common SDP offers an advantage; it is able to unify connected services such as television, automotive, fixed broadband, mobile, home monitoring or energy management, allowing for inter-device communication between those involved in the provision of such services and therefore provide the opportunity to create innovative applications based on the culmination of these individual services.

While the ability to integrate these services seamlessly within the cloud appears to be a logical and perhaps one of the most convenient means of providing broad interoperability, there remains the issue of devices being able to communicate with the cloud in the first place. Gateways, therefore, are of

critical importance to the viability of this method of providing interoperability. These devices will need to ensure they include the relevant and applicable communications technologies to facilitate the processing of the variety of connectivity protocols utilized within connected devices and their subsequent connection to the cloud. However, a major concern which is harder to fix with hardware alone, is the trend within the industry to reduce system interoperability and maintain closed networks.

VENDOR LOCK-IN

'Vendor lock-in', where a consumer can be dependent on a specific vendor for products and services, unable to switch to another vendor without significant switching costs, is expected to be a growing concern in the connected home industry. This can occur for a number of reasons, from proprietary variants of connectivity technologies to lengthy service contracts (either for the connected home service alone, or for other services from the same provider, such as broadband or security). For example, vendor lock-in can be driven by hardware requirements, such as where a consumer already has a gateway from a particular provider and associated interoperable connected home devices. In some cases, changing service providers will require additional hardware, such as bridging devices or new gateway/hub devices – and this can lead to their own challenges of interoperability, compatibility and even managing the transition from one system type to another.

Vendor lock-in isn't always inherently detrimental for consumers. Where consumer loyalty is high, and the end-user is fundamentally satisfied by the service being provided, vendor lock-in does not cause a major issue for the consumer. They don't feel locked in, as they don't intend to switch anyway. However, it's when the consumer becomes dissatisfied with the service, or where a more appealing service is available elsewhere, that vendor lock-in becomes an issue. Today, awareness of the availability of mass market connected home systems is still not ubiquitous, as highlighted by the recent consumer survey from IHS. As consumers become more aware of these systems, and a larger number of companies offer such systems, this will lead to growing competition based on both price and functionality.

While it may initially be seen as advantageous to a connected home system provider to lock consumers in to a specific system, this comes with its own challenges, which if managed ineffectively can lead to dissatisfied consumers that cannot switch providers or consumers that switch as soon as they get the opportunity. As new and existing connected home providers continue to innovate, this heightens the risk of dissatisfaction at vendor lock-in if a particular device or function offered by a competitor is deemed attractive by a user that is locked in to an alternative system. With many of today's connected home systems being relatively similar in terms of hardware and associated applications (typically including a range of home monitoring devices, such as motion sensors and window/door contacts, with the option for add-ons such as network cameras or energy management packs), for connected home suppliers (including device and service providers alike), this drives the need to invest in developing unique system or user interface functionality that can act as a differentiator as system availability grows, or at least keep up with the new features offered by competitors, and replicate these at attractive price points.

IHS does not expect a truly open ecosystem to become ubiquitous within connected home solutions in the coming years. From a device and hardware perspective, many of the device suppliers aiming for mass market adoption are expected to increasingly work towards improved interoperability and open standards; however, the system providers, i.e., those offering the enabling gateway and associated services, are expected to be the limiting factor. Even where a device vendor employs open standards, some system providers are expected to continue to request proprietary profiles to be employed on top of open standards to promote vendor lock-in. Despite this, some system providers are expected

to emerge using the lack of vendor lock-in as a key differentiating factor. For example, reducing contractual lock-in through up-front service pricing and reducing hardware lock-in through the support of a variety of connectivity technologies with multi-standard gateways. While this approach is not expected to become the norm within the coming years, efforts to create a more open ecosystem would help to reduce the growing fragmentation appearing in the industry.

Many cite this level of fragmentation as a major barrier to mass market connected home adoption. However, IHS believes that although this increasing fragmentation will lead to a number of issues in the future (such as reduced consumer satisfaction from a fragmented user experience and varying degrees of vendor lock-in), it is not a major barrier to mass market adoption today, as most consumers are not believed to be aware of this potential pitfall.

EDUCATION AND AWARENESS

Consumer awareness and education regarding the availability, ease-of-use and advantages of connected home systems will be a key factor in mass market adoption.

Interestingly, the recent consumer survey from IHS revealed that 30% of respondents that indicated an interest in one or more of the connected home use-cases outlined in section 4.2 were only made aware of these via the explanations and examples provided by IHS in this survey. Of respondents that had prior knowledge of connected home systems, this has mainly been due to the Internet, with 30% of respondents indicating they were made aware of connected home systems or applications via this medium.

There are indications of a broad lack of confidence in connected home systems ease of set-up, with little difference in responses between the various levels of technology adopters to whether the respondent would prefer to have their system professionally or self-installed. As highlighted previously in this section, more than two-thirds of respondents interested in connected home systems indicated they would opt to have these professionally installed.

Critically, improving the education and awareness of consumers must be a key strategic component for those currently involved in the industry and those looking to enter the market.

3 CONNECTED HOME ECOSYSTEM AND MONETIZATION MODEL ANALYSIS

Chapter three of this report is based upon a number of sources, namely:

1) The recent industry expert interviews, conducted by IHS as part of this project. IHS cannot reveal the companies or individuals interviewed for this research project. The content of the interviews are not reproduced verbatim, but are used to inform and shape the views of IHS in relation to the current and future state of the connected home market.
2) Industry knowledge within the IHS project team obtained as part of the research process for recent reports, such as "Connectivity Opportunities in the Smart Home", "Smart Home Energy Management Systems" and "Smart Home Consumer Survey – US, Brazil, UK, Germany & China".
3) Where applicable, reference is made to the recent IHS consumer survey, conducted as part of this project, and designed in conjunction with the CABA Monetization of the Connected Home Project Steering Committee.

Recommendations and statements included in this section of the report represent the view of IHS, formed in conjunction with the above research methods.

The company profiles, referenced in this chapter and presented in Appendix 1, are created using publically available information taken from the respective company websites.

3.1 INDUSTRY RECOMMENDATIONS AND MARKET EXPECTATIONS

CONNECTED HOME INDUSTRY ECOSYSTEM MATRIX

The four tables below present an overview of the key companies involved in the connected home ecosystem, as identified in conjunction with the CABA Monetization of the Connected Home Project Steering Committee Members. The tables presented below, and the subsequent text in Section 3.2, present an overview of the following aspects.

- **Key value proposition and core capabilities**. A key value proposition is the main feature(s) or service(s) which makes an offering attractive to its target market. Core capabilities are the unique abilities that a company acquires or develops in order to effectively do business in a particular area. It is what differentiates them from other company types or competitors.

- **Critical success factors**. The characteristics which together will drive the effectiveness and efficiency of an organization, without which competing in a particular market would be difficult.
- **Target segments**. A particular group (either consumers or other businesses) which are identified as the intended recipients of a particular product or service.
- **Partnerships**. A type of organizational structure where two or more business entities converge to share resources, knowledge or strategy in order to develop a new set of unique value propositions and core capabilities that will differentiate them from their original state, or to develop unique go to market strategies.
- **Competitors**. Competition refers to rivalry between two or more business entities offering a similar product or service. This may be current (typical in-segment competition) or potential, where a business entity from a different business segment may acquire or develop resources to vertically integrate its solution.
- **Routes to market and distribution channels**. The path or paths through which goods or services travel in order to get from the original vendor to the consumer or end-user. This could be direct, if consumer-facing, or indirect, via one or more intermediaries. The route to market will depend heavily on the type of product or service being offered.
- **Cost structure**. Company-specific methods relating to the investment or re-investment of capital into a specific market, in order to broaden the scope of the company into new areas of business.
- **Future opportunities**. Potential avenues of business that may be beneficial for a specific company or business type to develop, either to generate new revenue channels, or to protect against the future challenges in the competitive landscape.
- **Future challenges**. Potential pitfalls in the current or future competitive landscape that may negatively impact the business in the future.

The matrix presents only a brief overview of each of these factors. Please refer to section 3.2 for more detailed information for each company type, including analysis of how these factors are likely to develop or change in the coming years. Example companies are provided in the first column of the matrix.

3.1.1 INDUSTRY RECOMMENDATIONS

This section highlights the key challenges to future development in the connected home market for each of the company types listed in the matrices above, and makes recommendations for how to overcome these potential obstacles and leverage opportunities. This section is based on the more detailed analysis provided in sections 3.2 and 3.3.

EXISTING SERVICE PROVIDERS

In the context of this report, existing service providers are defined as those companies that have an existing customer base through offering a service other than connected home services, such as broadband, cable or security services. Examples of such companies which have now entered the connected home market in North America include ADT, AT&T, Verizon and Comcast. For more detailed analysis, please refer to section 3.2.

ADVERTISEMENT AND EDUCATION

Increasing demand for connected home services through advertisement and education programs presents a major opportunity for all companies within the connected home ecosystem.

Existing service providers are well-placed to develop connected home advertisement and education programs. With an existing subscriber base, consumer touch points – such as bills, new product release mail-outs and email notifications – are an excellent point of advertising and direct targeting for the connected home. IHS recommends that advertising and marketing to existing service customers should be a key priority for existing service providers over the coming years, to build awareness of connected home features and systems amongst the existing subscriber base.

It is clear that education and marketing is essential; nearly 40% of all respondents to the recent consumer survey from IHS only found out about connected home systems in the survey itself, highlighting the lack of ubiquitous awareness. However, these advertising efforts could be wasted if implemented ineffectively. For example, it is important to base marketing on end-applications rather than the devices themselves. For example, instead of advertising smart plugs, vendors should instead look to advertise how these connected home systems can benefit consumers' lives; identifying consumer use-case requirements, such as the ability to turn a lamp on and off from a smartphone (which can be enabled using a smart plug).

USE CONNECTED HOME SERVICES TO PROMOTE CORE BUSINESS LINES

With the number of existing service providers offering connected home services today still relatively low, there is an opportunity to use connected home packages to discourage consumers from switching core services, such as broadband, telephony or security services, by using these as a 'minimum' to obtain a connected home system, and therefore reduce consumer churn. Customer churn refers to the rate at which subscribers leave an existing service for a competitor. A low churn rate indicates higher customer loyalty, and can be enabled through a number of means, including contract terms. For example, Verizon offers connected home solutions – but these are only available to its existing broadband service subscribers.

In line with this, existing service providers have more flexibility than dedicated connected home service providers with respect to determining core profit centers. IHS recommends that existing service providers examine the price and profitability trends of different business lines to determine appropriate packages. For example, an existing service provider may be able to offer lower-cost connected home services than its competitors (at a lower margin) if there is a prerequisite for the user to subscribe to another higher-margin service, such as broadband.

LEVERAGE PARTNERSHIP OPPORTUNITIES

Competition from dedicated providers, device manufacturers and other existing service providers can be problematic: while each has a unique key differentiator, competition is dependent on consumer demand. Extended partnership opportunities are one way that existing providers can leverage the existing market knowledge for other companies active in the connected home space. For example, they can work with installation companies or contractors, which already have extensive experience of in-home device installation and knowledge of core devices, such as HVAC systems, in order to enable hassle-free installation for their customers. They can partner with platform providers, which have the existing in-house expertize relating to the provision of connected home platforms, to avoid needing to invest in the development of these capabilities internally, and reduce time to market. In addition to these partnership opportunities, architects and building developers can be useful targets for existing service provider partnerships to build on pre-existing relationships by bundling in connected home services. For example, security companies may already secure the homes that are being built, and telecoms companies may provide services to these homes.

SMART HOME ECOSYSTEM MATRIX (A)

Company Type	Key Value Proposition	Critical Success Factors	Target Segments	Partnerships	Competitors
Existing Service Provider (e.g., Verizon, Comcast, ADT, AT&T)	• Low cost • Existing media subscribers • Strong background in services	• Existing resources in service marketing, customer relationships and user support • Existing loyal customer base	• Existing media subscribers • Early adopters • Mass market, low-cost demographic	• Software/platform providers • Device manufacturers • Triangle between these three	• Other Existing SPs • Dedicated SPs • Device suppliers • Retailers moving to services
Dedicated Service Provider (e.g., Nest, EcoBee, Revolv)	• In-depth market knowledge • lower cost than Existing SPs • DIY/ professional Install flexibility	• Existing experience of providing services or devices in other product lines • Significant funding	• No specific target segment; start-ups pave the way	• Hardware supplier • Platform providers • Distributors	• Other dedicated SPs • Existing SPs • Device suppliers • Retailers moving to services
Specialist Home Automation Provider (e.g., Crestron, Lutron, AMX)	• Customisation of connected system • End-to-end involvement in implementation of system • Full after care service including technological concerns	• Awareness of connectivity systems and protocols • Existing network of high-net worth individuals and companies (e.g., architects)	• High net worth individuals • Luxury residential • Property Development Projects (MDUs)	• Some may partner with installers/ contractors • Device manufacturers (high-end) • Architects and construction firms	• Other specialist home automation providers
Device Supplier (e.g., Bosch, Honeywell, Schneider Electric, Emerson)	• Economies of scale • Ease-of-use / ease-of integration • Experience from other product lines	• Existing experience of supplying devices in other product lines • Awareness of smart home ecosystem and development of service provision	• Existing SPs • Dedicated SPs • Retailers	• Existing SPs • Dedicated SPs • Retailers	• Dedicated device and service providers (e.g., Nest) • Other device manufacturers

Routes to Market / Distribution Channels	Revenue & Pricing Model	Cost Structure	Future Opportunties	Future Challenges
• Direct to consumer • Via installers / contractors	• Monthly subscription • Upfront installation cost • Cost-plus mass market pricing	• In-house funding from existing lines • Occasional external investment • 3-4 years for ROI	• Consumer education • Increasing revenue per existing user • Beyond the subscriber base	• Subscriber saturation • Longevity of subscription model • Consumer demand for additional devices
• Can be direct to consumer (mostly online) • Dealers & distributors • Contractors & installers	Different approaches: • Monthly fee • Tiered service • Upfront fee	• Bank/ BS loan • External private investors • Re-investment from other projects • ROI dependent on start-up success	• Consumer education from other channels • Partnerships between dedicated device suppliers (e.g., Nest) with existing SPs.	• Existing SPs driving down cost of connected system • OEMs moving towards service provision
• Typically, direct to consumer • Occasionally via partners such as architects, contriuction firms in luxury new-builds	• Fee per project, or per square foot (depending on system type) • Deposit scheme essential • High costs (over $100,000)	• Primarily based on external private investment, rather than banks or building societies • Typically can be a combination of external private and internal private funding	• Increased education of consumers = higher net worth individuals also become aware • Separate ranges targeting lower-end of high net worth	• Growing availability of mass market systems removing some customers • Interoperability of systems
• Via distributors and dealers • Direct to retailers	• Upfront hardware costs rather than services • Devices as main profit • Wholesale to retailers / distributors	• Could be either start-up or existing • Existing - funded from other product lines & ROI quick • Start-ups -external private investment & ROI 5-8 years	• Strategic device partnerships • Retail market opportunities • Service provision • Residential load management	• Potential margin pressure • Device interoperability • Application-based market development

SMART HOME ECOSYSTEM MATRIX (B)

Company Type	Key Value Proposition	Critical Success Factors	Target Segments	Partnerships	Competitors
Contractors & Installers (e.g., KEEC electrical)	• Expert knowledge of electrical & in-home systems • Consumer trust in professional installation company	• Existing knowledge & experience in non-connected systems (such as electricity/ heating) • knowledge of wireless systems	• Device manufacturers & distributors selling professional-install or self-install devices • Dedicated or existing SPs	• Device suppliers • Tier One and Two existing SPs • Dedicated SPs	• Other installation companies within local catchment area / recommended by service provider or device supplier
Dealers & Distributors (e.g., FrontPoint Security, SageAlarm)	• Knowledge of product • Knowledge of local area & target demographics/areas • Local link for multinationals	• Established knowledge of electronic/CE goods • Established regional/local profile	• Dependent on specific partnerships • Application-based (security, energy, etc.) • Local conditions (weather, crime rate, etc.)	• Device suppliers • Dedicated Service Providers	• Other distributors within local catchment area / recommended by service provider or device supplier
Utility Companies (e.g., SCE, PG&E, Hydro One, BC Hydro)	• Unlimited access to energy database • Well-placed to feed electricity into the home • Load control activities	• Established realtionship with regulator / government to get on-board funding for residential programs • knowledge of database development to ensure TOU or real-time data	• Consumers with high consumption • Demand-response positive consumers • Those who already own connected home systems (especially security)	• Security providers • Existing SPs • Dedicated SPs • Device manufacturers (esp. meters)	• Other utility companies • Dedicated energy management service providers • Device suppliers offering meter clamps etc. • Demand response aggregators
Retailers (e.g., Home Depot, Lowe's, Best Buy, Staples)	• Accessibility & interaction with customer • Wide range of products & devices	• Established business line & reputation in consumer electronic goods • Pre-existing device manufacturer and platform provider relationships	• Mass market rather than connected home enthusiasts • DIY based low cost	• Distributors • Device manufacturers • Sometimes platform providers	• Some distributors • Dedicated SPs • Device manufacturers with services
Software/Platform Providers (e.g., Arrayent, iControl, AlertMe, Alarm.com, IBM)	• End-to-end package • Knowledge of software/platform design • Customisation of package	• In-house expertise on Apple, Android and Linux/ Windows based app development • Software/platform provision exerience in other business lines	• Tier One service providers (existing, not dedicated) • Device suppliers moving to service provision	• Device manufacturers • Existing service providers	• End-to-End providers (e.g., AT&T) • Device OEMs already providing service (e.g., Schneider Electric)

Routes to Market / Distribution Channels	Revenue & Pricing Model	Cost Structure	Future Opportunties	Future Challenges
Direct to Consumer: • Recommended by service provider • Recommended by device supplier • Direct marketing	• Paid directly by consumer, per hour • Purchase by consumer as part of service package from other provider, therefore paid by provider	• Privately funded, or by banks/building societies • Low barriers to entry • Quick/immediate ROI	• Partnerships with connected home providers • Ongoing services • Opportunity to consolidate regional networks	• Rise of mass market DIY connected home systems • Education of contractor / installer companies
• Direct to Consumer • Via Retail	• Paid directly by consumer, per hour • Purchase by consumer as part of service package from other provider, therefore paid by provider	• Privately funded, or by banks/building societies • Low barriers to entry • Quick/immediate ROI	• Consumer demand for connected devices • Mass market DIY systems • Ongoing services	• End-to-end solutions • Major service provider entrance to market
• Direct to consumer • Via dedicated/existing provder platform	Number of options for revenue generation: • Hardware revenues • Offset costs (DR) • Software services	• Government subsidies • Regulatory board funding / rebate for mandated base deployments • Internal funding for additional devices	• Cloud-to-cloud connectivity • Extended partnership opportunities • Branding opportunities	• Security as primary value propostion • Consumer surpport for residential load control • Demand response aggregators developing residential systems
• Always direct to consumer	• Basic, one-off costing model • Lowe's an exception with Iris system	• Funded by pre-established business • Low barriers to entry, but economies of scale difficult • ROI dependent on business stage	• Consumer demand • Seamless system integration • growing installed based of services and systems	• Aggressive service provider pricing • Interoperability • Fragmented UI experience • General retail entrants
• Via service providers • Via retailers	• Partner programs for device suppliers • Per system, sometimes per node monthly or annual fee	• Can be re-investment from other business lines • Start-up companies relying on external private investment • ROI expected between 5-8 years	• Application agnostic solutions • Functionality expansion • Movement into adjacent sectors • Expanded partnership opportunities	• Backwards Integration from SPs • Low barriers to entry

CREATE A BUSINESS PLAN BEYOND FIRST ADOPTERS

Today, the installed base of connected home services is still relatively low. However, as the penetration rate continues to grow, the first-mover market will become saturated. Existing service providers will need to ensure they can create an offering which appeals beyond the first-adopters, to a wider customer base. This could be through the creation of uniquely valuable starter or add-on packs, a lower cost proposition, or even new applications altogether. IHS' end-user survey, for example, identified remote notifications for intruder alerts.

BUILD BARRIERS TO SWITCHING

Most connected home systems from existing service providers have some form of up-front cost, which at a minimum includes basic connected home hardware (or a 'starter pack'). The cost of this hardware can represent a barrier to switching from one service provider to another. Once a service provider's existing subscriber base becomes saturated, trying to 'win' customers from other service providers can present an opportunity. IHS recommends that service providers be mindful of this today, even in the early stages of this market development, and work to create barriers to switching for their own systems. For example, companies can provide subsidized systems in order to retain consumers for a lengthy contract period. As the range of applications enabled by connected home systems grows, service providers can work to become more entrenched in consumers' lives, for example by offering discounted devices to 'extend' existing systems, based on the condition of an extended service period. Another approach might be to create barriers to switching using features of the user interface – for example, helping the user to create a highly involved range of automated scenarios for their systems which would be lost if the user went to another service provider. In parallel to this, existing service providers should also investigate the feasibility of 'taking over' connected home systems from other service providers, for example through the use of a complimentary gateway or bridge.

CONTINUOUS EVALUATION OF PRICING MODEL

There are a number of challenges inherent to the recurring service revenue pricing model employed by most service providers to-date, as analyzed in section 3.2 of this report. One of the main challenges is the potential for other companies, such as device providers, to offer on-going services for a fee which is included in the up-front system cost. This would be consistent with the findings of the recent consumer survey undertaken by IHS which highlighted a preference towards higher up-front system costs as opposed to higher on-going service fees. Please refer to section 4.3 for more information.

As more companies start to offer services included in an up-front cost, this can reduce consumer willingness to pay an on-going fee for services which are perceived to be available 'free' elsewhere. To overcome this issue may be a significant battle for existing providers, as the majority of existing business lines (i.e., media, telephony and other services) are generally provided on a subscription basis. IHS recommends that existing service providers which charge an on-going fee for these services will need to be aware of the complimentary services offered within the market, and ensure that there is a clear value proposition which justifies the on-going charges, compared with what is available on the market with no recurring fees.

Existing service providers should be aware of the opportunity to consolidate existing services into the connected home, similar to the way that ADT has done with its Pulse system – combining traditional security and automation in a single system to create inter-related scenarios. This creates a barrier to switching as an ADT customer moving to another home automation provider would not be able to easily integrate their connected home system with their ADT security system. Some similar interconnections could be designed for cable operators or telecommunications companies such as

AT&T or Verizon where the system is able to automate certain responses to TV services. For example, if the customer buys an on-demand movie, the system automatically turns down the lights, puts the phone on silent mode, turns up the surround sound and closes the blinds.

Should the connected home market develop in such a way that consumers are unwilling to pay on-going fees for related services, existing service providers will need to effectively model whether the gains from reduced customer churn are able to support the costs of providing connected home services that may not be able to be directly monetized. Customer churn refers to the rate at which subscribers leave an existing service for a competitor.

EXPANDING AND UPSELLING NEW PRODUCT RANGES

Today, existing service providers typically list a range of interoperable devices from certain device providers which they know will work with the system. The growing range of connected devices available presents both a challenge and an opportunity for existing service providers. As more connected home devices become available from other channels, such as via retail, consumers may become frustrated if they cannot add these to their systems. However, it also presents an opportunity to partner with interoperable device suppliers to include promotional periods for new products as they are released by device suppliers, and upsell existing customers beyond the typical starter-pack options, while offering the added value of early device availability.

It is important for connected home providers to be aware of the need to continuously update their range of devices and the applications they enable. Increasingly, connected home starter-packs look alike in terms of the initial hardware and applications they enable, with common devices such as window/door contacts and motion sensors. IHS recommends that existing service providers recognize that they will need to continue to innovate and improve the functions enabled through their systems, either by creating uniquely valuable user interfaces or improved application and hardware offerings, to differentiate themselves as connected home services become more widely available. For example, this might be through the formation of an internal organization whose sole priority it is to evaluate and design new use cases, devices and business models to continually exploit the external innovation and development.

For full analysis of the challenges and opportunities facing existing service providers in the connected home market, please refer to section 3.2. For further analysis of the upfront and recurring revenue models demonstrated by existing service providers, please review section 3.3.

DEDICATED SERVICE PROVIDERS

IHS defines a dedicated service provider as a company which offers connected home systems and services, but does not have a pre-existing customer base from other business lines outside of the connected home. For example, Alarm.com, which offers only connected home devices and services, is considered to be a dedicated service provider; whereas Verizon, which offers both connected home and telecommunications services, is considered to be an 'existing' service provider (which is covered in section 3.2 of this report). While not synonymous, many dedicated service providers are 'start-ups'. For more detailed analysis of dedicated connected home service providers, please refer to section 3.2.

Connected home start-ups have been appearing in the industry for many years. As the connected home premise becomes more proven, it may be easier for such start-ups to attract funding. In some cases, start-up companies have proven to be the source of incredibly innovative ideas. In some ways this presents an opportunity for current incumbents in the connected home (e.g., through imitation or acquisition opportunities); however, equally such companies need to be monitored for the creation of a truly game-changing development.

IHS makes the distinction between dedicated service providers and specialist home automation providers. Dedicated service providers are those who primarily specialize in the back-end network or related services (typically related with remote home control or enabling interactive system access via a smartphone or tablet), often partnering with device companies in order to provide a complete solution. Specialist home automation providers are those that offer predominantly whole-home solutions, including their own hardware, software, and additional services. Examples include companies such as Crestron, Lutron or AMX. This section focuses specifically on dedicated service providers; for analysis of specialist home automation providers, please refer to section 3.2 for an in-depth market analysis or the next section for recommendations.

LEVERAGE INCREASING CONSUMER AWARENESS THROUGH DIFFERENTIATION

Increasing demand for connected home services through advertisement and education programs presents a major opportunity for all companies within the connected home ecosystem. Typically, many dedicated connected home service providers are start-ups or relatively small organizations which do not have funding for major nationwide campaigns. As consumers become more widely educated on the features of connected home systems, dedicated connected home providers have the opportunities to leverage this increased awareness through offering differentiated solutions to those marketed by existing service providers entering this market, such as enhanced functionality or unique pricing options (for example, a lifetime service package or inclusive systems with wider device options).

CREATE STRATEGIC PARTNERSHIPS

As previously indicated, many connected home specialist service providers are relatively small companies. IHS recommends that these companies work to create further strategic partnerships with a range of more established companies. This might be with established connected home suppliers (such as the partnership between Nest and Control4), or with existing service providers, such as broadband or security providers, planning to enter the connected home.

While many of the major, or nationwide, service providers in North America are already offering or developing connected home systems (often in conjunction with platform providers and device OEMs), there are a large number of smaller, or regional, providers that may also be interested in entering the market, but unable to invest the capital necessary to create their own solutions. By partnering with smaller or regional service providers, dedicated connected home service providers could utilize their expertise to create a solution for existing service providers, offering the existing service provider a rapid time to market for branded connected home solutions at relatively low capital costs, and offering the dedicated connected home supplier an existing subscriber base and the associated brand recognition from which to monetize their services. IHS therefore recommends that dedicated connected home service providers assess the opportunities for partnership with smaller or regional existing service providers, such as broadband, telephony or security providers.

Device partnerships can also be a very effective means for dedicated connected home service providers to operate in this market as typically (although there are exceptions), dedicated connected home service providers do not offer their own range of devices. By partnering with device suppliers, dedicated service providers can also alleviate issues concerning device warranties, R&D into new product lines and consumer research, as the partnership would leverage both the device suppliers' expertise in these areas and incorporate the dedicated system provider's expertise in connected home UIs, software, and back-haul network maintenance.

In addition, dedicated providers can leverage their core capabilities to act as platform providers, as

many – such as Alarm.com and AlertMe – have done in the past. This can remove the overhead costs associated with acting as a B2C provider, enabling these companies to instead leverage their internal connected home platform expertise to effectively provide the required software systems to other service providers.

DEVELOP WAYS TO COMPETE WITH NEW MASS MARKET ENTRANTS

Dedicated connected home service providers are at risk from a wide range of new market entrants, such as existing service providers, and connected home device suppliers which start to launch their own service packages (e.g., as Schneider Electric has done with its WISER residential load management system).

As more companies, including existing broadband, telephony or security providers, enter the connected home market, this will start to drive down the cost of basic service packages. While existing service providers can, to some extent, cope with lower margins from connected home services provided, there are benefits in other business lines (e.g., lower customer churn for other services where fewer subscribers leave the existing service for a competitor), this is not the case with dedicated service providers. With no other business lines to support a declining margin, dedicated service providers will need to innovate and create unique value propositions, for example leveraging existing market knowledge to create new application solutions, in order to avoid entering a price war.

Interestingly, dedicated service provider pricing today often compares favorably with that from existing service providers entering into this market, although in some cases, this is due to a narrower focus than that offered by existing providers. In order to overcome the problem of existing service providers driving down the cost of connected home systems, dedicated providers will need to develop new ways to compete. To compete on price, innovative pricing models will need to be created which are more attractive than the recurring charges offered by existing service providers entering the connected home market. This could be through lower monthly fees, more attractive initial system or hardware costs, or through new pricing models, such as lifetime service contracts. Alternatively, it might be through offering additional features or services, such as elderly monitoring systems or healthcare tracking, the likes of which many existing service providers are currently exploring but few have actually deployed.

For full analysis of the challenges and opportunities facing dedicated service providers in the connected home market, please refer to section 3.2. For further analysis of the upfront and recurring revenue models demonstrated by dedicated service providers, please review section 3.3.

SPECIALIST HOME AUTOMATION PROVIDERS

IHS defines specialist home automation providers as those companies exclusively offering connected home devices or systems aimed at multiple applications, ranging from lighting control to A/V distribution. These specialists often provide whole-home, relatively high cost systems. In some cases, these specialist providers base their systems on proprietary protocols rather than using open standards, to enable further system customization or retain a closed system. Examples of those active in North America include Crestron, AMX, and VIA International. In some cases, these companies also provide their own supporting services, for example to enable remote home control and cloud-based home management. For more detailed analysis of specialist connected home automation providers, please refer to section 3.2.

INCREASE TARGETED EDUCATION AND ADVERTISING CAMPAIGNS HIGHLIGHTING VALUE DRIVERS

Education of general consumers is a significant issue for the connected home market, and existing service providers entering this market – such as broadband providers – are expected to play a major role in driving increased awareness within the mass market. While the mass market is not typically the target market for many specialist home automation suppliers (although it is for some), general awareness campaigns will still be beneficial for most companies in the connected home industry. These campaigns (anticipated to be spearheaded by existing service providers moving into this market) are expected to raise general consumer awareness of the connected home, which today is relatively low.

IHS recommends that specialist home automation providers build on the growing awareness of general connected home solutions by further developing marketing programs targeted to reach higher net worth individuals, emphasizing the value of features such as system customization and superior service levels, as well as how these systems can impact a consumer's day to day life. In addition to this, high-end home automation providers will also be able to target specific magazines, or companies (such as contractors, installers, or architects) in order to increase the number of potential consumer touch points. It could be that consumers are aware of mass market systems, but are not aware that customizable options are also available in the market, nor aware of how these devices could impact home life in terms of convenience, energy saving, or peace of mind. While the onus of mass market advertising and education is expected to be driven by existing service providers entering this market, the onus of informing high net-worth individuals about luxury alternatives falls on the specialist company. It is also important for specialist home automation providers to join the existing service providers in informing consumers about how connected home devices could impact consumers' lives. It is the onus of every connected home merchant to educate consumers about the benefits of the connected home from an application perspective and not just focus on specific devices.

It is important that the target market is offered a clear value proposition over the much less expensive systems being developed for the mass market. As mass market systems continue to evolve with additional features and applications, those targeting the high-end of the market must continue to focus on the aspects most important to their specific target audience, whether this is convenient installation, custom system design, superior service levels or a wider feature set such as customized cinema-based experiences (with partners such as IMAX), 'smart kitchens' (where automatic coffee makers and intelligent induction cookers are prime examples), and other high-ticket items that cannot be integrated into mass market systems.

LEVERAGE PARTNERSHIP OPPORTUNITIES

As the North American housing market rebounds, IHS expects that property development companies – including architects, construction companies and contractors will pose interesting partnership opportunities for specialist home automation providers. While many specialist providers already do this, the expanding property market may reveal more opportunities to gain additional revenue through additional partnerships. Such companies may also become targets of existing service providers, particularly those with pre-existing relationships with property developers (such as security providers that protect show homes). As such, specialist home automation providers will need to offer differentiators in order to leverage these opportunities, such as working with high-end developers looking for more customization than is offered by typical mass market connected home systems.

In addition to this, specialist home automation companies can further leverage partnerships with high-end device suppliers (such as A/V supplier, IMAX). As many mass market providers would not engage with high-end device partners (as these systems could price out many consumers in the mass

market), this presents an opportunity for high-end home automation providers to use the established brand names of high-end counterparts across different parts of the system to further establish their position at the luxury end of this market.

EVALUATE NEW SEGMENT OPPORTUNITIES

There is the potential for specialist home automation providers to leverage the growing awareness of the connected home to identify new target segments. For example, these might include high-middle income consumers with sufficient disposable income to comfortably consider spending reasonable amounts of money on a home automation system, but have only really become aware of these systems through the advertising of the relatively basic packages available through their broadband supplier. Some within this segment might consider the mass market systems too basic for their requirements, but are priced out by the very high-end specialist, custom solutions available at the luxury end of the market. Instead of allowing these customers to 'settle' for mass market systems, high-end specialists could consider the upper-middle class to be a great potential market for separate ranges (to avoid diluting existing brand associations) which target the lower end of the high net-worth segment with less expensive alternatives.

ASSESS CONNECTIVITY REQUIREMENTS

The topic of interoperability has been discussed widely in the connected home industry for many years. While there has been a general movement towards standards (such as ZigBee or Z-Wave) in some parts of the industry, many specialist home automation providers have stuck with proprietary, closed solutions. This has driven a closed ecosystem, where customers can be tied into using specific suppliers. As more mainstream systems move towards wider interoperability of wider device ranges and suppliers, those using a closed system will need to be aware of consumer attitudes as the use of an open, interoperable networking technology could become a differentiating feature in the minds of the technology-aware consumer in the future.

For full analysis of the challenges and opportunities facing specialist home automation providers in the connected home market, please refer to section 3.2.

DEVICE SUPPLIERS

Connected home device suppliers include both those companies dedicated to supplying connected devices (sometimes in conjunction with services) such as Nest or EcoBee, as well as device suppliers with established non-connected device product lines, such as GE, Emerson, Tyco and Honeywell.

DEVELOP STRATEGIC PARTNERSHIPS

Device suppliers can form partnerships with the growing number of connected home system providers that aim to monetize the market through on-going service relationships. Understandably, service providers do not typically want to invest in developing in-house device manufacturing or design capabilities, and therefore rely on partnerships with device suppliers to enable an end-to-end offering directly to the consumer. IHS recommends that device suppliers, both dedicated and those with a background in unconnected device provision, leverage the growing deployment of recurring revenue connected home services to create wider channels for their devices, and leverage service provider advantages, such as existing subscriber bases, brand recognition and customer-facing marketing programs.

TARGET RETAIL OUTLETS

Many consumers who purchase household electrical items, such as appliances, do so via retail outlets,

rather than dedicated providers. Home Depot or Lowe's, for example, provide a wide range of non-connected devices to consumers every year. As awareness of connected home devices grows, many consumers are expected to look to the same retail channels where they have purchased non-connected devices to provide connected device alternatives. In addition, as the installed base of households with connected home systems grows, device suppliers can take advantage of a growing demand for devices available through retail channels, as consumers look to add further devices to their systems.

This is particularly true of consumers which purchase service platforms which are device-agnostic, enabling consumers to integrate connected home devices from a wide range of suppliers, using multiple connectivity technologies. In order to take advantage of this, device manufacturers will need to assess which systems they need to be compatible with, and create solutions which can enable this through either open standards or inexpensive bridging devices, as well as continue to invest in developing retail channel partners.

TRANSITION INTO SERVICE PROVISION

As the demand for remote home management systems grows, this presents an opportunity for device suppliers to move into the provision of associated services. This could be a means of moving from an exclusively up-front costing model to a recurring revenue model, with associated on-going service fees. Alternatively, this service could be provided as part of the upfront hardware cost, in order to differentiate from other systems available from existing service providers, which typically have an on-going service element. Should this occur on a widespread scale, this could prove highly disruptive to a market which many are trying to monetize based on recurring service revenue.

While it may be beneficial for consumers, offering wider choice of service plans and pricing options, it would present a major risk to many connected home service providers as recurring revenue is central to their business model. Such companies may try to develop alternative strategies. For example, there could be a greater move towards offering free basic services, and trying to upsell to more extensive packages, but there would need to be a clear value proposition for the further features enabled by these packages in comparison to what is being offered by companies that have rolled the on-going service fee into the upfront system or device cost. Alternatively, other routes to monetization – such as leveraging consumer data or e-commerce platforms, may need to be evaluated. These topics are discussed further in section 3.3.

Should more device manufacturers start to move into the provision of remote management services, there is the risk that a fragmented connected home scenario could develop where consumers have multiple devices from multiple suppliers, each with their own management system, without a seamless single user interface. While this is not believed by IHS to be limiting the market today, primarily because most consumers are not thought to be aware of this developing issue, IHS believes that if this situation does develop it would represent a major barrier to the growth of the connected home market. This is supported by the results from the recent consumer survey from IHS revealed that over 70% of respondents that wanted to be able to perform connected home functions would find it valuable to be able to do this with a single app or system, with 37% of these respondents selecting that they would only choose a system which enables this. It is therefore key that the industry work to find a solution to the issue of developing system fragmentation before it becomes an issue for the consumer.

TRANSITION INTO DEMAND-RESPONSE AGGREGATORS

As more high electricity consuming residential devices (e.g., certain white goods and A/C units) or controllers of such devices (e.g., thermostats) become connected, there could be the opportunity to leverage the connectivity within these devices to enable consumers to take part in residential load

management programs, or create a system and associated devices to specifically enable this (such as Schneider Electric's WISER system).

These features could be used to differentiate devices for consumers where attractive incentives for demand-response exist, or could be sold through partnership with utility companies. Alternatively, device suppliers could investigate deploying their own cloud-based residential load management programs, enabling them to form partnerships with various utility companies in order to effectively trade residential load demand during times of peak usage.

PLAN FOR INCREASED MARGIN PRESSURE

Many mass market connected home systems are based around a model of relatively low up-front hardware costs to enable monetization through on-going service charges. As a result, the focus within these devices is often on low-cost, fairly basic hardware. As more device suppliers enter the connected home market, certain devices – such as magnetic contacts or smart plugs, where the opportunity for function-based differentiation is low – are set to become commoditized relatively quickly, squeezing margins.

Device suppliers today need to plan for this issue in advance. Some will be able to accept lower margins based on higher volumes or market share, whereas others will need to develop alternative plans; for example offering higher-cost devices such as smart thermostats, A/C units or appliances, where there is still the ability to differentiate based on feature set, or even move from mass market devices to higher-end devices where added functionality can act as a key differentiator and help to command higher margins.

PROMOTE AN INDUSTRY RESPONSE TO INTEROPERABILITY ISSUES (OR AT LEAST PLAN AROUND THIS!)

With different systems supporting a range of different standards, device suppliers are faced with a situation where they have to decide which connectivity technologies to adopt. Past initiatives, such as the U-SNAP module, seem to have lost momentum. Realistically, a widely accepted industry response to interoperability issues does not seem forthcoming (although some will argue that the move towards node-level IP addressability will help to alleviate some of interoperability issues seen today). In the meantime, device suppliers will need to work around these issues.

If device suppliers support only a single technology, devices will not be interoperable with other technologies without additional gateway hardware. However, if device suppliers support multiple technologies, this increases production costs as a result of the heterogeneous product line.

In order to overcome device interoperability issues, device suppliers should work together to maintain standardization across the board, even if this refers only to device suppliers using the same technology (e.g., ensuring a Z-Wave device from one manufacturer can interoperate with that from other suppliers). In some cases, the ability of device suppliers to do this is limited by requests from partner companies (namely service providers) to employ proprietary profiles on top of the core specification. In these cases, while the device supplier still benefits from economies of scale by employing an open standard to achieve SKU efficiency during the production process, they are requested by service providers to employ proprietary software or firmware licensing on top of the core specifications to reduce interoperability.

IHS recommends further investigation of the potential for multi-protocol gateways and bridges to offer alongside devices, or the potential to easily offer a range of devices with multiple connectivity technologies (e.g., though the use of plug and play modules). In doing this, device suppliers can make their products more flexible and compatible with a wider range of different systems.

DEVELOP SOLUTIONS FOR 3RD/4TH/NTH WAVE APPLICATIONS

Many mass market connected home systems are based on home monitoring, with later expansion to energy management applications. Today, these devices are increasingly widely available. For example, smart plugs – which can be used to measure electricity consumption from, or control, individual applications – used to be available only from specialist device suppliers; they are now offered by a broader range of connected home suppliers as energy management starts to appear more on the connected home agenda. Device suppliers need to anticipate the next 'wave' of applications to be enabled by connected home systems, and create first-mover advantage in these markets. Already, discussions have moved beyond the standard home monitoring and energy management applications, with growing interest around other applications such as lighting controls (specifically connectivity-embedded light bulbs) or elderly monitoring and independent living solutions. Device suppliers will need to continue to keep apprised of these developing interest areas and create first-mover advantage before these markets become commoditized.

For full analysis of the challenges and opportunities facing device suppliers in the connected home market, please refer to section 3.2.

CONTRACTORS & INSTALLATION COMPANIES

Contractors and installation companies do not typically provide their own hardware or software for the connected home market; instead acting as channel partners for third-party hardware suppliers.

Some contractors or installation companies may be dedicated to offering connected home systems, such as installing high-end home automation systems, whereas others may offer more general installation or contractor services, or be focused on a specific function – such as HVAC systems – covering both non-connected and connected product ranges.

PARTNER WITH CONNECTED HOME SERVICE PROVIDERS

Partnerships with connected home service providers can offer great opportunities for installation companies or contractors. Many dedicated providers and some existing service providers offer 'recommendation' schemes for local areas so that consumers wishing to get their system professionally installed can do so by choosing one of the recommended installers. Additionally, some service providers mandate professional installation through their partner network, including the costs in the upfront hardware and system price.

With connected home service providers anticipated to be at the forefront of building consumer awareness and bringing connected home systems to the mass market, IHS recommends that contractors and installation companies work to partner with these companies to become part of their preferred installer network.

DEVELOP ON-GOING SERVICE PROGRAMS

Installation companies and contractors could generate revenue through the provision of on-going service programs, such as aftercare, system maintenance or the addition of further devices to the system as new devices become available and a consumer wants to expand their connected home system. This is expected to represent a more significant opportunity once the installed base of connected home systems grows. However, IHS recommends that installation companies and contractors develop service packages or offerings around on-going system care from an early stage, to market to clients as initial systems are installed.

DEVELOP OR JOIN NATIONWIDE CONNECTED HOME CONTRACTOR ORGANIZATIONS

Many general contractor or installation companies are locally based, and often even family run. As such, there could be benefits to forming nationwide connected home contractor collectives, such as increased buying power or shared marketing campaigns. Currently, there are no such organizations dedicated to connected home contractors, although similar organizations exist for contractors in general, such as the Associated General Contractors of America (AGC).

Developing a specialist connected home collective could help to distinguish contractors with experience and knowledge base to expand beyond standard non-connected device installation to connected systems, which can have their own challenges (such as device pairing and networking).

INCREASE EDUCATION OF INSTALLER AND CONTRACTOR EMPLOYEES

Building on from the last point, general contractors or installation companies moving into the connected home market may not have specialist knowledge and expertise of connected home systems. While the knowledge of in-home systems, such as heating, air conditioning or electrical systems may be extensive, networking technologies may not be within the standard education of a typical residential device installer. To overcome this, installation companies and contractors moving into the connected home market should investigate relevant education and training; e.g., from the original system provider they are installing the system for, or at least study the system designs in order to ensure the system integration will go smoothly. This is particularly important for companies aiming to monetize on-going service opportunities with existing connected home users.

LEVERAGE THE AVAILABILITY OF DIY SYSTEMS

As mentioned, many connected home system providers favor the use of professional installation companies. However, some alternatives, such as those from Comcast or Verizon, are designed for customers to install themselves. However, as highlighted in the recent consumer survey from IHS, many consumers are not comfortable installing their own systems. Installers and contractors can leverage this by developing new service offerings. As well as providing a full installation option, these companies can position themselves as a 'helping hand' for DIY systems, charging lower fees than a full specialist system install, or providing a 'do-it-with-me' service or tutorial; e.g., over the phone, to support consumers that are not comfortable setting up these systems themselves, along with on-going support options.

For full analysis of the challenges and opportunities facing contractors and installation companies in the connected home market, please refer to section 3.2.

DISTRIBUTORS

Distributors act as intermediaries for getting a product – in this case, a connected home device, solution or system – to market, selling into other channel partners, such as installation companies or contractors, or to (typically local) retail stores.

Where a distributor sells directly to the consumer, such companies would be covered in the retailers section, which covers the B2C retail model. In addition, there can be some overlap on the issues facing distributors and installation companies, due to the close working relationship and also some integration between the two functions as seen from some companies. Please review the previous section, highlighting the recommendations for installation companies, as some factors might be applicable to both companies.

For full analysis of connected home distributors, please see section 3.2.

TRANSITION FROM GENERAL DISTRIBUTORS TO CONNECTED DEVICE SPECIALISTS

As the consumer demand for connected home devices grows, driven in part by the advertising campaigns from existing service providers moving in to this market, an opportunity is presented for general residential device distributors to also become specialized in the distribution of connected home variants, working with channel partners to recommend system or device types, help to educate channel partners on system requirements, and leverage relationships with both existing device suppliers moving into this market and, further downstream, existing channel partners, such as installation companies or contractors. As the connected home market develops, and a wider range of device and system providers enter the market, this presents an opportunity for distributors to create a range of new exclusive or non-exclusive partnerships with a varied mix of suppliers. IHS recommends that distributors work with current device suppliers to assess any current connected device ranges, and also increase awareness amongst channel partners who in turn sell through to the consumer.

In addition, as self-install systems become more widely available, distributors can partner with system providers to increase the availability of these systems in further channels, such as local retail stores, which might be too small to contract with the device supplier directly, or require a higher level of service than device suppliers typically afford small-volume customers. Many consumers today buy non-connected devices, such as thermostats or appliances, through retail channels; as the demand for connected alternatives grows, retail channels can play a growing role in the provision of connected home devices.

EVALUATE DIRECT TO CONSUMER EXPANSION

Distribution companies will typically develop a very specialized knowledge of the markets they are serving and the associated products they distribute. There is the potential for distributors to expand operations to offer products or systems directly to the consumer, for example by developing their own installation services, as opposed to selling into installation companies. The lines between some of these companies, such as retailers, installation companies and distributors, has already been blurred by companies pursuing forwards vertical integration, and the connected home space could be no different.

INVESTIGATE CONNECTED HOME SERVICE OPPORTUNITIES

As more connected home systems or devices start to be offered alongside recurring service contracts, this presents an opportunity for distribution companies to partner with such companies to promote these services alongside the devices they offer. As a result of the recurring service revenue tied to these contracts, service providers may be able to offer distributors hardware at prices where they can obtain a higher margin if they can sell through the on-going service program. Today, a number of service providers, including Alarm.com, AlertMe and others offer a full connected home service through distribution channels.

DEVELOP STRATEGIES TO COUNTERACT END-TO-END SYSTEM PROVISION FROM MAJOR SERVICE PROVIDERS

A growing range of connected home service providers are offering hardware (from basic to more extensive) directly to consumers, with the option to add on further devices following the initial system purchase. In many of these cases, the larger service providers have partnered directly with the device supplier to source these devices. This emerging business model could impact the role of the distributor, as consumers are purchasing hardware directly from a service provider, which will often have sufficient scale to contract with the device supplier directly. Distributors will need to continue to monitor

this trend, and develop plans to counteract this emerging model. This might include partnering with smaller service providers that cannot directly contract with the device supplier themselves, or offering differentiated services to become more attractive to the larger channel partners.

For full analysis of the challenges and opportunities facing distribution companies in the connected home market, please refer to section 3.2.

UTILITY COMPANIES

There are a number of ways utility companies can be active ecosystem players in the connected home market. These can range from residential load management systems to consumer-driven energy management programs, such as building awareness of electricity consumption through the use of smart plugs with energy measurement capabilities, or enabling whole-home electricity consumption to be displayed on smartphone or tablets by creating a consumer-accessible portal or app. Utility companies today don't typically offer this service directly. Using a compatible format, this data can be made available, with the customer's agreement, to partner companies (as is done in the ADT/SCE partnership). Other examples of initiatives developed to make energy data more readily available include Green Button, an industry-led initiative adopted by a growing number of utilities to offer electricity data in a common, easy to understand format that third-parties can leverage to offer consumers new solutions, such as apps or connected home system integration.

LEVERAGE THE POTENTIAL FOR ALTERNATIVE ELECTRICITY DATA NETWORKS

There are some challenges to using the smart meter as the central gateway for residential load management programs, such as device interoperability, lack of consumer confidence and 'home area network (HAN) gateway' activation challenges. Instead, many companies are interested in the creation of other electricity data networks, via IP-based networking, which takes advantage of existing broadband infrastructure in order to enable cloud-based integration of utility-driven systems and connected home platforms. IHS recommends that utility companies assess the role of broadband networks in the creation of electricity data systems to leverage potential partnership opportunities as connected home systems develop.

DEVELOP ENERGY MANAGEMENT 'ADD-ON' PARTNERSHIPS OR OFFER BRANDED SYSTEMS

In the North American market, energy management is often considered a secondary value proposition, following home monitoring or safety and security applications. However, energy management is increasingly viewed as an extension to the initial home monitoring packages, presenting an opportunity for utility companies to partner with existing connected home providers to offer energy management as an 'add-on'; for example through enabling electricity data to be available through the connected home system. By partnering with existing connected home providers, the utility does not have to develop their own cloud-based platform to enable this, instead relying on the partner's platform to provide the notifications, alerts and consumption information.

Utility companies may also have the opportunity to launch their own branded connected home systems, effectively competing with their counterparts offering security or telecommunications services, such as ADT or Comcast. This would allow utility companies to build on their pre-existing customer relationships, service contracts and associated customer contact. Systems could be developed to highlight the positive consequences of having a smart meter, to counteract the distrust displayed by some groups of consumers. In some cases, this distrust is caused by the perception that smart meters offer negative consequences, with no advantages to the consumer. The deployment of smart meters

has, in a number of cases, led to negative press. For example, in the Bakersfield incident, where PG&E was sued by a consumer over the deployment of smart meters in the area and the jump in bill costs since deployment. Utility companies could develop their own branded connected home systems that are perceived to have very real benefits to the consumer, such as reducing energy consumption or bills, to try to improve consumer attitudes. However, as this would require significant investment, this is a more viable opportunity for utility companies with major service territories.

DEVELOP ROBUST MONETIZATION MODELS

In situations where a utility company opts to create connected home services as an add-on to existing services, there is some uncertainty over how this can be monetized. Many utility companies today already offer free services which allow consumers to view their electricity consumption online. For areas which don't, at a basic level this can be enabled by other connected home suppliers by using add-on devices, such as meter clamps and readers. As energy management becomes an increasingly common add-on to existing connected home systems, utility companies will need to develop a clear value proposition which cannot be easily replicated by other connected home providers. Utility companies will need to assess what they can uniquely add to these systems – such as having access to pricing information and integrating this into the connected home system. The recent consumer survey from IHS highlighted that respondents with an interest in being able to view electricity data were consistently more interesting in having access to on-going electricity cost rather than consumption, both at a device and a whole-home level.

LEVERAGE CONNECTED DEVICES FOR RESIDENTIAL LOAD CONTROL

Utility companies can leverage the growing installed base of connected devices to integrate these devices into residential load control programs, through partnerships with associated device suppliers or connected home system providers. This is a key value proposition, as it can take advantage of existing devices and infrastructure. The advanced metering infrastructure (AMI) network or parallel cloud-based network on the utility side and connected devices already deployed in a residential home can be leveraged, in order to enable automated electricity savings during peak-load events, based on predefined customer preferences.

While demand response or residential load control can be a controversial topic, a previous consumer survey from IHS found that just over 50% of U.S. consumers would take part in demand response programs if their electricity prices were lower at certain times of the day. Just over 40% indicated that a flat rate rebate on electricity bills would be an incentive.

IHS expects that changing attitudes towards demand response programs will require a combination of clear education programs and robust consumer value or incentive programs. Building this functionality into a wider connected home service could be one means of making residential load control more customer-friendly.

For full analysis of the challenges and opportunities facing utility companies in the connected home market, please refer to section 3.2.

RETAILERS

Connected home retailers include those companies dedicated to supplying connected devices, physical retailers with established non-connected device product lines, such as Lowe's, Best Buy, Home Depot, as well as online retailers such as Amazon.

INCREASE AVAILABILITY OF CONNECTED VARIANTS OF STANDARD DEVICES AND EMBRACE NEW PRODUCT RANGES

As awareness of connected home systems continue to grow, and existing customers want to expand beyond basic 'starter kits', this can increase demand for emerging product categories (such as smart plugs or DIY home monitoring devices); stimulate demand for existing product categories (such as network cameras); increase the replacement rate of existing non-connected devices, such as thermostats, as consumers opt for connected alternatives. It also presents the opportunity to cross-sell other connected devices (where interoperable) and increase sales of high-tier devices, such as thermostats and appliances, as connectivity functionality typically permeates the higher cost device models first.

As well as pursuing standard advertisement channels, physical retailers have the opportunity to leverage their physical presence through in-store demonstrations to improve consumer awareness of what functions or use-cases connected home devices can enable. If companies can provide examples of how connected variants of legacy devices can change consumers' lifestyles for the better, it would be one of, if not the most influential driver for the success of connected home systems.

PROMOTE AWARENESS OF INTEROPERABILITY (OR LACK THEREOF)

Retailers, as the touch-point for the customer, have the opportunity to help consumers to manage expanding choices in the connected home market, by ensuring that customers are aware of which devices will or will not work with other devices or an existing system. For example, retailers could partner with service providers to promote certain devices as compatible with those systems. In addition to this, retailers could educate the consumer about which devices will be supported by certain systems or build awareness of the major technologies – such as ZigBee and Z-Wave – to promote better understanding of the technology itself, in the same way that consumers are now familiar with Wi-Fi or Bluetooth technology.

Retailers can either stock connected devices which use a single connectivity technology, or more commonly, devices using a range of different technologies. While this increases the choice for consumers, it also increases the number of SKUs which a retailer needs to carry. If retailers stock a wide range of connected devices which use a variety of communications technologies, they will need to avoid consumer dissatisfaction if consumers expect that two connected devices purchased at the same store should be interoperable.

IHS recommends that retailers consider the issue of system interoperability carefully when moving into the connected home market - as the customer-facing channel partner, the retailer may face the brunt of issues associated with consumers purchasing the wrong devices.

ASSESS THE POTENTIAL FOR THE PROVISION OF CONNECTED HOME SERVICES

Some retailers are moving into the service aspect of the connected home market, pursuing recurring revenue opportunities through service fees. This can offer a number of benefits, such as increased customer contact (e.g., through the online home management portal or app) and recurring service revenues. In addition, a retailer offering their own system can pre-test compatible devices which it stocks in its stores, and promote these for use with its own-brand system. As well as resolving issues surrounding interoperability (by highlighting compatible devices to consumers), it offers cross-sell opportunities of compatible devices, and improves customer loyalty as connected home owners will start to associate compatible devices with that particular retailer, and trust that they will be interoperable.

IHS recommends that retailers moving into the connected home market consider the development of branded connected home systems and services (as Lowe's has done with its Iris system). For companies that do not follow this model, there is the potential to instead partner with existing connected

home service providers which can then recommend the retail outlet as a place for the consumer to purchase the system's associated hardware.

EVALUATE THE IMPACT OF SERVICE PROVIDER 'STARTER-KITS' AND 'ADD-ONS'.

A range of existing service providers – from security providers to cable operators – are entering the connected home market. Typically such companies offer a range of hardware propositions (from basic to more extensive), with the option to add on further devices following the initial system purchase.

Arguably, the growing deployment of these systems can be both a driver and a barrier for retailers entering the connected home. Initially, the typical service provider model removes the retailer from the equation, with device OEMs offering devices directly through the service provider. Service providers typically monetize the connected home through recurring service charges; as such, they may be able to be more aggressive on hardware pricing than the retail market, as the hardware proposition is viewed as a key way of selling the whole service into the home.

However, as service providers drive growth in the installed base of connected home systems, retailers can benefit from consumers that wish to expand beyond relatively basic connected home 'starter-kits'. While there are still some issues surrounding interoperability to be resolved, there is the opportunity for retailers to sell connected devices which are not typically available as part of the basic hardware provided by service providers, in order to expand system functionality.

This also relates to the earlier recommendation from IHS that retailers work with the major service providers to offer a range of devices which are interoperable with the basic systems deployed by the service providers. These devices can be marked as compatible with certain system types, and the retail channel promoted by the service provider. The retailer can benefit from increased trade through the recommendation from the service provider, as well as reduced interoperability issues. In turn, a service provider benefits when a consumer adds further devices to their system, as it means the core service becomes more entrenched in their lives.

For full analysis of the challenges and opportunities facing retailers in the connected home market, please refer to section 3.2.

PLATFORM AND SOFTWARE PROVIDERS

Connected home platform providers do not typically provide hardware associated with the connected home system, instead working to enable the service element of the connected home, specifically relating to cloud-based home control or remote home management packages. They are typically B2B companies which partner with customer-facing system providers in order to enable the provision of a full connected home package. Examples of connected home platform providers active in North America include iControl, Arrayent, and AlertMe.

ENHANCE VALUE FOR BOTH END-USERS AND PARTNER COMPANIES

Platform providers have the flexibility to expand the platforms offered to existing and emerging connected home providers in a number of ways. For example, through application expansion, or through leveraging developing business goals of service providers, such as increasing up-sell, powering user interfaces designed to promote related products or services. As service provider requirements evolve, platform providers have the opportunity to enhance the value created for the service provider, developing effective business relationships and moving from a software vendor to a partner.

CULTIVATE EXPANDED PARTNERSHIP OPPORTUNITIES

As more companies move into the connected home market, there are growing opportunities for platform providers to form partnerships. As other company types start to enter the market – from retailers to existing service providers and device OEMs – many of these companies utilize third-party platform developers.

While some companies do develop their own platforms, or even chose to acquire platform providers (as was the case of AT&T, which acquired Xanboo), for many companies moving into the connected home, the investment and expertise required to develop proprietary platform solutions in-house makes partnership with external platform providers an attractive option. As such, the platform providers should leverage the opportunity for additional partnerships – from an increasingly wide range of companies - over the coming years.

CONSIDER MOVEMENT INTO ADJACENT SECTORS

Connected home platform providers can leverage the existing platforms and internal expertize to enter into adjacent markets. This could range from telehealth monitoring (creating a platform to enable device data to be shared remotely with institutional healthcare networks), to demand response (assisting utility companies in the deployment of residential load management programs, including dynamic pricing programs) or commercial building automation (leveraging building data and connected devices to ensure efficient business operation).

PARTNER WITH SERVICE DELIVERY PLATFORM PROVIDERS

Connected home platform providers can cultivate partnerships at both ends of the value chain. For example, connected home platform providers (such as Arrayent or iControl) can work with wider global service delivery platform (SDP) providers (such as IBM), which can provide an open platform upon which third-party connected home platform providers can base their software solutions, in order to create white-label solutions for their own business customers. Working with a common platform can potentially reduce future interoperability or fragmentation issues (should the industry work more collaboratively to promote interoperability at a platform level). IHS expects this opportunity to have a significant impact on the future of the connected home: as platform provision is the backbone of the connected ecosystem, an open platform delivery solution which can – potentially – enable the interoperability of multiple systems will be a step forwards in reducing interoperability and fragmentation concerns.

WORK TOWARDS THE CREATION OF A SEAMLESS USER INTERFACE

Today, companies such as Revolv are working to create a seamless user interface to leverage the growing installed base of connected devices. As more devices become connected, ranging from wireless audio systems to smart thermostats and smart appliances, there is the opportunity for the development of a software platform which can interconnect a range of devices from multiple suppliers, without specific agreements or partnerships being in place. Existing connected home platform providers are well-placed to work on the development of a platform which can enable seamless interoperability at a cloud-level, across multiple profiles, protocols and suppliers. This could help towards resolving the issue of a fragmented user experience (for example, as device suppliers launch their own apps or user interfaces, and a customer ends up with multiple connected home systems which cannot interact).

For full analysis of the challenges and opportunities facing platform and software providers in the connected home market, please refer to section 3.2.

3.2 ECOSYSTEM OF THE CONNECTED HOME

This section of the report presents an overview of some of the key company types involved in the connected home industry. It has been developed following a series of primary research industry interviews with companies across each category covered in this section of the report.

Company types included in this section are: existing service providers, such as telecommunications companies or security providers that then enter the connected home market; dedicated service providers that are solely involved in the provision of connected home services and have no existing customer base through other channels; utility companies; connected home specialists that specialize in the provision of connected home systems; device manufacturers; retailers; contractors and installers; and software/platform providers.

It must be noted, however, that while IHS believes that the following categories encompasses the majority of different providers in the market today, there are many companies which are active across more than one category. Alarm.com, for example, is one key company which has – over the years – blurred the lines between dedicated service provider and platform provider.

3.2.1 EXISTING SERVICE PROVIDERS

IHS defines existing service providers as those companies or organizations that have an existing customer base through offering a service other than connected home services, such as broadband, cable or security services. Examples of such companies which have now entered the connected home market in North America include ADT, Verizon and Comcast.

DEVICES AND SERVICES

Key devices offered by existing service provider include a wide range of devices, which can be broadly grouped as below:

Safety and security devices: motion sensors, magnetic contacts, garage door sensors, glass break sensors, smoke detectors, CO detectors, alarm detectors, water/flood detectors and shut-offs, network cameras and door locks.

Energy Management devices: smart thermostats, light switches and other lighting devices (such as connectivity-embedded bulbs), temperature sensors, electricity readers and displays (such as meter clamps and in-home display units), and smart plugs (including appliance modules).

Network devices and controllers: gateways, repeaters, adapters, control panels, key fobs or remotes and keypads.

As new connected variations of devices become available and price points decline, these systems are expected to evolve over the coming years to include connected-variants or more everyday household items, such as connected window blinds or dressings.

KEY VALUE PROPOSITION AND CORE CAPABILITIES

The key value proposition from existing service providers entering the connected home market is typically based around offering interactive home control services, from devices such as tablets or smartphones, at a relatively low cost compared with the traditional high-end, customized solutions that people associate with home automation.

In addition, in many cases, consumers will already have accounts set up with their connected home service providers for other subscriptions such as security or telecommunications. Opting for a connected home service from an existing service provider means they can 'add-on' to an existing contract, which can be more convenient than setting up a new service contract with a new dedicated connected home supplier.

In addition, existing service providers may already be considered trusted suppliers that consumers are already familiar with, which may consider them more attractive than dedicated connected home suppliers where the consumer is not familiar with the company, any terms and conditions, and the associated level of service or support. Given that a number of connected home products are based on the security application (such as security camera – which could effectively be remotely accessed by the provider – and door locks), trustworthiness is an important factor in providing connected home systems. Not only is this a critical advantage on the business relationship but also on the type of services being offered. Given that some connected home devices (such as cameras, locks, and alarm systems/sensors) are critical to the security of the home, it may help being a trusted source that consumers know are not doing anything nefarious like tapping into the camera feed or potentially getting hacked into, allowing for remote disarming of locks and alarm systems. However, it is interesting to note that the recent consumer survey from IHS (conducted as part of this study for CABA) found a significant proportion of respondents also considered dedicated connected home providers to be the preferable source of such systems, indicating that this level of familiarity is only considered to be a key value proposition for some consumers.

Systems are often modular, in that a 'starter pack' of devices are offered, which can then be expanded at a later date with add-on or extension packages or devices, which reduces the overall upfront cost of creating a connected home system.

Home security and remote home monitoring are considered to be high value propositions in North America, and the general consensus from existing service providers moving into the connected home market is that the initial value proposition needs to be based around home monitoring services, with other features – such as energy management – offered as a secondary extension.

This is in contrast to the approach seen in other parts of the world. For example, connected home systems in Europe are more typically based initially around energy management or HVAC control applications as the main value proposition, whereas in parts of Asia, systems are marketed based on comfort and convenience aspects.

As mentioned previously, home monitoring packages can include a wide range of device types. These range from the more basic standard packages, which include a range of relatively low-cost devices, such as motion sensors or magnetic contacts, to more comprehensive packages with higher cost devices such as network cameras and connected locks.

For examples of some of the packages offered by existing service providers, please see Appendix 3.

Existing service providers, such as security service providers or telecommunications companies, are considered well-placed to offer connected home services. In turn, for such companies it can offer a means of reducing customer churn (the rate at which subscribers leave a particular product or service provider for a competitor) and increasing average revenue per user. The majority of smart home offerings from existing service providers are offered in conjunction with other core business lines. For example, consumers selecting a connected home package from Verizon must either be an existing Verizon *FiOS* or *High Speed Internet* subscriber, or be willing to sign up before subscribing to the connected home service.

The emerging connected home services market is a major opportunity for any company with an existing subscriber base, and as such, IHS expects that within the coming years an increasing number

of existing service providers, such as telecommunications companies and security providers will enter this market.

The core capabilities generated in other lines of business are often directly applicable to the connected home market. For example, such companies already have strong backgrounds in services marketing, maintaining subscriber relationships, and user support or trouble-shooting. As a result of existing offerings, there is a prevailing trust from consumers that these existing providers are able to offer services without privacy invasion or security concerns; there is an established regulatory ecosystem for these companies' other business lines, and they are typically well regulated and monitored for privacy and security compliance.

For connected home service providers with multiple business lines, there is the opportunity to adjust the pricing and margin on a specific offering in order to gain market share and generate profit elsewhere. For example, a company offering both broadband and home control services might be able to offer home control services at a lower cost than competitors which only offer home control services, as the reduction in margin could be offset by an increased margin on broadband services.

It is interesting to note that the initiatives seen over the last few years are not the first attempts by some existing service providers to move into the connected home market. In 2000, Comcast, along with Cablevision Systems, Charter Communications, Rogers Communications, and Shaw Communications, invested in Security Broadband Corp. based in Austin, Texas. In 2002, Comcast and Cox agreed to begin "limited marketing" of Security Broadband's "SafeVillage" system. Cox also completed an alpha trial of Security Broadband's system in 2001 that involved about 100 homes. Security Broadband has since changed its focus to mobile healthcare products. Notably, this venture was before the deployment of smartphones, which are a key driver of the connected home market.

TARGET SEGMENTS

As existing service providers cater to a wide variety of demographics in their existing business lines, it is important for these companies to develop connected home solutions which also appeal to these segments. As highlighted previously, these systems are typically focused on consumers which are interested in home monitoring solutions – a key driver of connected home systems in North America. In general, Internet connectivity is a prerequisite to many of these systems, which are based around cloud-driven home control. Such systems aim to appeal to a range of consumer segments by offering tiered systems which have varying hardware packages (i.e., a starter-pack with add-on devices) and in some cases different service levels. For more information on the types of subscription services offered in the connected home, please see Section 3.3.

There are a broad range of system offerings from existing service providers, with the upfront price and ongoing service fees being a key differentiator.

At the less expensive side of the market, systems might include:

- Minimal installation costs or DIY systems
- Typically small product range included within the standard package (e.g., less than five devices)
- Low one-off fees (e.g., under $300)
- Lower monthly cost (e.g., under $20)
- A wide range of smaller, low-cost add-on bundles (e.g., including only a small number of additional devices, in a very modular fashion)

Verizon, for example, is offering a relatively low-cost connected home system, with low monthly subscription fee (base: $9.99) and relatively low installation fees (base: $129). The primary target segment of the Verizon system is expected to be either existing subscribers – as Verizon's system requires a Verizon Internet connection – or those looking to switch Internet providers.

These lower-cost systems can be used to appeal to target those who are interested in connected home systems, but could not afford or see the value in the high-end, high-cost alternatives which people often associate with the 'connected home'. In addition, they represent a relatively inexpensive means to sell a connected home system into a household, so that once the gateway and associated service is in place, customers may then be up-sold to various other packages by highlighting the use-cases enabled by each package. For example, AT&T (which follows more of a higher cost model) has already done this with its 'Pet Care', 'On the Go', and 'Protect the Family' bundles. One way to not only differentiate but also help with educating consumers about the connected home is to create bundles of kits depending on what they enable. For example, a "Utility Bill Saver" package that has thermostat control along with appliance and lighting control devices, or a "Teen Monitoring Kit" that has a smart lock that allows parents to get alerts when their child comes home from school along with a camera feed, or a "Baby Sitter Monitoring" package with locks and cameras.

One means of reducing the upfront cost of a connected home package is by offering a DIY system. Verizon, for example, offers a DIY package, requiring users to install the system themselves. Alternatively, they personally hire a professional installer (not Verizon-contracted) to complete the setup. In general, DIY systems can present some challenges as many users may not be confident in their ability to set these systems up themselves – not only from the perspective of installing the devices, but also in terms of connecting devices to the network. For companies pursuing the DIY route, care must be taken to ensure all devices are intuitive and easy to connect to a network, and that associated support and troubleshooting facilities are available. For more information on the DIY or professional installation topic, please see Section 3.3.

As mentioned, the upfront and associated costs of connected home systems from existing service providers vary, with some packages being more comprehensive than others. An example of a higher-cost, more far-reaching system type might include:

- Professional installation, priced either as an additional fee or included in the upfront system costs.
- Typically larger product range included within the standard package (e.g., more than five devices).
- Higher one-off upfront fee (e.g., from $300-$1000).
- Higher monthly subscription fee (e.g., from $20 - $100).
- A small number of add-on bundles which include a large number of devices in each, typically over $100, and in some cases with an additional monthly fee.

Typically, the higher fees are justified by either a higher functionality starter-pack or professional installation. For example, ADT's *Pulse* package starts with a monthly fee of $49.99, with a $399 one-off fee which includes professional installation from an ADT contractor.

The service provider examples highlighted above are based on information available in the public domain. Further examples of the pricing models and offerings from further existing connected home service providers active in North America are provided in Appendix 3.

PARTNERSHIPS

There are a broad range of partnership opportunities available to existing service providers. Existing service providers typically act as the 'face' of the system, leveraging the existing subscriber base and associated contracts, working with other companies to offer the hardware and associated services.

- Software and platform providers are key partners of connected home service providers, developing a connected home platform and associated user interface (typically branded by the service provider, rather than the platform provider). This is typically the more common approach, rather than an existing service provider developing these platforms internally. Alternatively, existing service providers can acquire platform developers (which include a range of relatively small organizations), as AT&T did with its acquisition of Xanboo.
- Rather than manufacture their own devices, existing service providers typically partner with existing device OEMs to create a hardware offering. In some cases, devices will be rebranded based on the service provider system, although often the devices are offered under the OEM's brand (such as Honeywell or Tyco). Service providers can partner with many device manufacturers to create a wide range of promoted devices which are compatible with the system. Equally, device manufacturers typically work with many service providers (as well as other channel partners). In some cases, in order to market devices to the service provider, the device manufacturer must first partner with the platform provider to ensure compatibility with specific reference designs for the system.

ROUTES TO MARKET AND DISTRIBUTION CHANNELS

All current existing service providers in North America that are currently promoting connected home systems are doing so directly to the consumer, without third-party intermediaries. This follows the traditional route-to-market for these companies, where the service provider interfaces directly with the consumer, which allows them to capitalize on their existing B2C marketing capabilities.

In terms of getting the systems into the consumers premises, in the case of DIY systems, these are shipped directly to the consumer to install themselves. For systems which require professional install, contracted installation companies will set these systems up for the consumer.

Many providers today have launched and maintained connected home services as an online exclusive, with connected home devices not available for sale in stores. However, some existing service providers – such as Verizon and AT&T – have their own branded stores. Such stores could represent a key sales channel for service providers moving forwards, as it offers the opportunity for consumers to see and experience connected home devices and systems before purchase, as well as to educate consumers about what is possible with a connected home via demonstrations and informed staff.

REVENUE AND PRICING MODELS

All major existing service providers, which offer connected home systems in North America, have opted for a monthly subscription-based model, rather than an exclusively upfront cost approach, to guarantee recurring revenue. For a basic package, monthly subscription fees range from $9.99 to $57.99 per month. However, the majority of systems also offer 'add-on' bundles or packages which can increase the monthly cost further by an average of $10 per package or service level.

As consumers are used to paying monthly subscription costs for existing services from these suppliers (such as media, entertainment, telephony or security services), the recurring revenue model is a viable option. Offering additional services to existing bundles can reduce consumer churn (the rate at

which subscribers leave an existing provider for a competitor) by making the supplier more 'sticky', i.e., creating more barriers to switching.

As highlighted previously in this section, the specific costs charged for connected home systems vary significantly by company. As would be expected, those which include professional installation fees typically have a higher upfront cost. For example, both AT&T and ADT include professional installation for first time buyers as mandatory (ranging from $149 - $999 for a standard package including hardware and installation).

Others, such as Comcast's *Xfinity Home* and Verizon's *Home Monitoring* solutions do provide installation options, but tend to integrate the remote monitoring costs and device costs into 'a la carte' device fees rather than offering installation as standard. Verizon, for example, offers a $9.99pcm plus $129.99 one-off fee for a standard kit. Add-on devices or bundles are not typically offered with professional installation included: the customer must either self-install or personally hire a professional to install the device.

Examples of some of the devices offered – and where available, the associated pricing - from existing service providers offering connected home systems are included in Appendix 3.

COST STRUCTURE

Existing service providers already have existing business lines and profit centers from which to invest in the deployment of connected home systems. As such, the development of connected home offerings, using in-house funding, has not led to a dependency on external funding or investors. Justification for investment in the development of connected home systems include the premise that the recurring revenue model can reduce consumer churn (the rate at which subscribers leave a particular product or service provider for a competitor) in the long run for multiple parts of the business (e.g., where the connected home subscription is contingent on the household being subscribed to another service, such as broadband or security systems). The investment should also increase average revenue per user, and also help to maintain a predictable stream of revenue into the business.

According to industry participants interviewed during the process of this report, the average length of time before return on the initial investment for existing service providers moving into connected home operations is expected to be three to four years after initial deployment. Initial upfront costs are often reduced through partnership with connected home platform providers, which can offer lower capital costs than developing this expertise in-house. However, it is very difficult to accurately assess the return on investment for existing service providers, as there is the ability to adjust costs and margins of connected home services in order to tie customers in to other services, such as broadband or security.

For more information on the recurring revenue business model and its application in the connected home industry, please refer to section 3.3

MAIN COMPETITORS

There are several groups of companies which may act as competitors to existing service providers moving into the connected home market:

- Other existing service providers are set to be key competition. As the majority of existing service providers moving into this market will be targeting similar consumer segments, in-segment competition will be a primary concern for existing service providers. Today, service providers have differentiated themselves based on the packages offered and the associated pricing. However, with commonality across many of the devices included (such as home

monitoring kits), and questions over the long-term validity of the recurring revenue pricing model (see section 3.3 for further analysis), existing service providers will need to also apply other means of differentiation, such as diversified service offerings or superior user interfaces.

- Dedicated service providers are also competing with existing service providers for customers. At the moment, dedicated providers are general synonymous with start-ups (although there are exceptions). However, as the market develops and consumer awareness of connected home systems grows, these start-up companies may have developed sufficiently to drive their systems into the mass market. However, existing service providers have the advantage of established brands, an existing subscriber base, and marketing reach that it is difficult for dedicated service providers to compete with.
- Device manufacturers are not yet a major competitor to service providers. Typically, service providers use device manufacturers as a source of hardware for connected home systems, acting as a channel partner; thus partnerships are mutually profitable. However, some device manufacturers may be planning to invest in the development of their own systems and services to offer alongside the hardware they produce today.
- Retailers are also starting to move into the connected home market, with some taking on a service provider role. Lowe's has been a fast mover in this capacity, although IHS expects that some other retailers intend to follow-suit, competing directly with service providers.

MAJOR OPPORTUNITIES FOR FUTURE EXPANSION

One of the major opportunities for future expansion within the connected home market is through the education of consumers. Many consumers are not aware of what is possible with a connected home system, or that they are available at affordable price points. The industry as a whole has the opportunity to increase awareness of the availability and functionality of connected home systems through targeted advertising and education campaigns, notably highlighting the potential use-cases to consumers, as opposed to being device-centric. Consumers are expected to respond more positively to use-case focused marketing (e.g., highlighting that connected home systems can enable consumers to receive alerts when their children return home from school, or view an intruder through a camera feed on their smartphone) than device-centric marketing (focusing on the enabling hardware, such as connected locks or network cameras), as the use-cases are more likely to resonate with a typical consumer, whereas device-centric messaging may only resonate with early adopters.

Today, many existing service providers regard connected home services as a means of growing average revenue per user and reducing customer churn (the rate at which subscribers leave a particular product or service provider for a competitor), focusing initially on their existing customer base. Once the penetration rate of connected home services into the existing subscriber base becomes more saturated, service providers can either accept the ongoing monthly revenues being obtained from the connected home subscribers (e.g., while trying to focus on gaining cost efficiencies or upselling them from basic packages) or try to grow revenues further. This could be done through two main channels – increasing average revenue per existing connected home user further, or increase the number of subscribers outside of their existing customer base. These channels are further explored in the following sections.

INCREASING AVERAGE REVENUE PER EXISTING USER

As the supplier base of connected home services grows, this will assert an inevitable price pressure on connected home services without a unique value proposition. In order to increase the average revenues from existing users, service providers can start to offer further add-on packs with new, exciting

or otherwise valuable functionality. Examples could range anywhere from enabling voice control functionality to independent living applications or personal emergency response systems (PERS).

A range of existing providers, notably security providers, have already entered the PERS market to leverage common capabilities developed in their core business activities. These systems are currently considered to be a 'value-add' product to current security and home monitoring systems.

Connected home systems can also be adjusted to function as independent living systems, which are notable in that much of the hardware required is similar to that used in home monitoring systems for today, albeit used in a different way. For example, motion sensors can be used to detect if a person hasn't gone about their usual routine; e.g., going into the kitchen or bathroom by a certain time. Magnetic contacts can be used on medicine cabinets to detect if a user has accessed their pills.

These systems can be targeted at older generations, who may purchase the system in order to maintain an independent lifestyle, as well as younger generations who want to implement such a system for elderly relatives or dependents.

PERS or independent living systems are only one example of how connected home systems could evolve in the future to generate higher average revenue per user. The crux of expanding these systems is to determine which specific needs or demands can be resolved by connected home systems in the future.

INCREASING CONNECTED HOME USERS BEYOND THE SUBSCRIBER BASE

Increasing connected home users beyond an existing service provider's subscriber base could be done by creating new connected home customers; i.e., converting non-users to users, or by poaching existing users from competitors.

The ability of companies to create new connected home customers will be based on its ability to create – and effectively market – a unique value proposition at an attractive price point. This is a challenge that many existing service providers will be familiar with today, for example how to persuade people to upgrade to cable TV over freeview options, or to install a new security system where previously a household did not have one. As highlighted previously, marketing unique value propositions that focus on solving or easing day to day scenarios are expected to be more compelling than device-focused messaging.

An alternative strategy is to win existing connected home users from other service providers. This approach would inherently be a challenge due to contractual issues, and system compatibility issues, and the fact that such systems are designed by service providers as a means to reduce customer churn (the rate at which subscribers leave a particular product or service provider for a competitor), deliberately implementing barriers to switching. Contractual issues are inherent to the service provision market: many existing services are provided on a fixed-term basis, with both subscription and early exit fees associated with them. Existing service providers that enter the smart home market are expected to follow this traditional business model. For this reason, the likelihood of a consumer switching media provider in the middle of a fixed period contract is low.

Where switching does occur, system compatibility can be an issue. Existing service providers are allied with different technologies, device suppliers and platform providers. This could make it very difficult for a consumer to easily transition from one provider to another. In these cases, further business case analyses would need to be undertaken in order to assess if it might be worth it for the new provider to take a loss on upfront device sales or service fees in order to facilitate and entice customer switches into their own locked in contracts.

This presents an opportunity for service providers which are able to create seamless ways for users of competing systems to transfer to their own services. For example, this could be facilitated

by offering complimentary gateways to improve system interoperability, or resolving interoperability challenges at a cloud level, as more end-nodes move towards featuring direct IP addressability.

For further opportunities associated with recurring revenue models – which are inherent to the services offered by existing service providers today – please refer to section 3.3.

LEVERAGING CONNECTED HOME DATA

The connected home platform is at the center of much of the data generated by activities in the connected home. Service providers could form agreements with platform providers to find a way to leverage this data. Please refer to section 3.3 for further analysis of the connected home data opportunity.

MAJOR CHALLENGES TO FUTURE EXPANSION

As highlighted previously, once an existing service provider's subscriber base becomes saturated with connected home services, the company must continue to innovate by developing new services or pricing models in order to appeal to existing users of other systems, or create new users by targeting those that do not currently have a connected home system.

While both of these approaches have their own challenges, a more pressing concern for those pursuing a business model which includes monetizing the service aspect of a connected home is whether this model is sustainable as other companies enter the market. The connected home hardware itself is sometimes considered as a loss leader for service providers – with low or negative margin accepted based on the creation of an ongoing revenue stream from the associated services.

LONGEVITY OF SUBSCRIPTION MODEL

The subscription model has proved its long-term viability in a number of markets, such as the cell phone market. Best practices from these markets and the associated contracts and subscriber management techniques could be evaluated to see if they can be successfully emulated in the connected home market.

For existing service providers, the monetization of connected home systems is dependent – by using the recurring revenue model – on the predictable and secure monthly revenue generation from services associated with the hardware. As the hardware may be a loss leader, success of these companies in the connected home market can rely on the cooperation of the consumer to pay continuous monthly costs for the service. For this reason, many industry participants are skeptical of the longevity of this model, particularly as more companies are expected to enter this market without requiring ongoing fees or contractual obligations.

Some consumers may be more comfortable with higher upfront hardware fees, but an ongoing complimentary service aspect. Others involved in the ecosystem, such as device suppliers, may capitalize on this segment of the market by offering ongoing remote home services, such as remote control, all included within the cost of the device. This strategy is already employed today by companies such as Nest. If more companies start to offer complimentary services associated with the purchase of connected devices, there is the risk that this could create a consumer expectation that they should not need to pay additional or ongoing fees for connected home systems. Service providers which charge an ongoing fee for these services will need to be aware of the complimentary services offered within the market and ensure that there is a clear value proposition which justifies the ongoing charges compared with what is available on the market with no recurring fees.

LIMITED HARDWARE AVAILABILITY

A further challenge facing existing service providers today is that often the range of hardware they

offer (in conjunction with partner device OEMs) is often smaller than that which is available through retail channels or specialist connected home providers. This will become an increasing challenge as consumers want to add further devices to their systems, and may lead users to become less satisfied with the service provider if they could otherwise have purchased these devices elsewhere, were they not tied into a contact for a non-interoperable system. This will be worsened if the device suppliers themselves offer a complimentary service included in the device cost, as the user will feel they are tied in to an unjust ongoing subscription, which doesn't include all the functionality they could obtain elsewhere.

Should the connected home market develop is such a way that consumers are unwilling to pay ongoing fees for related services, existing service providers will need to effectively model whether the gains from reduced customer churn (the rate at which subscribers leave a particular product or service provider for a competitor) are able to support the costs of providing connected home services that may not be able to be directly monetized.

For further challenges associated with recurring revenue models – which are inherent to the services offered by existing service providers today – please refer to section 3.3.

3.2.2 DEDICATED SERVICE PROVIDERS

IHS defines a dedicated service provider as a company which offers connected home systems and services, but does not have a pre-existing customer base from other business lines outside of the connected home. Examples include Alarm.com, Vivint, and Revolv. For example, Alarm.com, which offers only connected home devices and services is considered to be a dedicated service provider; whereas Verizon, which offers both connected home and telecommunications services, is considered to be an 'existing' service provider (which is covered in section 2.1 of this report). While not synonymous, many dedicated service providers are 'start-ups'.

Connected home start-ups have been appearing in the industry for many years. As the connected home premise becomes more proven, it may be easier for such start-ups to attract funding. In some cases, start-up companies have proven to be the source of incredibly innovative ideas. In some ways this presents an opportunity for current incumbents in the connected home (e.g., through imitation or acquisition opportunities); however, equally such companies need to be monitored for the creation of a truly game-changing development.

IHS makes the distinction between dedicated service providers and connected home specialists. Dedicated service providers are those who primarily specialize in the back-end network or related services (typically related with remote home control or enabling interactive system access via a smartphone or tablet), often partnering with device companies in order to provide a complete solution. Connected home specialists are those that offer predominantly whole-home solutions, including their own hardware, software, and additional services. Examples include companies such as Crestron, Lutron or AMX. This section focuses specifically on dedicated service providers; for analysis of connected home specialists, please refer to section 3.2.3.

DEVICES AND SERVICES

Specialist connected home service providers typically either partner with device suppliers to offer a pre-qualified range of devices, or offer the service aspect alone, and enable consumers to independently purchase their own devices. As a result, the range of devices used with such systems can vary widely.

Today, devices offered through dedicated service providers span multiple application areas, and include: smart thermostats, electricity readers and displays, smart plugs, lighting controls, network

cameras, motion sensors, magnetic contacts, control panels or displays, and the associated networking devices (such as gateways, adapters and range extenders). Please note that due to the wide range of devices offered, this is not an exhaustive list.

In addition, some dedicated service providers offer the service alone, and can enable the consumer to purchase their own devices. For example, Revolv, which is a software and networking platform developed to take advantage of existing connected devices available to the consumer. Today, Revolv can facilitate the inclusion of certain devices from Insteon, GE, Leviton, Trane, Sonos, Yale, Kwikset, Philips and Belkin within its system, although it does not act as a reseller for these devices.

KEY VALUE PROPOSITION AND CORE CAPABILITIES

Unlike existing service providers, dedicated service providers offer customers a means of creating a connected home system without having to be subscribers of other services. For example, existing service providers often make subscription to other offerings, such as broadband, cable or security packages, a prerequisite to the connected home service. In contrast, any consumer can purchase a connected home service from a dedicated service provider.

Some dedicated service providers offer a lower cost alternative to those from existing service providers entering this market, particularly because of the lack of prerequisites. Some dedicated service providers also offer lower contractual obligations and fewer 'minimum-term' clauses compared with the alternatives seen by existing service providers.

Where systems are designed to incorporate a wide range of connected devices which the consumer can purchase themselves, this allows the consumer to create their own modular, custom system of compatible devices, rather than purchasing required 'starter-packs' or pre-defined add-ons, which may include devices or applications not relevant to them. For example, many existing service providers moving into the connected home offer packages to cover applications such as home monitoring or energy management, but other applications – such as media control – are less widely available. This will become increasingly valuable as a wider range of connected devices become available, and consumers want to integrate more into their systems.

In addition, systems from dedicated service providers do not typically mandate professional installation, which for some consumer segments may be a key value proposition. Instead, in many cases, consumers are left to decide for themselves whether they want to obtain only DIY devices, or if they want devices that may be harder to install (such as a smart thermostat), they can obtain their own contractor (or the help of a friend or relative) to have this installed.

As dedicated connected home service providers are focused specifically on the provision of these services, they typically have more experience in this market and the associated internal expertise, compared with existing service providers that are starting to develop connected home services as an 'add-on'. This is an important capability for dedicated providers in competition with existing service providers: where traditional media suppliers (telecoms, MSOs, etc.) may not have expertise in the industry, dedicated providers can leverage existing market experience and knowledge.

In addition to this, core capabilities of dedicated companies can vary based on the company type and the services that they provide. For example, some dedicated service providers have started with a relatively narrow focus on specific applications (such as Nest and EcoBee in the energy management space, or Alarm.com in the home monitoring market), building up dedicated application-specific expertise before expanding to other features.

TARGET SEGMENTS

From an application standpoint, dedicated service providers have either opted to focus on a specific

application or the more wide-reaching connected home premise as a whole, combining multiple application areas. However, even where dedicated service providers have started as having a specific application focus, often these have expanded to cover a wider reach. For example, Alarm.com now offers support for a range of devices related to energy management, such as lighting and appliance control, smart thermostats and meter clamps, and Nest has recently announced an alarm detector.

Dedicated service providers that provide the services alone, without promoting a range of devices, seek to be compatible with devices from a wide range of suppliers and are effectively application-agnostic. In some cases, these companies aim to target consumers who already have a range of connected devices in their homes today, but that are not being used as part of a wider system.

PARTNERSHIPS

Dedicated device suppliers can partner with a range of different companies. In contrast to the existing service providers, dedicated service providers often develop their own connected home software platforms, rather than partnering with platform providers.

- Dedicated service providers can either work with hardware manufacturers to offer a range of compatible devices, or in some cases offer their own range of devices. Some, such as Alarm.com, do a mixture of both. Often, the dedicated service provider will offer a gateway (and the associated service), and the end-user can select their own packages or add-on devices. In some cases, dedicated providers will not work directly with the hardware provider, but will 'recommend' which devices a consumer can purchase, making sure these devices can be incorporated into the system. This might not be a 'partnership' (as the hardware OEM may not be involved in this process) but the dedicated provider's system will be compatible with specific devices, and therefore – in a sense – an unwritten partnership does exist.
- Service providers, device suppliers, and platform providers can, to some extent, control the 'openness' of their devices through the use of standardized technologies and opening up APIs to others in the industry. For example, at the CEDIA Expo in September 2013, Control4 demoed Nest thermostats integrated with Control4 lights, motorized shades and other devices. Nest has opened its closed software to partner with Control4 to integrate its solution via an open platform. Should this occur more widely, as some industry experts believe is the case, this could be a positive trend for the connected home industry.
- Many connected home service providers are still working to establish strategy roadmaps and future partnership opportunities. IHS expects that future opportunities include device manufacturers, retailers, distributors, integrators and installers.

ROUTES TO MARKET AND DISTRIBUTION CHANNELS

Compared with existing service providers, which typically retain a simple 'direct-to-consumer' route-to-market, dedicated service providers use a wider variety of channels. Many (though not all) dedicated service providers are relatively small or new businesses without an existing customer base, and as such they need to determine the most viable – and accessible – routes to market.

Some dedicated service providers in North America offer their systems directly to the consumer. Typically, this is online via their own Web sites, with very little retail store activity. However, as volumes and awareness starts to grow, some of these systems may become more widely available through other channels, such as major online retailers or department stores. For some dedicated service providers, the wider distribution of their systems through existing third-party retailers is a key strategy for expansion.

However, many dedicated service providers in North America are focused on distributing products and the associated systems through dealers, contractors or installation companies. This can enable a wider, yet more targeted, geographic reach, as typically the dedicated service providers will partner with various contractors or dealers in specific geographic locations. In addition, it allows the dedicated service provider – which might have relatively low brand awareness – to gain credibility through the use of well-received distributors. In some cases, the use of these third-party channels can remove the customer from the reach of the original supplier; however, in this case, where the service provider has some form of ongoing interaction (such as by offering a remote home management portal or app), this is less of a concern in this case, and still enables the service provider with opportunities to cross-sell or up-sell to the consumer, and create an ongoing relationship.

REVENUE AND PRICING MODELS

Revenue and pricing models vary widely between dedicated service providers.

Generally, dedicated service providers are less likely to approach customers directly with monthly fees. Partly, this is because consumers may be reluctant to agree to yet another ongoing monthly financial commitment, particularly with a company they do not know well. More commonly, dedicated service providers may:

- Generate a monthly fee by using a partner distributor company, such as a contractor, to sell the service into customers.
- Offer a tiered service, where some services are offered for free. Once consumers have started to use these services, they have the option to upgrade to a paid service which offers advanced functionality.
- Include the price of the ongoing service as an initial upfront fee. For example, Revolv includes a gateway, app and lifetime subscription in an upfront fee of $299.

However, as these companies build brand awareness and trust, some movement towards the recurring revenue model is expected in the future. Both the upfront and the recurring payment models are analyzed in more detail in Section 3.3

COST STRUCTURE

Unlike with existing service providers, which have other revenue streams from which to generate investment funds, dedicated service providers are exclusively engaged in the connected home market.

Many dedicated service providers are small, start-up companies, which have created a premise around the connected home, and have sought external investment which, ideally, will be used to fund the development of the system and associated services, and then allow a successful exit by investors once the service becomes a standalone success or is acquired. Needless to say, this is not always how these ventures end.

The funding for start-up companies is often dependent on external investment, and the exit strategies associated with the investment can impact when sufficient revenue is generated to be re-invested in the business. There are a number of different avenues for dedicated service providers to obtain funds for investment:

- Banks and building societies are most commonly used to fund new SMEs. In the connected home environment, these might include, for example, app developers: small loans up to ~$2m can be taken from these sources and repaid once the business is reaping sufficient profit.

- External private investors are most commonly used for businesses with realistic expectations of a good return on investment, particularly within high fixed cost ventures where a bank loan would not suffice. External investment can range from a small investment – such as $50,000 – to hundreds of millions, depending on the investment potential. However, one of the key disadvantages of using external investment is that the money is specifically designated to certain areas of the business, and this may lead to less flexibility for the individuals behind the concept, as in many cases the investor needs visibility – and to approve – where and how the money is being spent, and it is harder to deviate from the original business plan. In addition to this, investor exit strategies can vary significantly, and it can be frustrating if initial revenues cannot be reinvested into the business.
- Re-investment from previous projects or personal funds can also be a booster for connected home start-ups. While in some cases this can be sufficient for smaller projects, such as app development if the technical expertise already lies within the company, personal funding is often used in conjunction with bank loans or external investment in order to guarantee a larger initial project investment. One key barrier to using personal funds, however, is that the ROI for banks or other external sources must be prioritized ahead of personal ROI.

MAIN COMPETITORS

Dedicated service providers – particularly those which also offer devices or supply systems with devices from other companies – effectively compete with existing service providers, such as Verizon, Comcast, AT&T, Rogers, Cox and ADT, that are deploying connected home systems to their own customer bases. As a result of the relatively similar offering, dedicated service providers often compete with similar companies to existing service providers moving into this market. For more information, please see the 'main competitors' section in 3.2.1 of this report.

In these cases, the offerings can often look the same, with a range of device types available across multiple application areas. There are advantages and disadvantages with each type of service provider. In the case of dedicated service providers, customer awareness or recognition is low and, without a strong distributor strategy, their reach is inhibited; in contract, existing service providers are well known to consumers, and their marketing prowess is extensive. However, they are more likely to require ongoing monthly subscriptions for the associated connected home services; whereas for dedicated service providers, this is more likely to be built into an upfront cost. Both company types are felt to have a place in the market, and it will be interesting to assess how consumers react to the different business models, each of which have their own inherent advantages and disadvantages. For more information, please refer to section 3.3.

In addition, device suppliers expanding into service provision may pose a significant threat to dedicated providers in future. As many dedicated providers partner with specific device suppliers in order to offer 'recommended' hardware to their customers without having to invest in in-house R&D or hardware provision themselves, the fact that some device suppliers are planning to move across to service provision could result in channel confliction to some extent.

MAJOR OPPORTUNITIES FOR FUTURE EXPANSION

There are a number of opportunities facing dedicated service providers as the connected home market develops.

CONSUMER EDUCATION VIA OTHER CHANNELS

As more existing service providers deploy connected home marketing programs, this actually represents an opportunity for dedicated connected home service providers, as it creates a wider base of consumers aware of, and interested in, these systems. With dedicated connected home providers typically offering services with lower or, in some cases, non-existent recurring subscription fees, this presents an opportunity for such companies to satisfy consumers who are interested in having a connected home, but unwilling to make a major investment in setting up and maintaining the system. This is expected to become increasingly evident as more relatively low-cost, easy-to-install, connected devices become available. The potential downside to pursuing the one-off cost approach is that there is no stable revenue generation, requiring continuous device and product innovation to continuously attract new customers. This is not inherently a disadvantage for a company that is able to set design cycles or have exceptional customer service and support. If not, however, this business model may be easily commoditized.

PARTNERSHIPS WITH MAJOR SERVICE PROVIDERS

Alternatively, rather than go it alone, there is the opportunity for specialist service providers to partner with existing service providers to take advantage of their existing subscriber bases. While many of the Tier I service providers in North America are already offering or developing connected home systems (often in conjunction with platform providers and device OEMs), there are a large number of tier II and tier III providers that may also be interested in entering the market, but unable to invest the capital necessary to create their own solutions. This could present an area of opportunity for dedicated service providers. By partnering with tier II and III service providers, dedicated connected home service providers could utilize their expertise to white label a solution for existing service providers, offering the existing service provider a rapid time to market for branded connected home solutions at relatively low capital costs, and offering the dedicated connected home supplier an existing subscriber base and the associated brand recognition from which to monetize their services.

Dedicated service providers which offer their own devices (such as Nest) could even partner with existing service providers who have moved into this market to allow this existing device range to be part of existing systems. This approach may be best suited to dedicated service providers with a differentiated hardware offering that are not aiming to monetize this market with ongoing service revenues.

DIFFERENTIATION THROUGH A-LA-CARTE SYSTEM PACKAGES

Systems provided by dedicated service providers can be more rigid in terms of which devices are offered as part of the system, with pre-defined starter packs and extension packs. There is the opportunity for specialist service providers to develop more inclusive systems which will allow a wide range of devices to be added to the system, for example by offering multi-connectivity gateways.

For further opportunities associated with the upfront and recurring revenue models demonstrated by dedicated service providers, please review section 3.3.

LEVERAGING CONNECTED HOME DATA

The connected home platform is at the center of much of the data generated by activities in the connected home. Service providers could form agreements with platform providers to find a way to leverage this data. Please refer to section 3.3 for further analysis of the connected home data opportunity.

MAJOR CHALLENGES TO FUTURE EXPANSION

Equally, there are a number of challenges facing platform providers in the connected home.

EXISTING SERVICE PROVIDERS DRIVING DOWN COSTS OF CONNECTED SYSTEMS

Today, dedicated service providers typically have lower recurring fees than those of existing service providers that are entering the market. As more existing service providers, such as telecommunications companies and security providers, enter the connected home market, this will inevitably start to drive down the costs of basic service packages from such suppliers, which will also start to squeeze the pricing of dedicated service providers. While existing service providers can, to some extent, cope with lower margins from connected home services provided there are benefits in other business lines (e.g., lower customer churn for other services such as broadband). This is not the case with dedicated service providers. With no other business lines to support a declining margin, dedicated service providers will need to innovate and create unique value propositions and pricing models in order to avoid entering a price war.

THREAT FROM DEVICE SUPPLIERS AND OEMS

Many dedicated service providers do not produce their own devices, instead partnering with device OEMs to create an integrated hardware and service offering. In the future, there is the risk that more device OEMs may start to also develop their own service platforms to offer in conjunction with their devices.

In addition, some dedicated service providers do not partner with device suppliers and instead opt to create systems which allow the consumer to select their own devices, generally from a short-list of supported devices. As the range of connected devices grows, consumers will need to be educated to understand which devices are or aren't compatible. If this is not carefully managed, it can create dissatisfied customers, who either can't connect devices they have purchased, or want to purchase devices which are not available with a specific supported technology.

Device suppliers moving over towards associated platform provision may also pose a significant threat to the supply chain for dedicated providers. Traditionally dedicated providers would partner with device suppliers in order to offer hardware for a system, instead of having to develop in-house device design or manufacturing capabilities (or outsource this step). Now, if device suppliers move over to the service provision side as well, channel confliction may occur.

For further challenges associated with the upfront and recurring revenue models demonstrated by dedicated service providers, please review section 3.3.

3.2.3 SPECIALIST HOME AUTOMATION PROVIDERS

IHS defines specialist home automation providers as those companies exclusively offering connected home devices or systems aimed at multiple applications, ranging from lighting control to A/V distribution. These specialists often provide whole-home, relatively high cost systems. Examples of those active in North America include Crestron, AMX, and VIA International. In some cases, these companies also provide their own supporting services, for example to enable remote home control and cloud-based home management.

DEVICES & SERVICES OFFERED

The devices offered from specialist providers, which are typically aimed at the high-end of the market, can be more varied than those offered under mainstream systems. There is less focus on DIY devices, and more focus on highly customized solutions spanning multiple applications across the whole home.

While there is some commonality – for example in devices such as motion sensors or thermostats, these are typically higher-end variants with increased functionality and wider interoperability with other parts of the system due to the larger range of connected devices. For example, a connected

thermostat in a mass market system might just be connected to HVAC devices and enable some scenario setting such as adjusting the temperature when the system is in 'away' mode, as well as offering remote control functionality. In contrast, a thermostat used in a high-end home automation system might offer all these features but also allow more advanced scenario creation to take into account the other devices in the system, such as automated blind or shade control.

In addition to the 'standard' devices found in other connected home systems, additional devices can also be modified or integrated into high-end home control segments. For example, higher cost, customized devices. These can range from integrated lighting controls and dimmers (as opposed to the retrofit lighting modules seen in mass market systems today), A/V control and distribution devices, motorized shades and shutters, and high-end, high-functionality (often touch-screen) control panels. The range of devices offered in these systems is extensive, and specialist solutions can also be created to satisfy individual client needs.

While such systems are similar to the expensive systems often associated with home automation, increasingly services such as cloud-based home management features are being offered by these companies as the market evolves.

KEY VALUE PROPOSITION AND CORE CAPABILITIES

Typically, specialist home automation providers target a very different segment to existing or dedicated service providers, which are aimed at making connected home services available to the mass market, often in order to generate associated recurring service revenues. Existing and dedicated connected home service providers typically offer more accessible price points with less room for device customization. In contrast, specialist connected home providers instead often target high net-worth individuals with extensive, high-cost systems which are highly customizable to their specific requests. From this targeting stems the key value proposition that specialist providers offer. While existing service providers do offer a certain level of customization, such as supporting additional devices or 'add-on' bundles, these are typically limited to the most commonly required devices, whereas connected home specialists typically offer a fully customizable system designed from specific end-user requirements.

At the high-end of the market, home automation specialists, either directly or through partner companies such as architects or contracted installation companies, will typically be involved in the deployment of the system from start to finish, from initial client briefing to system design and installation.

A key differentiator – alongside the level of functionality and degree of customization – between specialist home automation providers and the connected home services offered to the mass market, is the ongoing level of support service associated with the high-end, whole-home projects.

The core capability for a specialist home automation provider is – undoubtedly – the ability to customize the system to the consumer's wishes around both system functionality and finish. While mass market systems can be customizable to an extent (for example door locks in several different finishes can be bought from Lowe's), specialist home automation providers are able to effectively customize the system to suit the home, the architects plans and the homeowner's expectations.

TARGET SEGMENTS

Specialist home automation providers typically aim solutions at the high-income households with high disposable income. Within this, systems can vary depending on whether they will be used in new-build premises or in luxury premises retrofit projects. Creston, for example, have created a range of 'pre-construction' and 'post-construction' options to target these two separate markets.

Where home automation providers are installing a system during a new-build project, this can reduce issues associated with retrofitting an existing occupied house. As well as avoiding inconveniencing the consumer if a premise is already occupied during construction, it can be easier to install the system while the dwelling is still in the construction phase. For example, cabling can be run within walls or under flooring, and installed before the internal structure is complete. In some cases, the system will be purchased directly by consumers: for example, if people have decided to commission a new house to be built for them on a new or pre-existing plot of land. In other cases, it will be commissioned by real estate developers aiming at developing a premise which appeals to high net-worth individuals and for which they can obtain a significant margin. In these cases, high-end home automation systems can be seen as a value-adding feature.

High-end home automation systems often comprise whole-home systems, with devices ranging from lower cost items such as thermostats or motion sensors to higher cost items such as A/V systems or awnings. Complete integration of these devices to form a whole-home system does require a significant home renovation project, particularly where wired solutions are being used. For this reason, high-end specialist home automation providers target the luxury segment of the retrofit market, consisting of those with the disposable income required to pay for such a project. While costs can be decreased in some circumstances by using wireless alternatives in retrofit projects, the large number of devices involved in whole-home systems, the level of customization and the associated installation fees are prohibitive to the mass market.

PARTNERSHIPS

Specialists home automation providers partner with a number of different company types, typically targeting the luxury high-end segment. Device suppliers can be a key partner. While many specialist home automation providers offer their own line of products, there are some products which are too specialized to develop themselves. For example, many high-end companies partner with cinematic or A/V control companies (such as IMAX) in order to offer surround sound, multi-room audio control or large screen televisions in order to work these devices into the system.

Specialist home automation providers will also work with contractors and architects on various projects, depending on the scale and the internal expertize of the specific company.

ROUTES TO MARKET AND DISTRIBUTION CHANNELS

Specialist home automation providers go to market via a range of different channels, including via partnerships with construction companies, architects, dealers or distribution companies. This can vary depending on whether they are targeting the new-build or retro-fit segments. To target the new-build luxury segment, specialist smart home companies will partner with construction companies and other organizations as building plans are being developed. Alternatively, specialist home automation providers can partner with architects to provide a whole-home luxury system for very high net-worth individuals. In these circumstances, the specialist home automation company deals directly with the consumer, and enters into discussions with architects and construction workers and other various entities involved in the build of a new house or the remodeling of an existing house.

In some circumstances – for example in the project development of multi-dwelling units, connected home specialists will not work directly with a consumer, but will instead work with a project development team, as well as have discussions with the contractors and architects involved in the project.

In addition, many high-end home automation providers also sell through distributors, dealers, or in some cases, directly to the consumer.

REVENUE AND PRICING MODEL

The value proposition behind whole-home systems from high-end specialist providers is the wide range of devices available and the level of system customization, installation and support. Within the luxury home segment, pricing for high-end home automation projects are can be designed in a number of ways, including on a price-per-square-foot basis, or creating a breakdown of pricing based on hardware charges, project length and system complexity. As a result, project costs vary widely, and the below information is provided as a broad guide only.

High-end specialist home automation providers can offer full turn-key solutions with custom design, engineering, implementation, training, and on-going aftercare support. A luxury homeowner approaches a residence project as much more of a fluid "design-build" engagement, where changes are made from original plans as the project evolves. These changes must be managed during the course of the project with a series of mid-project scoping, engineering and design, and modified implementation processes, which inevitably consume more professional service resources. For a whole-home, high-end system to be retrofitted into an existing home, total project fees can range from $100,000 and above, with an average estimated at roughly $10-$50 per square foot within the premises. From a revenue perspective, retrofit and new construction projects are comparable in cost if the scope is comparable. One requires wiring while the other requires the addition of wireless solutions which although easier to fit in existing properties, can be more expensive than hard-wired solutions from a hardware perspective. At the very high-end of the market, projects are priced in the $150,000 to $450,000 range and are typically sold in conjunction with channel partners such as architects, designers, and custom home builders.

Multi-dwelling unit (MDU) property development system installation can generate lower profit margins than in the single residence segment. Property development projects for MDUs are generally longer, with fewer devices per end residence and lower system complexity than in custom-built homes. In addition, developers can use the volume of units required for the same device to leverage lower overall devices costs. Unless this same cost efficiency is being achieved in the manufacturing process, this can eat into margins.

Specialist home installation projects can be lengthy, often ranging from three to nine months with a typical spend of $150,000 - $450,000. However, this spend can increase with increased length of build and system complexity. As a result of the high cost and project length, the customer is typically required to submit a large deposit before the implementation of the project. This typically ranges from 20%-50% of the total cost, submitted to the specialist provider.

COST STRUCTURE

High-end home automation providers have been around for decades, with many starting up in the early 2000s when connected home technology was perceived to be developing rapidly. While the majority focused on wired solutions, many have moved into wireless connected home solutions. Because many firms were set up in the 2000s or earlier, many are already very well established in the home automation market today.

High-end specialist companies have typically been funded as a result of re-investment from other ventures, or by external private funding, which has been a large source of investment for many companies in the market. While many were originally set up primarily under internal funding and small external loans, the rapid transformation of technology over the last decade has resulted in a rapid expansion of technological requirements, knowledge, expertise and reference design knowledge; for this reason, many required additional external investment part way through secondary and tertiary phases of the business development.

As a result, high-end home automation specialists are typically set up as a result of a combination of internal re-investment from other projects and external loans, with constant re-investment of capital and additional external investments over the secondary and tertiary phases. In addition, some specialist home automation companies, such as Control4, have now gone public.

MAIN COMPETITORS

Specialist home automation providers have a unique place in the market: as specialist providers specifically target the luxury segment, IHS does not expect any other company types to become competitive in this environment. As such, the only competitors considered for smart home specialists are other high-end home automation providers.

MAJOR OPPORTUNITIES FOR FUTURE EXPANSION

There are a number of opportunities facing specialist home automation providers in the connected home market.

TARGETED ADVERTISING AND EDUCATION CAMPAIGNS

The market for luxury whole-home automation systems is projected to continue to grow; while some industry commentators suggest that the wide availability of less expensive mass market systems will displace the high-end solutions, IHS projects the declining market share to be offset by more rapid growth in the connected home market as a whole, continuing to drive organic market growth in the high-end sector. Conversely, many consider the wider availability of connected home systems to be a driving force behind the high-end variants, as companies such mainstream system providers – such as ADT or Comcast – invest in marketing and consumer education programs; this will build general awareness for connected home systems, and also highlight the disadvantages of off-the-shelf solutions, highlighting the need for customization.

To support this, there is the opportunity for specialist home automation providers to increase targeted marketing campaigns, either individually or via associations such as CEDIA, in order to reach high net-worth individuals and emphasize the value of features such as customization, as people become more aware of the connected home.

DECLINING DEVICE AND PLATFORM COSTS

The deployment of mass market systems may have significant benefits for connected home specialists. While targeting different end-user segments, connected home specialists often work with many of the same partner companies that also cater to the mass market. As these companies gain economies of scale and growing expertise through their work in the mass market, this is expected to also benefit their high-end partners. For example, most high-end home automation systems already support cloud-based home control services. As the deployment of mass market alternatives grows, the backend platforms could be outsourced to dedicated platform providers to manage this aspect, benefitting from economies of scale through their work in the mass market.

OPPORTUNITY TO DEVELOP LOWER-END SYSTEMS

While it is unlikely that many specialist home automation providers will move away from focusing on the luxury segment, there may also be the opportunity to develop separate ranges (to avoid diluting existing brand associations) which target the lower end of the high net-worth segment with less expensive alternatives. This would need to be managed carefully to avoid cannibalizing sales to the high net-worth individuals or diluting brand value, but there could be an emerging segment of consumers with

a reasonably high level of disposable income who have had their appetite for connected home systems whetted by the mass market systems increasingly available today, but are willing to pay additional fees for a more customized and wider system.

IHS believes that the opportunities for new build smart homes (especially flats or apartment blocks) have reduced significantly over the past five years. However, IHS expects that – given the current slight growth in the North American construction industry of late – the opportunities for taking smart devices to market via new-build construction may increase over the next five years.

MAJOR CHALLENGES TO FUTURE EXPANSION

There are also a number of key challenges to the expansion of connected home specialist providers.

CHALLENGE OF MASS MARKET SYSTEMS

As discussed, there are different opinions as to whether the growing availability of mass market connected home systems will challenge the role of the high-end specialist providers. While the general consensus is that the systems will continue to target different segments of the market, there is the possibility that some consumers that were considering the high-end alternatives may first try the lower-cost alternatives. In order to combat this, specialist home suppliers will need to invest in marketing or educational campaigns to highlight their key value propositions, such as superior service levels and customized solutions.

USING PROPRIETARY SOLUTIONS

The growing prevalence of connected home systems is set to drive wider availability of connected devices at retail. Many specialist connected home suppliers today use proprietary connectivity solutions – and even where a standard technology is used, this is sometimes overlaid with a proprietary profile in order to retain a closed network and implement a barrier to supplier switching. With the growing availability and marketing of connected home devices which are available at retail to consumers, customers of high-end whole-home systems may find it frustrating that they cannot simply purchase devices and have these added to their systems, or even do it themselves in the case of DIY devices. Specialist home automation providers will need to ensure that as the price of alternative devices becomes more widely visible to customers, they are able to justify charging a premium (e.g., through service levels, system functionality, or levels of customization). Alternatively, smart home specialists could also overcome the issue of using proprietary profiles by working with the device manufacturer to allow an over-the-air (OTA) upgrade for devices running open standards that could download the proprietary profile over-the-top (OTT). This would allow smart home specialists to retain control of the system while still enabling their customers the freedom of purchasing some devices from other retailers.

3.2.4 CONNECTED HOME DEVICE SUPPLIERS

Connected home device suppliers include both those companies dedicated to supplying connected devices, such as Nest or EcoBee, as well as device suppliers with established non-connected device product lines, such as GE, Emerson, Tyco and Honeywell.

For dedicated connected home device suppliers, services are often offered alongside the device purchase (as is the case with Nest and EcoBee); there is therefore significant overlap with dedicated service providers, which are covered in section 3.2.2 of this report.

DEVICES & SERVICES OFFERED

Device suppliers – by nature – provide a wide range of connected home devices, spanning home monitoring, comfort and convenience, energy management, and A/V control. Device manufacturers supply devices through specific channels. For example, if a device supplied sold via ADT – for example – the devices would be typically security-based, with a number of energy management devices as add-ons. Alternatively, if they are dedicated – such as Nest – the devices supplied are inherent to the core capability of the business.

In some cases, device suppliers will be focused on a specific application; such as energy management, in the case of EcoBee and Nest. Others, such as multinationals Schneider Electric, Honeywell and Bosch, will offer a broader range of devices driven through a broad range of existing product lines.

KEY VALUE PROPOSITION AND CORE CAPABILITIES

For device suppliers, the key value proposition is robust, appropriately networked devices, i.e., devices with can easily interoperate with standards-based systems or which use an effective proprietary technology where closed networks are required.

Typically, connected home service providers will opt to sell devices from existing device suppliers, who can benefit from economies of scale and existing manufacturing partnerships. This allows service providers, such as Verizon or Comcast, to leverage their core capabilities in the customer-facing service aspect (often in conjunction with platform partners), while device manufacturers leverage their respective hardware capabilities, often gained through other core non-connected business lines. There are, however, some service providers which offer their own devices, either exclusively or alongside those from other device suppliers – such as EcoBee or Alarm.com. This is where the lines are blurred between dedicated service providers and connected home device suppliers, as these companies are effectively providing both parts of this ecosystem.

For device suppliers which sell directly to the consumer, the key value proposition can vary depending on which segments they target: for example, for people unfamiliar with connected home systems, ease-of-use will be a key value proposition; for those targeting existing connected home customers, interoperability and ease-of-integration will be key.

For both B2B and B2C connected home device suppliers, further value propositions can be developed based on standard differentiators, such as cost and functionality.

PARTNERSHIPS

Connected home device suppliers partner with a wide number of company types in order to get their products to market. Many device suppliers are inherently B2B enterprises, using channel partners to get products to the consumer. Please also refer to the section ‘Target Segments, Routes to Market and Distribution Channels’ for more information.

Connected home service providers and platform providers can represent a valuable partner for device suppliers. As the majority of device suppliers today do not offer an associated software package alongside their hardware, device suppliers can ensure their hardware adheres to a set of technical specifications outlined by service providers, to enable their devices to form part of these systems. Partner programs set up by platform providers allow device suppliers to access these specifications and therefore design products to adhere to a dedicated system. Service providers are increasingly using third party platform design (e.g., from companies such as iControl or Arrayent), and as device manufacturers can specifically design devices around these platforms, device suppliers can lobby for position in the service providers’ product lines.

TARGET SEGMENTS, ROUTES TO MARKET AND DISTRIBUTION CHANNELS

While there are some exceptions (such as HomeSeer or Nest), many device suppliers do not offer their devices directly to consumer, instead using channel partners, as highlighted below. The end-user target segment for each channel partner is highlighted in their respective sections.

SERVICE PROVIDERS

With the growing number of service providers offering connected home systems, service providers present a key channel for connected home device suppliers. Typically, these systems often utilize a standard technology, such as ZigBee or Z-Wave, to allow a broad ecosystem of supported devices to develop, although some systems also include proprietary (typically sub-GHz) solutions. Service providers value easy-to-use, easy-to-install (although not necessarily DIY) devices, which will reduce the burden on the service provider relating to troubleshooting, hardware support or ongoing after-care. In addition, devices are typically relatively low-cost, as the service providers aim to offer affordable upfront fees in order to make the systems attractive to a broad range of consumers, supporting monetization of the system through recurring service charges.

RETAIL

Device suppliers are starting to offer connected home devices through a broader range of retail channels. Traditionally, specialist connected home retailers – typically online – were the main retail outlet for connected home devices. These were typically aimed at consumers with a good knowledge of home renovation or DIY, who would install these systems themselves. Increasingly, other retail channels – such as Lowe's and Best Buy – are starting to stock connected devices, as the connected home becomes more mainstream. Typically, interoperability is key to these channels. For specialist connected home retailers, customers typically have a relatively good understanding of interoperability, and this is marked clearly for devices, so consumers can search based on whether they want devices that use Insteon, X10, Z-Wave. Less specialist retail channels are targeted at general consumers as opposed to connected home enthusiasts. Interoperability could be a major issue as the connected home market goes mainstream, as consumers are not familiar with the typical technologies used, and will need to be educated about which device can and cannot be added to the system. Lowe's demonstrates a means of resolving this issue in a less technical way, by marketing certain devices from multiple device manufacturers as 'compatible with Iris', its connected home service.

DISTRIBUTORS, CONTRACTORS & INSTALLATION COMPANIES

While smaller device manufacturers may work directly with contractors and installation companies, many opt to go via distributors. Distributors partner with a number of different company types on both sides of the value chain, as is inherent to their business model. Typically, they partner with device or system manufacturers in order to act as resellers for their solutions. This can either be on an exclusive or non-exclusive basis. The distributor in turn will work with a number of other channel partners, such as retailers, installation companies or contractors, in order to sell these solutions through to the end-user. The breadth of channel partners available to local distributors is a core capability to their business, and is therefore a key reason that device suppliers choose to sell through them. In addition, distributors are often smaller organizations, able to provide a level of support to relatively low-volume customers (such as contractors or installation companies) which major device suppliers would not be able to do without having a major impact on the service element of operating costs.

In addition to this, distributors, contractors and installation companies act as a link between device

suppliers and companies closer to the end-user, and can be responsive as end-user needs and target segments develop.

REVENUE AND PRICING MODEL

As would be expected, device suppliers typically monetize connected home devices through upfront hardware costs. The specific pricing varies significantly depending on the device type, brand, sales channel and target end-user.

For example, device suppliers targeting only the high-end of the connected home market may offer high-cost devices with a relatively low market volume, but higher margins. In contrast, a device supplier working with a mass market service provider will offer lower-cost, and typically lower-margin, devices in higher volumes as service providers aim to offer relatively inexpensive hardware packages with ongoing service revenues in larger volumes.

Industry participants interviewed for this report believe that many multinational device suppliers (such as Honeywell, Bosch, etc.) will use a cost-plus pricing method, basing pricing on the bill of materials (BoM) for each device plus a specific margin.

COST STRUCTURE

Many device suppliers moving in to the connected home market already have pre-existing non-connected business lines. Such companies can re-invest existing internal capital in order to produce connected device models for the connected home market.

Other device suppliers may only be active in the connected home space. Such companies are often start-ups, and are typically engaged in both hardware and service provision. For more information, please refer to the dedicated connected home service providers section.

MAIN COMPETITORS

Multinational device suppliers have a unique advantage in the connected home market in that the cost of investment in the connected home for them is relatively small. While new product lines with new product design cycles need to be introduced to get into the market, re-investment in the form existing product lines is relatively simple, and existing product designs can be manipulated in order to create the new connected product lines. For this reason, multinationals have very little cross-segment competition, especially not on the scale they are currently operating.

One potential competitor is the dedicated device supplier (such as Nest), which has a unique advantage of smart home knowledge and expertise coupled with device supply capabilities; however, as these are relatively niche and small-scale, they do not currently pose a significant threat to the bulk manufacturers.

MAJOR OPPORTUNITIES FOR FUTURE EXPANSION

As the availability of connected home systems grows, this presents a major opportunity for device suppliers to take advantage of the growing market in a number of ways. IHS believes that device suppliers will have the most adaptable opportunities out of all ecosystem players; as devices will consistently be used across all other points in the value chain, the device manufacturer will play a pivotal role in the development of the connected home and the direction that the industry is driven in.

STRATEGIC DEVICE PARTNERSHIPS

Device suppliers can form partnerships with the growing number of connected home system providers that aim to monetize the market through ongoing service relationships. Such companies typically do

not want to move into device manufacturing, and instead opt for promoting hardware packages which include third-party devices. This model has already been seen in a range of existing service providers. This can enable device manufacturers to leverage service provider advantages, such as customer-facing marketing and existing brand recognition.

RETAIL MARKET OPPORTUNITIES

As the installed base of households with connected home systems grows, device suppliers can take advantage of a growing demand for devices available through retail channels, as consumers look to add further devices to their systems. This is particularly true of consumers who purchase service platforms such as Revolv, that aims to be device-agnostic, enabling consumers to integrate connected home devices from a wide range of suppliers, using multiple connectivity technologies. In order to take advantage of this, device manufacturers will need to assess which systems they need to be compatible with, and create solutions which can enable this through either open standards or inexpensive bridging devices.

SERVICE PROVISION

As the demand for connected home services, such as remote home management, grows, this presents an opportunity for device suppliers to move into the provision of associated services (e.g., in conjunction with dedicated platform providers). This could be a means of moving from an exclusively upfront costing model to a recurring revenue model, with associated ongoing service fees. Alternatively, this service could be provided as part of the upfront hardware cost, in order to differentiate from other devices available. This transition, however, would not be without its challenges.

RESIDENTIAL LOAD MANAGEMENT

For suppliers of high consumption devices, such as certain white goods and A/C units, or controllers of such devices, such as thermostats, there could be the opportunity to leverage the connectivity within these devices to enable consumers to take part in residential load management programs. For consumers where attractive incentives (such as rebates or lower tariffs) are available through their utility companies, this feature could act as a differentiator in the purchase of such devices. As many consumers do not currently have these programs available, alternatively the device supplier could create their own systems and enter into agreements with consumers directly, enabling them to form partnerships with various utility companies in order to effectively trade residential load demand during times of peak usage.

LEVERAGING CONNECTED HOME DATA

The connected home platform is at the center of much of the data generated by activities in the connected home. Device suppliers could form agreements with service providers and platform providers to find a way to leverage this data. Please refer to section 3.3 for further analysis of the connected home data opportunity.

MAJOR CHALLENGES TO FUTURE EXPANSION

There are a number of challenges facing connected home device suppliers.

POTENTIAL MARGIN PRESSURE

For some mass market connected home system providers, such systems are based around a model of relatively low upfront hardware costs to enable monetization through ongoing service charges. As a

result, the focus within these devices is often on low-cost, fairly basic hardware. As more device suppliers focus on this segment of the market, and the trend towards standardized technologies grows, product-level differentiation for service-provider systems is set to be harder. With a growing emphasis placed on cost, this is expected to result in downwards pressure on the associated hardware margins, emphasizing the importance of developing the most efficient manufacturing processes. This is expected to mainly affect the already low-cost devices, such as smart plugs, motion sensors and magnetic contacts, where the opportunity for function-based differentiation is low. In contrast, devices such as thermostats or connected appliances will continue to be able to offer differentiated hardware based on other factors such as energy efficiency, level of functionality, or brand.

Arguably, this highlights a potential opportunity for some device suppliers to move from the mass market to high-end system types, where added functionality may be used to command higher margins.

DEVICE INTEROPERABILITY

One of the key issues that has impacted the connected home market is the lack of a single universally accepted connectivity standard. With many moving towards standardized wireless technologies, for the North American market it seems that a combination of ZigBee, Z-Wave and Wi-Fi may prevail for mass market systems. With different systems supporting a range of different standards, device suppliers are faced with a situation where they have to decide which connectivity technologies to adopt. Interesting initiatives in the past, such as the U-SNAP module, seem to have lost momentum. If device suppliers support only a single technology, devices will not be interoperable with other technologies without additional gateway hardware. However, if device suppliers support multiple technologies, this increases production costs as a result of the heterogeneous product line.

APPLICATION-BASED MARKET DEVELOPMENT

The market for connected home systems is developing at a different rate for various application areas. For example, many mass market connected home systems are based on home monitoring, with later expansion to energy management applications. For suppliers of home monitoring devices, this has driven significant growth from this segment of the market already; however, for suppliers of devices which are seen as the 'second wave' of connected home devices, competition may be steeper as the existing home monitoring device suppliers start to enter this market to take advantage of expanding customer requirements. For example, smart plugs – which can be used to measure electricity consumption from, or control, individual applications – used to be available only from specialist device suppliers; they are now offered by a broader range of connected home suppliers as energy management starts to appear more on the connected home agenda.

3.2.5 CONTRACTORS AND INSTALLATION COMPANIES

Some connected home device or system providers use installation or contractor companies to go to market. In turn, installers and contractor typically partner with other companies in the industry to provide expertise and knowledge of installation processes without the need for companies to invest in installation capabilities.

DEVICES & SERVICES OFFERED

Contractors and installation companies do not typically provide their own hardware or software for the connected home market; instead acting as channel partners for third-party hardware suppliers.

Some contractors or installation companies may be dedicated offering connected home systems, such as installing high-end home automation systems; whereas others may offer more general

installation or contractor services, or be focused on a specific function, such as HVAC systems, covering both non-connected and connected product ranges.

These are some devices that require professional installation, either because it is mandated that individuals cannot install these devices (often on a county-by-county level), such as connected thermostats or connected major home appliances, or because consumers are not personally comfortable or capable of installing devices themselves, particularly those relating to water or electrical systems.

KEY VALUE PROPOSITION AND CORE CAPABILITIES

Contractors or installation companies offer consumers seamless expert integration of connected home systems, leveraging their expertise in installation projects. This builds on their core capability: their knowledge base, experience and expertise. Contractors and installation companies are typically very experienced dealing with residential systems, such as HVAC control or security systems, and therefore as the trend towards the connected home grows, such companies are well-placed to provide connected alternatives in addition to non-connected devices.

The depth of knowledge about devices – especially those with non-connected alternatives, such as thermostats or air conditioning units – is a key capability of general contractors and installation companies. For specialist connected home contractors and installation companies, it is their knowledge and experience around connected home systems – typically high-end, whole-home solutions – which contributes to their value in this market.

Many installation companies will have a wide range of in-home installation expertise, ranging from plumbing, to heating and electrical systems, knowledge which can become transferable when dealing with wireless thermostats, water shutoffs or other connected devices. With the main reason that consumers would prefer to have a professionally installed system being that many feel that they would not set up the system correctly even if it was designed to be self-install, this level of expertise is valuable to a consumer.

TARGET SEGMENTS

One of the key characteristics of contractors and installation companies is that they are often run at a local level, with a fairly narrow regional reach. There are relatively few major contracting and installation outfits that operate on a nationwide scale.

A key target of the contractors and installers is – inherently – the professional install market. There are a number of service providers offering professional install systems – such as AT&T or ADT. While some of these do have in-house installation capabilities, this is one area of the market that installation companies could seek to target. As system installation is sometimes contracted out by connected home system providers to local companies, these local companies can enter into a partnership with service providers or device manufacturers in order to be 'recognized' as an approved partner.

The primary target for contractors and installation companies is typically consumers that are not able to install their own home systems. This is true of both the connected and non-connected residential device market. This can range for mass market devices, such as thermostats or water heaters (and the connected variants), through to whole-home, high-end home automation systems. While many system integrators such as VIA or Crestron provide the installation themselves, contractors will typically be involved in a luxury project from early on to enable the integration of the system into a new-build home. Alternatively, specialized installation companies may be brought into a retrofit luxury project, where specific expertise is required on structural layout. As a result, the target market for connected home installation companies can vary from general consumers starting to move into the connected home, through to the luxury end of the market, with high-end whole home systems.

PARTNERSHIPS, ROUTES TO MARKET AND DISTRIBUTION CHANNELS

Installation companies can go to market in a number of ways. Some contractors and installation companies will enter into an agreement directly with the consumer, and obtain connected home devices from dealers or system providers. Some consumers, particularly those who have undergone renovation work, etc., may have formed relationships with existing installation companies or contractors. This is typical for relatively small-scale local organizations which offer general installation or contractor services, not specific to connected home systems.

Alternatively, contractors or installation companies may be recommended by the system provider directly when a consumer wants to purchase a connected home system. This leverages the existing brand and consumer awareness of the connected home system provider, often while enabling a local installation company to install the system.

Installers will be contracted by a specific service provider to install all systems within the service provider's range. Many service providers are offering (with the exception of Verizon) a mandated installation of the system, specifically for first time users. Some service providers – such as Comcast – only provide first-time installation, requiring the consumer to install any additional devices. However, some service providers – such as ADT – require installation for every device then added to the system.

Secondly, however, some installers are 'recommended' by a service provider or manufacturer if a consumer requires professional installation. Installers can partner with dedicated or existing service providers to be on the 'recommended' list, and will have access to professional installation instructions for specific systems or devices. For example, AT&T offer professional installation for first time users; however, after the initial installation has been completed, any a la carte purchases are not provided with installation; the consumer can either install the add-on device themselves, or hire a professional installer to complete the job. This can enable the 'recognized' installation company to directly monetize the connected home market, rather than indirectly through a specific service provider.

REVENUE AND PRICING MODEL

There are a number of different revenue and pricing models exhibited by contractors and installation companies. As mentioned, some installation companies or contractors partner directly with the system providers, such that when the consumer purchases a system, the upfront cost can include the installation fee. Rather than being paid by the consumer, the installation company or contractor is paid by the system provider directly. The cost of installation will depend on the system being installed, and will vary widely. For the typical starter-packs offered by emerging connected home players (typically consisting of a gateway and small number of peripheral devices), installation costs are estimated to vary between $99.95 (Comcast) and $999 (ADT Pulse).

For high-end connected home systems, such as a whole-home automation project, the cost of installation will be much higher as it is much more significant in terms of project length and system complexity. In addition, at the high-end of the market where there is a high level of customization, contractors are often more specialized in the provision of such systems, and as such command a higher rate than some general contractors.

Where installation companies partner with, and are paid by, a specific connected home system provider, they can either be paid an hourly rate or a per project rate (where projects do not vary significantly, for example the installation of a pre-defined 'starter pack'), depending on the specific contract in place.

For contractors or installation companies working with consumers directly, a per hour rate is typically offered. The contractor will then work with a distributor to source the required hardware or software, with the costs passed through to the consumer.

COST STRUCTURE

Many installation companies and contractors are typically relatively small, local companies, with no standardized national network. The cost structure of these companies is therefore expected to be typical of many SMEs. Local installers and contractors are often privately funded, or have external funding provided by a bank or building society as a small loan. Some are family-owned.

There are fewer barriers to entry for installers and contractors: while some other companies – such as service providers or platform provider – require the capital to invest in developing new solutions, installers and contractors looking to migrate into the connected home market will be transferring the majority of pre-learned skills, with only minor education and training required to deal with connected home systems.

MAIN COMPETITORS

Aside from the evident competition from other local and nationwide installation and contracting companies, other company types can act as competitors to installation companies and contractors in the connected home market. For example, while some existing service providers use third-party contractors for the installation of connected home systems, other already have in-house installation capabilities, or have retrained existing engineers to perform connected home installations.

In addition, there is the potential for other companies involved in the connected home market to move into installation services. For example, connected home distributors could move in this direction, or dedicated service providers may start to invest in this expertize in-house to offer an end-to-end service.

MAJOR OPPORTUNITIES FOR FUTURE EXPANSION

As the connected home market expands, this presents a major opportunity for contractors or installation companies within both the mass market and high-end segments.

PARTNERSHIPS WITH CONNECTED HOME SYSTEM PROVIDERS

As existing service providers, such as telecommunications companies or security providers, start to offer connected home systems, many opt for systems which require professional installation to reduce issues associated with consumers not feeling comfortable with setting up home systems, or setting up the system incorrectly. This presents a major opportunity for installation companies or contractors to partner with such companies, as the system providers will be responsible for all marketing and consumer-facing promotion of the system, and pass clients directly through to the contractors or service providers when systems have already been purchased.

ONGOING SERVICES FOR CONNECTED HOME CUSTOMERS

As the connected home installed base grows, this presents the opportunity for contractors or installation companies to provide ongoing services, or upsell installation of additional devices. Services such as after-care, device or system warranty, or proprietary remote diagnostic & system maintenance could be beneficial for consumers opting for a modular, DIY system (and who would therefore not be able to access these services via a distinct end-to-end solution provider). If installers could offer these services, it could generate additional revenue for the company. In addition, installation companies could work with distributors or service providers to upsell additional devices, which would ultimately result in additional revenue for all associated parties.

OPPORTUNITY TO CONSOLIDATE

The current geographic reach of a single installation or contractor company is a key challenge in the current market. Many local installation and contractor companies compete within a local catchment area. However, this presents a significant opportunity for the installation and contractor companies to consolidate at a region or national level; the consolidation of these companies – either by merger or national enterprise acquisition – could be one way to expand the capabilities of these smaller enterprises using economies of scale that they previously were not able to achieve.

MAJOR CHALLENGES TO FUTURE EXPANSION

The major challenges for contractors and installation companies cited by the industry include the rise of DIY systems and education surrounding unfamiliar systems.

THE RISE OF MASS MARKET DIY SYSTEMS

Some consider the deployment of DIY connected home systems to be a major challenge for contractors or installation companies working in this segment. With a growing number of systems designed specifically to enable consumers to install it themselves, aided by intuitive pairing processes, installation wizards, etc., some fear this could negatively impact the market for system types which require professional installation.

However, it is important to note that many of the companies driving connected home systems into the mass market actually favor professional installation as some existing and dedicated service providers feel it is more appealing to customers, and reduces the need for dedicated system set-up trouble shooting and support, which can be a downside of many DIY or self-install systems. IHS believes that systems requiring professional installation will continue to be a common approach, despite the growing press surrounding self-install systems. The recent consumer survey from IHS indicated that 70% of North American respondents that have an interest in connected home applications would prefer to have a connected home system professionally installed, primarily because they are concerned about not setting the system up correctly. For more information on consumer reaction to installation processes, please refer to section 4.3.

In addition, even where a basic system is designed to be installed directly by consumers, typically the devices included in these starter-packs are those which are inherently easiest to install – such as wireless motion sensors, magnetic contacts, network cameras or smart plugs. Arguably, this wider installed base actually presents an opportunity for contractors or installation companies as consumer want to add further devices, such as connected thermostats, which they may not be comfortable doing without professional support.

CONTRACTOR AND INSTALLATION COMPANY EDUCATION

General contractors or installation companies may be unfamiliar with the installation of connected alternatives of existing devices. For example, while a contractor might have extensive experience of installing thermostats, when putting in a connected variant, they may be less sure of how to pair this with the home network, or in large houses, how to position of wireless repeaters to ensure optimum network coverage.

While this is not the case for contractors which specialize in connected home systems or for those that have partnered specifically with connected home providers, general contractors that are more familiar with non-connected devices may be reluctant to strongly promote connected alternatives; or where they do install connected devices, may not be doing so in an optimum way from a networking perspective.

This presents an opportunity for device suppliers and distributors to educate and incentivize general contractors to become more aware of the benefits of connected home devices, and how to optimize the installation of such systems.

3.2.6 DISTRIBUTORS

Some connected home device or system providers use distribution companies to go to market. In turn, distributors typically sell to other channel partners, such as installation companies or contractors, or to (typically local) retail stores. Distributors vary significantly, with North American examples including companies such as: AVAD LLC, Johnstone, SageAlarm, Advanced Security Engineering and FrontPoint Security.

DEVICES & SERVICES OFFERED

Distributors act as intermediaries for getting a product – in this case, a connected home device, solution or system – to market, typically indirectly to the consumer via other channels, such as installation companies, contractors, or retailers. For this reason, the specific solutions offered vary based on the suppliers a distributor is working with.

Connected home distributors can vary widely in size, scope and geographic reach. They include general distributors that typically distribute non-connected devices, such as HVAC systems or security devices, which have moved into distributing connected home devices, either as a result of new device or system partnerships, or existing suppliers moving into the connected home space. Alternatively, some distributors are dedicated to connected home systems, and do not offer non-connected alternatives.

In addition, the geographic reach of distributors is a key variant, with the market consisting of a range of locally-focused distributors, state-wide distributors and nationwide organizations.

KEY VALUE PROPOSITION & CORE CAPABILITIES

For device manufacturers, partnering with distributors offers wider access to a higher number of customers, who may be too small for device or system suppliers to individually target without incurring significant service costs through more efficient operational processes (i.e., consolidating logistics, billing, ordering, etc.) Distributors typically thrive by creating strong relationships with local or national B2C organizations, such as contractors, installation companies or retail partners. By partnering with distribution companies, device or system suppliers can enable access to a wider range of customers than they could otherwise effectively target.

Distributors need to be selected based on whether they have or could effectively develop the product knowledge to sell into the connected home market. With many already focused on selling non-connected alternatives of the same products (e.g., standard thermostats, A/C units or home monitoring devices), such companies can be well-placed to develop the required internal knowledge base or capabilities. Alternatively, some distributors are specialized in connected home systems, either acting exclusively for a single system provider or for multiple providers.

Typically, companies purchasing via distributors are relatively low-volume (compared with the overall volumes produced by the original supplier) and therefore working with distributor offers customers a level of personal service which may not be available from major suppliers directly. Many distributors have a local focus, and differentiate themselves based on the level of personal service they can provide to customers. Many distributors will offer solutions from a range of different device or system providers, and can help customers to select the most appropriate combination or products, further building the relationship between companies.

In addition, distributors will have a higher level of buying power than individual customers, such as installation companies or small retailers, as they will consolidate demand across multiple companies downstream. In addition, in some cases, distributors may be the only channel where certain devices or systems are available, as many manufacturers will have minimum order requirements.

TARGET SEGMENTS

Distribution companies will typically sell into a range of companies, such as installation companies, contractors or retailers. As distribution and dealer networks are often local, the target segment may be specific to the local area that the company is working in, and also be specific to the products that the distributor is selling. These companies are the initial targets of connected home distributors; each of which in turn has their own target sections, as covered in the sections above. Distributors act a link between device suppliers and companies closer to the end-user, and need to be responsive as end-user needs and target segments develop. However, the channel partner is their ultimate customer, and so their specific requirements – whether this is easy installation or the ability to obtain a bigger spread between cost price and end-user price – need to continue to be a major driving force.

PARTNERSHIPS, ROUTES TO MARKET AND DISTRIBUTION CHANNELS

Distributors partner with a number of different company types on both sides of the value chain, as is inherent to their business model. Typically, they partner with device or system manufacturers in order to act as resellers for their solutions. This can either be on an exclusive or non-exclusive basis. The distributor in turn will work with a number of other channel partners, such as retailers, installation companies or contractors, in order to sell these solutions through to the end-user.

As mentioned, there are a number of different channels which distributors can sell through. This includes retail stores, which may be nationwide or local depending on the scale of the distribution company, and contractors or installation companies. Many installation companies or contractors are locally focused, and working with a range of similarly-focused distribution companies enables larger, often nation-wide or international device suppliers to leverage an effective locally focused distribution or dealer network.

REVENUE AND PRICING MODELS

The revenue and pricing models of distribution companies are typically fairly homogenous. Distribution companies typically purchase directly from device manufacturers, in some cases consolidating channel partner demand in order to increase buying power and gain from associated discount levels. Distribution companies will then sell these solutions on to their channel partners (such as installation companies) at a higher price; generating additional revenue based on this margin. In some cases, pricing will need to be specifically agreed with the original device or service provider in order to ensure it meets their overall pricing strategy. In other cases, distributors can determine their own pricing dependent on associated services and profit margin targets. Here, distributors often use the markup method, which involves adding a predetermined percentage to the company's purchase price to arrive at the price for customers. In some cases, this will also include the shipping costs included in the relatively agreements.

COST STRUCTURE

Many distributors are typically relatively small, local companies, with no national network. The cost structure of these companies is therefore expected to be typical of many SMEs. Local distributors are often privately funded, or have external funding provided by a bank as a loan.

There are fewer barriers to entry for distributors: while some other companies – such as service providers or platform provider – require the capital to invest in developing new solutions, distributors act as the intermediary wholesale provider between the device manufacturer and other channel partners.

MAIN COMPETITORS

The main competition for distributors is from other distribution and dealer companies. The level of competition can vary by local area, and there might be a number of local distributors serving a particular area. In addition, there is also competition from nationwide dealers or distributors.

As the connected home market grows, there is the potential for further competition from other channels. For example, if installation companies or retailers are successful in growing their business in the connected home market, there is the potential that they could start to work directly with some device manufacturers, if they are large enough to generate sufficient volume. However, volumes would need to increase relatively substantially for this to be a major concern, and many device manufacturers have clear guidelines in place to ensure that they do not compete with their distribution partners directly.

MAJOR OPPORTUNITIES FOR FUTURE EXPANSION

There are a number of opportunities facing distributors in the connected home market.

GROWING CONSUMER DEMAND FOR CONNECTED DEVICES

As consumers demand a higher degree of connectivity in their lives, driven in part by the rise of always-on smartphones and tablets, this is set to drive demand for connected home systems. Interest in the connected home market will also be positively influenced by advertising campaigns and marketing from service providers, such as telecommunications companies and security providers, moving into this market. This can drive growing demand for connected devices from B2C companies which are serviced by distributors, such as retail channels or installation companies and contractors.

THE RISE OF MASS MARKET DIY SYSTEMS

Some consider the deployment of DIY connected home systems to be a major challenge for contractors or installation companies working in this segment. However, interest in DIY systems could present an opportunity for distributors to widen their reach beyond installation companies or contractors, and start to partner with other channels such as online or physical retailers which could offer DIY solutions direct to the consumer.

DIRECT TO CONSUMER EXPANSION

Distribution companies will typically develop a very specialized knowledge of the markets they are serving and the associated products they distribute. There is the potential for distributors to expand operations to offer products or systems directly to the consumer, for example by developing their own installation services, as opposed to selling into installation companies.

CHANGING PRODUCT MIX & PARTNER ORGANIZATIONS

Distributors can either act exclusively for a particular device supplier, or offer a range of devices from multiple device suppliers. There are advantages and disadvantages inherent to each approach. As the connected home market develops, and a wider range of device and system providers enter the market, this presents an opportunity for distributors to create a range of new exclusive or non-exclusive partnerships with a varied mix of suppliers.

CONNECTED HOME SERVICE DISTRIBUTION

As more connected home systems or devices start to be offered alongside recurring service contracts, this presents an opportunity for distribution companies to partner with such companies to promote these services alongside the devices. As a result of the recurring service revenue tied to these contracts, service providers may be able to offer distributors hardware at prices where they can obtain a higher margin if they can sell through the ongoing service program.

MAJOR CHALLENGES TO FUTURE EXPANSION

There are also some challenges facing distributors moving into the connected home market.

END-TO-END SOLUTION PROVISION BY MAJOR SERVICE PROVIDERS

A range of existing service providers – from security providers to cable operators – are entering the connected home market. Typically such companies offer a range of hardware propositions (from basic to more extensive), with the option to add on further devices following the initial system purchase, all provided as in-house devices dealt straight from the device manufacturer with the service provider acting as the intermediary. This emerging business model could impact the role of the distributor in these cases, as consumers are purchasing hardware directly from a service provider, which will typically have sufficient scale to contract with the device supplier directly.

GROWING COMPETITION DEDICATED AND GENERAL DISTRIBUTION COMPANIES

A number of general (non-connected) residential device distributors are moving into the connected home market. For example, HVAC distributors starting to offer smart thermostats alongside traditional solutions. In addition, connected home specialist distributors are continuing to emerge. With growing competition, this puts the market at risk of squeezed margins as the distributors are faced with a wider range of competitors.

3.2.7 UTILITY COMPANIES

As the deployment of smart meters and the associated advanced metering infrastructure (AMI) networks in North America gained pace, in part stimulated by the American Recovery and Reinvestment Act of 2009, there was widespread industry enthusiasm behind the premise of residential demand-response and peak load reduction activities. In some cases, this had already been going on in relatively small-scale programs even before smart meters were deployed, with long-range RF solutions enabling direct connectivity to device such as smart thermostats. However, in more recent years, the momentum behind wide scale residential demand response deployments has started to wane, impacted in part by a lack of consumer enthusiasm and challenges associated with greater deployment of dynamic pricing, and the impact on consumer electricity bills during some trials. While it is still viewed by the industry as a very valuable premise, and the use of demand response programs continues to grow within North America, some utility companies are still waiting for large-scale deployments from others to assess the lessons which can be learned.

However, demand response is just one of the ways that utility companies can be involved in the connected home, with other examples starting to develop. For example, utility companies can, either in partnership or alone, work with consumers to create consumer-driven energy management programs, such as building awareness of electricity consumption through the use of smart plugs with energy measurement capabilities, or enabling whole-home electricity consumption to be displayed on smartphone or tablets by creating a consumer-accessible portal or app.

It is important to be aware that the fractionalized nature and lack of national policy for AMI networks

contributes to lack of coordinated strategy. This is highlighted in Appendix 4, which presents an overview of the electric utility regulatory environment in North America.

DEVICES & SERVICES OFFERED

Multiple North American utility companies are pursuing demand response activities. Companies in Canada, such as HydroOne and BCHydro, and companies in the U.S, such as SCE and SDE, are all looking to implement smart meter or smart energy programs.

However, there are currently relatively few utility companies that are integrating demand response with wider connected home packages. Southern California Edison (SCE) is an example of one such company that is moving forward in the consumer-driven connected home environment. SCE has partnered with ADT to allow customers of the ADT Pulse system to display their energy consumption, historical energy usage and energy bill estimates by connecting to SCE customer data systems. Interestingly, this system also features utility-driven alerts, and is integrated into SCE's 'Save Power Day Incentive Plus' program, which aims to reduce peak load when electricity consumption is at its highest. It is an opt-in program, whereby consumers will receive an alert when a 'Save Power Day' is scheduled. Consumers are not tied in to reduce electricity consumption by a certain amount, but receive a credit of $1.25 for each kWh of electricity they save compared to their average usage during similar periods.

This is an interesting approach from SCE. With home monitoring features often considered to be the key initial value proposition behind the connected home, by partnering with ADT, SCE can build on the existing security-based platform in order to deploy energy management services.

KEY VALUE PROPOSITION AND CORE CAPABILITIES

For the North American market, energy management applications are often billed as the second-wave of the connected home, following home monitoring and other safety or security-related applications. Moving forwards, utility companies can create a strong value proposition behind their involvement in the connected home by creating solutions which really impact consumers where it matters – in their electricity bills. This could be done by enabling basic energy saving methods, such as adjusting the HVAC when a connected home system is set to 'away' mode; however, many connected home suppliers have already started pursuing this line of development already, and may not need to partner with the utility company to do so. Instead, utility companies will need to assess what they can uniquely add to these systems – such as enabling the integration of demand-response activities into connected home systems. This is a key value proposition, as it can take advantage of existing devices and infrastructure – i.e., the AMI network on the utility side and the connected devices already deployed in a residential home – in order to enable automated electricity savings during peak-load events, based on predefined customer preferences.

Utility companies are well-placed to feed electricity consumption data into a connected home system. While this can, at a basic level, be enabled by third-party devices such as meter clamps or readers, a utility company can have access to more comprehensive data, such as historical electricity usage, and – where applicable – specific time-of-use rates, and other such utility-driven data. Arguably, utility companies are best placed to provide energy management systems using real-time (or close to) energy data – both consumption and pricing. According to the consumer survey conducted by IHS, respondents that were interested in receiving energy data were most interested in being able to view this data in terms of cost, rather than consumption; the utility company is well-placed to provide this data based on individual pricing tariffs or consumer programs.

TARGET SEGMENTS

For utility companies looking to deploy demand-response based programs, the most effective target segments would be those with devices with high electricity consumption which could be easily delayed or reduced, such as air conditioning units or pool pumps. Where a smart meter is installed, this could be enabled via the AMI network; or where a smart meter is not present, long-range RF is an alternative. Alternatively, even where smart meters have been deployed, some utility companies opt for cloud-driven interaction, using an IP gateway to enable this functionality.

Some groups of consumers may be more open to the demand-response concept than others, and incentives will need to be well designed. While demand response or utility-driven load reduction was not covered in the consumer survey conducted for CABA (the scope of which was designed in conjunction with project steering committee members), a number of previous studies from IHS have covered demand response. According to an alternative study from IHS, females were most likely to opt for demand response programs, and so were those with higher technology adoption scores. However, education, advertising and, most importantly, incentive programs, may be effective in creating further support for such programs.

In addition, utility companies can target customers which already have connected home systems. Utility-driven information can be integrated into these systems (either via direct connection to a smart meter or by using a cloud-based network to relay intelligence from the utility back-end systems down to the connected home gateway) to offer value-added services, such as automated demand response systems. This would allow a consumer to pre-define their preferences, e.g., if the cost saving is expected to be more than $5 then it's fine to automatically adjust certain connected devices for a set number of hours. By targeting customers with existing connected home systems, utility companies can capitalize on the existing device infrastructure, and not need to try to sell associated devices into the home (where demand response alone might not be a sufficient value proposition to justify obtaining or replacing certain devices, whereas the wider connected home premise might).

In areas of North America where regulations promote competition between utilities, attractive energy management systems can act as a key differentiator between utilities, particularly where electricity costs are very similar.

PARTNERSHIPS

Utility companies can partner with a number of different company types in the connected home market to enable increased penetration of utility-run energy management systems in homes either with or without a smart meter.

In North America, home monitoring is believed to be the key initial value proposition for connected home systems, and the current service provider offerings reflect that, with companies such as ADT, Verizon and Comcast all developing such solutions. As such, utility companies may have the opportunity to partner with these providers to offer energy management services as an over-the-top service, sometimes even as a widget to add-on to the system as SCE have done on the top of ADT's Pulse solution.

From a smart grid perspective, utility companies often contract with meter suppliers to offer not only the smart meter, but other peripherals such as in-home displays. Other device OEMs can also provide compatible devices, including in-home displays, thermostats and other in-home energy devices that can be added onto the in-home system and communicate with the smart meter.

ROUTES TO MARKET AND DISTRIBUTION CHANNELS

Retail electricity companies are inherently B2C companies and the traditional route to market has been reaching out directly to the consumer through advertising channels such as through television advertisements, or mass postal campaigns.

However, as mentioned, there is a significant opportunity to partner with existing connected home system or service providers in order to leverage the connected devices which are being shipped as part of these systems. In addition, as devices suppliers start to offer associated connected home services themselves, other companies, such as appliance or HVAC suppliers, may also present an opportunity for collaboration as each connected device represents a load which could be under management.

REVENUE AND PRICING MODELS

There are a number of ways that utility companies could monetize the emerging connected home market:

- Hardware revenues: for utilities with an existing or growing installed base of residential users with smart meters, or utilities that can otherwise create energy information networks (e.g., via the cloud), peripheral devices could be offered. These include devices such as in-home displays, which utilities could either offer themselves or partner with device manufacturers, to larger devices such as smart appliances.
- Offset costs through demand response or peak load reduction: alternatively, utility companies could monetize the connected home by leveraging connected home devices to create a critical mass of residential electricity usage which they are able to influence at times of peak demand. While this may not directly lead to revenue generation, it can offset the costs associated with powering up the most in-efficient, costly-to-run peaker plans, or even delay or avoid building new plans altogether.
- Software services: Many utilities are investigating the potential for adding-on smart energy widgets or apps to sit on top of other connected home packages. There is still uncertainty how this could specifically be monetized, and is, to some extent, dependent on the regulatory environment facing each utility. For example, in areas with steep competition, this could be used as a complimentary value-add feature to increase customer interaction and reduce churn (the rate at which subscribers leave a particular product or service provider for a competitor).

The points above highlight some possible ways in which utility companies could monetize the connected home; however, their involvement in this market is still relatively nascent, and for many, their specific strategies are yet to be seen.

COST STRUCTURE

The cost structure of electric utilities is to a large degree dictated by the regulatory environment. A previous study from IHS, “Smart Home Energy Management Systems – 2012 Edition” summarizes the structure of the electricity markets as follows.

Canada's federal system of government means that jurisdiction over energy is divided between the federal, provincial and territorial governments. All provinces and territories have set up utilities boards and regulate transmission and distribution rates. However, the Canadian liberalization process of the 1990s changed some elements of the market such as the unbundling of generation, transmission and distribution functions of incumbent utility companies, in order to foster a competitive wholesale

market. However, most provincial governments still maintain a strong financial stake as operators in the electrical markets.

However, the U.S. has a highly deregulated utility environment and this has enabled thousands of utility companies of varying sizes to exist. Since the 1930s, electric utility companies in the U.S. have been regulated by the specific states in which they provide services. States have developed a full spectrum of regulatory and market models. Competitive retail markets have emerged that exist outside the traditional model, as customers interface with retail electricity providers, which provide consumers with electricity but which may not own generation assets themselves. These markets are regulated according to state-specific rulings, and vary widely across the U.S. An example is Texas, where the typical residential customer can choose from well over 200 retail electricity offers.

For decades, vertically integrated utility companies have used demand response for emergency response and peak shaving to help meet grid reliability. Prices for this service typically were set administratively and did not reflect the market value of demand-response. In recent years, wholesale electricity markets have evolved in various ways to allow demand-response resources to compete for services. However, as a result of the 'patchwork' approach to legislation, there is no 'one size fits all' model for offering further services, such as demand response and peak load management programs.

Demand response and peak load management programs – while potentially beneficial for the consumer, depending on the associated incentives – are extremely beneficial for the utility companies if they can reduce issues associated with grid stability, avoiding blackout or brownouts or reducing the need to cycle, and even avoid constructing new, peaker plants. Here, investment in the deployment of such systems may be internally funded, or potentially assisted by government subsidy or other assistance. Investment in residential peak load control programs, where supported by existing AMI networks, can be viewed as a means of further leveraging the investment associated with smart meter deployments.

However, there are some disparities between the monetization structure in the U.S. and in Canada. In 2010, for example, Ontario's energy board mandated that time-of-use (TOU) pricing for consumers should be available: to meet this requirement, smart meter solutions were deployed. One of the most important aspects of this though is that the Canadian government itself does not monetize this venture, but the energy boards themselves will take the hit on the cost for base case metering.

Where utilities are pursuing more customer-driven connected home systems, such as those aimed at reducing general electricity usage irrespective of smart meter infrastructure, again this is likely to be internally funded. However, partnerships can be put in place with other connected home service providers to help to leverage the existing customer base, such as the partnership between ADT and SCE. In some cases, there may be direct revenue associated with these activities (for example if a consumer needs to pay to download an energy management app or widget); while in others, the service will be offered for free, as a means of increasing customer contact and reducing churn (in areas where there is competition between electricity suppliers).

MAIN COMPETITORS

Utility companies have a relatively unique position in the connected home market due to their ability to access consumer electricity data, particularly where AMI networks have been deployed. This includes access not only to a consumer's ongoing electricity consumption, but also historic consumption data, which can also be leveraged in connected home systems (e.g., to compare current and past usage).

The extent to which utility companies compete with each other is heavily dependent on their location and the associated regulatory environment. For example, in parts of California, competition is rife; whereas in other areas, local utility companies can hold a monopoly over their customers.

Should utility companies opt to offer energy management as an over-the-top service for other system providers, then both company types can be seen as complementary to each other. However, should utility companies opt to develop their own connected home systems, they would effectively compete with the alternative system providers active in this market, including dedicated service providers, existing service providers, and connected home specialists.

MAJOR OPPORTUNITIES FOR FUTURE EXPANSION

There are a number of opportunities for utility companies to expand in the connected home space, as highlighted previously.

GROWING INSTALLED BASE OF CONNECTED HOME SYSTEMS

A key opportunity for utility companies is to leverage the growing interest in – and installed base of – connected home systems. While home security is often the primary value proposition enabling suppliers to sell connected home systems to new customers, energy management can be seen as the second wave. Utility companies can partner with other system providers in order to support expansion in the energy management segment, either through basic energy management functionality, or through value-added services such as more detailed information on electricity consumption and associated pricing or bills, as well as utility-driven messaging. In addition, as the connected home market grows, this presents an opportunity for utility companies to integrate these devices into residential load shedding programs, through partnerships with associated device suppliers or connected home system providers.

UTILIZATION OF ALTERNATIVE CHANNELS INTO THE HOME

While there remains some challenges to using the smart meter as the central gateway for residential load management programs (such as device interoperability, lack of consumer confidence and lack of ubiquity), there is the opportunity for utility companies to instead use other channels, such as IP-based networking which take advantage of existing broadband infrastructure in order to enable cloud-based integration of utility-driven systems and connected home platforms.

DEVELOPMENT OF BRANDED CONNECTED HOME SYSTEMS

While partnerships with other service providers are expected to be developed to enable utility companies to enter into the connected home, utility companies may also have the opportunity to launch their own branded connected home systems, effectively competing with other service providers, such as ADT or Comcast. This would allow utility companies to build on their customer relationships and service contracts and the associated customer contact which they already have. Systems could be developed to highlight the positive consequences of having a smart meter, given the distrust displayed by some groups of consumers. However, as this would require significant investment, this is a more viable opportunity for utility companies with major service territories. In addition, this would take utility companies out of their core focus, as they would need to expand systems to offer other applications, such as home monitoring services.

MAJOR CHALLENGES TO FUTURE EXPANSION

There are a number of challenges facing utilities in their efforts to expand their role in the connected home. For example, utility companies are under increasing pressure to demonstrate the ability of smart meters to provide significant consumer benefits, and in some cases are operating in a climate of distrust.

OVERCOMING SECURITY PREFERENCE

With home monitoring applications often viewed as the initial driving force behind the connected home in North America, utility companies will need to either offer their services as an 'add-on', or develop a connected home solution which will stand-out amongst the increasing number of connected home systems available. There are challenges associated with each approach.

If a utility company opts to create connected home services as an add-on to existing services, there is some uncertainty over how this can be monetized. For example, many utility companies today already offer free services which allow consumers to view their electricity consumption online. For areas which don't, at a basic level this can be enabled by other connected home suppliers by using add-on devices, such as meter clamps and readers. As energy management becomes an increasingly common add-on to existing connected home systems, utility companies will need to develop a clear value proposition which cannot be easily replicated by other connected home providers.

MANAGING CONSUMER BACKLASH FROM RESIDENTIAL LOAD CONTROL

While not monetized in the tradition sense, residential load control services represent a key opportunity to add to existing connected home services, which can lead to benefits such as reduced costs from expensive 'peaker' plants, or delayed development of new electricity sources. However, these programs will need to be carefully explained and marketed to gain consumer support. For utility companies, there is a risk that should this system not be effective, this will be detrimental to gaining consumer confidence in their energy management services as a whole.

Utility companies will need to act carefully to avoid consumer backlash, such as the scenario experienced following PG&E's smart meter deployment in Bakersfield a number of years ago when a number of consumers very publicly attributed their higher electricity bills to smart meter deployments. IHS believes that demand response programs and residential load management activities will be more attractive to consumers if two prerequisites are met. Firstly, the programs need to offer some form of incentive to the consumer. Financial incentives may include reduced electricity rates or rebates. At a very basic level, the program needs to offer something of value to the consumer (in one Canadian trial many years back using long-range RF instead of a full AMI network, an iPod was offered to participants), without leading to price increases, which will generate significant levels of bad press. Secondly, demand response programs need to be opt-in, rather than opt-out, so the consumer does not feel that participation is being forced upon them. Instead, participation in the program should be advertised to try to gain willing customers, attracted by the incentives on offer – and importantly, the utility company must deliver on these incentives, or risk generating consumer backlash not just from their existing customers but also heightening a negative perception of the concept nationwide.

COMPETITION FROM DEMAND RESPONSE AGGREGATORS

There may also be the risk that other companies, such as electricity demand aggregators or connected home system providers, could start to develop systems which allows them to manage consumer electricity usage, in the same way that utility companies are starting to with residential load reduction programs today. Should this occur, utility companies could not only be faced with a smaller installed base of devices which they could have leveraged as load shedding resources, but also it's feasible that a utility company could end up being dependent on third-party devices to purchase reductions in residential electricity consumption at critical times, and be more vulnerable to higher pricing for this than if they were to be working directly with the consumer.

3.2.8 RETAILERS

DEVICES & SERVICES OFFERED

Connected home device retailers have typically been relatively specialist online providers (such as smarthome.com), aimed mainly at those who want to install devices themselves.

However, in recent years, more mainstream bricks and mortar retailers in North America have started to offer connected home devices. Lowe's, however, has entered the connected market in more ways than just selling connected devices by developing its own associated system, Iris, using a platform developed by AlertMe.

Connected home devices which are starting to be offered more by general retailers include thermostats, appliances, window blinds, lighting controls, water heaters, ceiling fans, network cameras and various sensors. In many cases, it expected that suppliers of non-connected devices may start to offer connected devices through the same retail channels used for the non-connected variants. For example, current connected device suppliers to Lowe's include Honeywell, General Electric, Whirlpool, Schlage and Yale.

Other general bricks and mortar retailers are also entering the connected home market, such as Best Buy and Staples. Best Buy has previously been more active in the A/V aspects of the connected home, offering devices such as Smart TVs, wirelessly-connected sound systems and docking stations. It also offers some a small range of connected home devices, such as an Insteon home monitoring starter-kit, smart thermostats and energy monitors. It is expected that Best Buy, and other general retailers, will continue to move more strongly into the connected home market in the coming years. Staples, on the other hand, is focusing on the platform as its priority: Staples Connect will be launching in select stores from November 2013 and uses a platform by Zonoff, as well as integrating devices from a range of major safety, lighting and HVAC device manufacturers.

KEY VALUE PROPOSITION AND CORE CAPABILITIES

The primary value proposition from general retailers is their accessibility and interaction with the customer. Customers are used to purchasing non-connected devices, such as appliances, from such stores and they are therefore well-placed to offer connected alternatives of these devices. Customers typically trust these outlets, which have often already established credibility in the customers' minds. Stores such as these include Best buy, Lowe's and Staples, all of whom are gaining traction in the connected home market.

In addition to this, retailers can offer a large range of devices that are not available from existing or dedicated service providers; because service providers in the connected home market typically focus on 'basic' hardware packages, as a means of selling the service into the home, the range can be relatively limited, particularly in comparison to specialist connected home retailers.

For specialist, typically online, connected home device retailers, the core value proposition is the wide range of devices available for the connected home, with multiple models offered from a range of suppliers, typically clearly marked to highlight interoperability with other devices or systems.

Core competencies vary by retailer type. For example, core competencies of a general retailer might include identifying new segments of growth (whether geographic or product focused), generating appropriate and effective marketing campaigns, including pricing strategies, and creating new ways to interact with consumers and build relationships. Retailers can leverage these competencies in the way they move into the connected home market.

TARGET SEGMENTS

Specialist connected home retailers, which are typically online-only, can target connected home

enthusiasts who are comfortable with setting up their own connected home systems, and have a fair understanding of concepts such as interoperability. Specialist connected home offerings are based on DIY installation because the majority of dedicated device retailers are start-ups, and therefore do not have the capacity to provide installation services or continued customer care. In addition to this, these devices tend to be modular and rely on the user independently purchasing additional devices. Revolv, for example, supplies a gateway, and recommends that it can connect to a number of branded devices (e.g., Sonos, Philips, etc.); the onus to buy these devices, however, is on the consumer.

General retailers, such as Lowe's or Best Buy, are expected to target the general mass market rather than existing connected home enthusiasts. It is expected that device ranges will predominantly offer DIY devices where easy-to-install models exist (such as DIY home monitoring kits, smart plugs and connectivity-embedded bulbs) alongside some, such as smart thermostats, which recommend professional installation. As with non-connected devices, for some devices – such as thermostats and appliances - retailers are expected to offer a growing range of connected device options, as device suppliers increasingly integrate connectivity into high-end, and then mid-range, device models, which appeal to a broad range of consumers.

PARTNERSHIPS

Device manufacturers are the evident partnership opportunity for retailers; while these are primary made up of multinational device suppliers (such as Bosch, Honeywell, and others), retailers can also stock devices from dedicated connected home device suppliers (such as the Nest thermostats, for example).

In addition to this, Lowe's and Staples have set a trend to move across to service provision in addition to retailing devices. As a result of this transition, retailers are beginning to partner with platform providers – for example Lowe's is partnering with AlertMe to provide the Iris platform, and Staples is partnering with Zonoff to provide their smart home/office platform.

ROUTES TO MARKET AND DISTRIBUTION CHANNELS

The route to market and distribution channels for a retail outlet entering the connected home market is very much 'business as usual'. Retailers are consumer facing organizations, selling directly to the consumer either through physical retail outlets or online.

Some retailers offer "own brand" devices alongside those from other device suppliers, and in the mid to long-term, the same is expected to be true of connected home devices. However, initial connected home devices are expected to be sourced through established device suppliers, such as GE, Bosch, Yale, Whirlpool or Honeywell.

REVENUE AND PRICING MODEL

At a basic device level, retailers approach connected home devices using the same business model employed with other devices, i.e., purchasing devices at wholesale prices, adding a margin and selling the device at retail prices to consumers. As mentioned, some retailers will also offer "own brand" alternatives.

There is also the opportunity for retailers to pursue the route that Lowe's has taken by developing a gateway and service proposition, in order to monetize the growing connected home market through recurring monthly fees. Lowe's offers a tiered system, where basic ongoing services are offered with no monthly charge, with additional services incurring an ongoing fee. For more information on the recurring revenue business model, please refer to section 3.3.

Today, DIY is typically the focus of most general retail companies moving into the connected home.

However, as the range of connected devices grows, there is also the opportunity to partner with contractors or installation companies to offer installation services alongside the initial device purchase.

COST STRUCTURE

Typically general retailers moving into the connected home space already have established business lines, and moving into the connected home market does not require major new investment in new physical retail premises, as such devices are typically offered alongside their existing non-connected device ranges, or initially via online channels.

However, unlike other devices, such as standard appliances, thermostats, etc., which have existing (typically replacement) markets established, retailers may need to invest in education programs – for both consumers and retail staff alike – as well as extensive marketing programs.

Specialist connected home retailers are typically online outlets, with relatively low overhead costs. These may be funded in a variety of ways, from personal funding, to SME bank loans.

MAIN COMPETITORS

The main competitors of retailers are other retailers, or other channels offering connected home systems. For example, connected home service providers are increasingly entering the market with a range of hardware packages, including starter-packs, add-ons, or wider 'a la carte' options. In addition, other company types which sell directly to the consumer – such as some dedicated service providers, as well as installation companies, contractors and even utility companies – could emerge as competitors over the coming years.

Typically, however, retail channels can offer a wider range of devices than those offered as part of pre-defined systems. However, it is important to address interoperability issues which stem from open consumer device selection.

MAJOR OPPORTUNITIES FOR FUTURE EXPANSION

There are a number of opportunities for retailers within the connected home market.

GROWING CONSUMER DEMAND FOR CONNECTED DEVICES

As consumers demand a higher degree of connectivity in their lives, driven in part by the rise of always-on smartphones and tablets, connectivity technology is set to permeate a growing number of consumer devices. Interest in the connected home market will also be positively influenced by advertising campaigns and marketing from service providers, such as telecommunications companies and security providers, moving into this market.

This can result in a number of benefits, including generating demand for emerging product categories (such as smart plugs or DIY home monitoring devices); stimulating demand for existing product categories (such as network cameras); increasing the replacement rate of existing non-connected devices, such as thermostats, as consumers are wooed by connected alternatives; the opportunity to cross-sell other connected devices (where interoperable) and increasing sales of high-tier devices, such as thermostats and appliances, as connectivity functionality typically permeates the higher cost device models first.

SEAMLESS SYSTEM INTEGRATION

The issue of interoperability in the connected home market is well-known in the industry, yet less well recognized by a typical consumer. Retailers, as the touch-point for the customer, have the opportunity to help consumers to manage expanding choices in the connected home market, by promoting

the use of a single technology, or ensuring that customers are aware of which devices will or will not work with other devices or an existing system. For example, retailers could partner with service providers to promote certain devices as compatible with those systems. Equally, the topic of interoperability of connected home devices can also be a challenge for retailers – as the customer-facing channel partner, the retailer may face the brunt of issues associated with consumers purchasing the wrong devices.

PROVISION OF CONNECTED HOME SERVICES

As demonstrated by Lowe's, there is also the opportunity for retailers to move into the service aspect of the market, pursuing recurring revenue opportunities through service fees. This can offer a number of benefits, such as increased customer contact (e.g., through the online home management portal or app) and recurring service revenues. For more information the recurring revenue model and its application in the connected home, please refer to section 3.3.

In addition, a retailer offering their own system can pre-test compatible devices which it stocks in its stores, and promote these for use with its own-brand system. As well as resolving issues surrounding interoperability (by highlighting compatible devices to consumers), it offers cross-sell opportunities of compatible devices, and improves customer loyalty as connected home owners will start to associate compatible devices with that particular retailer, and trust that they will be interoperable.

GROWING INSTALLED BASE OF CONNECTED HOME SYSTEMS

As service providers drive growth in the installed base of connected home systems, retailers can benefit from consumers that wish to expand beyond relatively basic connected home 'starter-kits'. While there are still some issues surrounding interoperability to be resolved, there is the opportunity for retailers to sell connected devices which are not typically available as part of the basic hardware provided by service providers, in order to expand system functionality.

MAJOR CHALLENGES TO FUTURE EXPANSION

There are, however, a number of challenges facing retailers involved in the connected home market.

AGGRESSIVE SERVICE PROVIDER PRICING

A range of existing service providers – from security providers to cable operators – are entering the connected home market. Typically such companies offer a range of hardware propositions (from basic to more extensive), with the option to add on further devices following the initial system purchase. This business model removes the retailer from the equation, with device OEMs offering devices directly through the service provider. Service providers typically monetize the connected home through recurring service charges; as such, they may be able to be more aggressive on hardware pricing than the retail market, as the hardware proposition is viewed as a key way of selling the whole service into the home.

INTEROPERABILITY

As mentioned, interoperability is a topic which has plagued the connected home for a number of years. With no single universally adopted connectivity technology, this can cause consumer confusion and a range of issues for retailers. Some device suppliers have opted to pursue a single technology – typically Z-Wave, ZigBee or Wi-Fi. Retailers might stock non-connected devices from a range of device OEMs which enter the market with different connectivity solutions. Alternatively, device OEMs may opt to offer a variety of device models to support a range of connectivity technologies. While this increases the choice for consumers, it also increases the number of SKUs which a retailer needs to carry.

If retailers stock a wide range of connected devices which use a variety of communications technologies, they will need to avoid consumer dissatisfaction if consumers expect that two connected devices purchased at the same store should be interoperable.

FRAGMENTED USER INTERFACE EXPERIENCE

As some device suppliers start to offer remote home management services included in the upfront device costs, a fragmented user experience may start to develop. For example, to control smart plugs, they may need to log into one app, and to control a thermostat, they may require another. Equally, this reduces the ability of devices to interact, e.g., to create scenarios. While this is not a challenge limited to the retailer, the retailer does play a part in this by often being the conduit for these devices to the consumer. While this could, to some extent, be resolved by retailers offering their own service platform to span multiple devices yet offer a single user interface, this topic still remains a challenge for the connected home industry as a whole.

ENTRANCE OF GENERAL PHYSICAL RETAILERS

The entrance of general bricks and mortar retailers into this market represents a major challenge to the dedicated connected home retails, which are typically smaller organizations with an online presence only. General bricks and mortar retailers – such as Best Buy, Lowe's or Staples, are household names in North America; as these companies have more consumer awareness and brand recognition, a physical presence, and often operate on a larger scale, they can pose a threat to specialist online merchants.

3.2.9 CONNECTED HOME PLATFORM PROVIDERS

DEVICES & SERVICES OFFERED

Connected home platform providers do not typically provide hardware associated with the connected home system, instead working to enable the service element of the connected home, specifically relating to cloud-based home control or remote home management packages.

They are typically B2B companies which partner with customer-facing system providers in order to enable the provision of a full connected home package. Services provided by the platform provider will vary by provider; however, some options will include management of the back-end network, provision of remote software upgrades, web portal management and additional system care services.

Examples of connected home platform providers active in North America include iControl, Arrayent, and AlertMe.

KEY VALUE PROPOSITION AND CORE CAPABILITIES

Many would consider platform providers to be the backbone of the connected home value chain. While offerings from these companies vary from system to system, the 'end-to-end' package has become the greatest value proposition for these platform providers, enabling much of the functionality which is driving connected home value from a consumer perspective, such as the ability to receive automated alerts and to manage in-home devices from a smartphone or tablet.

Many platform providers 'white label' their solutions, partnering with customer-facing service providers. For example, while the software platform might be provided by a company such as iControl, from a consumer perspective, the user interface, Web portal and customizable options would all carry the service provider branding (such as ADT, for example). This can be a key benefit to service providers that do not want to invest in R&D to develop and maintain their own connected home software platform, instead contracting this out to a specialist, which retaining benefits such as brand reinforcement and ongoing customer contact.

Many platform providers effectively offer customized platforms for their partners, so while a platform provider may be working with several connected home providers, each platform will be developed based on the specific requirements or preferences of that company, enabling them to customize the system to suit the needs of a particular target segment. In addition, platforms are typically designed to be highly flexible, to support system adaption and expansion both from a service provider perspective (for example, as they add new service packages or features), as well as from a consumer perspective (for example, as they add new devices to their system).

Platform providers are increasingly working with partner companies in new ways to strengthen their value proposition; for example, by enabling additional functionality for the consumer, or by supporting service provider objectives such as system up-selling (for example, by integrating further advertising features and direct access to an online store).

As platform providers offer agnostic solutions, they can cater for a number of different application targets: for example, if company A were to deploy an energy management specific solution, and company B were to deploy a security specific solution, both could be catered for by the application-agnostic platform: the same platform can be optimized for different applications and use cases depending on the requirements of the consumer. Many service providers in North America today are basing connected home services initially around home monitoring. However, as connected home applications evolve, platform providers have the flexibility to help service providers to quickly adapt to offer new services or systems.

Traditionally, platform providers would partner with Web/app developers in order to provide the smartphone or tablet interface control of the system. However, this has typically been a scattered approach, and requires exceptional co-ordination between two parties. Now, however, a core capability of platform providers is the investment of R&D and internal workforce expertise to also provide a smartphone/tablet app: the investment in this across all platform providers may be a great opportunity for segment expansion, as the majority of industry organizations consider the smartphone or tablet to be the dominant user interface for smart home services.

TARGET SEGMENTS

Platform providers typically target organizations that are interested in moving into the connected home, but do not have the current expertise or systems in place to deploy their own existing platforms. Instead, such companies often look to partner with a dedicated platform provider that has already developed connected device platforms and already has the associated expertise.

Connected home providers often target 'Tier I' service providers, such as major cable companies, telecommunications companies and security providers, offering them a means of deploying connected home systems without investing in creating their own platforms. Instead, by partnering with existing platform providers, service providers can more quickly go to market with a connected home system, taking advantage of the software and system capabilities from the dedicated supplier, while leveraging their own capabilities, such as strong brand recognition and services marketing, etc.

In addition, as device suppliers increasingly consider the deployment of their own associated connected home services, they also present an attractive target market for platform providers.

PARTNERSHIPS

As previously discussed, IHS expect platform providers to become the backbone of the connected home industry; for this reason, several connected home providers look to partner with the platform providers in order to offer a specialized service. Key partnerships include:

- Existing service providers will comprise the main partnership opportunity for platform providers; where traditional or specialist home automation providers would have had – and still have – internal expertise on software and platform development, existing providers – such as telecoms or MSOs – do not have the internal expertise available. For this reason, all service providers looking to migrate into the connected home space will require partnering with third party providers. The exception to this rule has been AT&T who acquired software provider Xanboo in order to develop 'in-house' expertise.
- As the majority of device suppliers today do not offer an associated software package alongside their hardware, device suppliers can ensure their hardware adheres to a set of technical specifications outlined by service providers, to enable their devices to form part of these systems. Partner programs set up by platform providers allow device suppliers to access these specifications and therefore design products to adhere to a dedicated system.
- Platform providers can work with established service delivery platform (SDP) providers, such as IBM, which offer a framework upon which to build their solutions. As a result, there is an opportunity for platform providers to develop connected home software solutions on a common platform, which are then offered as a white label solution to other businesses (such as service providers) entering the connected home market. By utilizing this underlying open framework, this can potentially reduce future interoperability issues.

ROUTES TO MARKET AND DISTRIBUTION CHANNELS

Typically, platform providers are B2B-only companies, selling services into partner companies such as customer-facing connected home suppliers (such as device OEMs or service providers that want to enter the home management market).

Many service providers are reluctant to invest in platform development in-house, preferring instead to partner with a dedicated platform provider. Alternatively, however, acquisitions – such as AT&T's acquisition of XanBoo – can also assist a service provider in entering the connected home market.

In the past, some platform providers have tried to take their systems directly to market by offering branded devices to the consumer, for example via their Web sites. However, as more service providers have entered the market, platform providers have typically moved away from offering devices or systems directly to customers, instead partnering with service providers to take advantage of their brand awareness and existing subscriber base.

REVENUE AND PRICING MODEL

The majority of current platform providers 'white label' their products for use by third-party service providers. Pricing models can vary significantly according to the specific agreements in place with each service provider. They can range from a license fee per user, per node, or an overall license fee for use of the platform and supporting infrastructure (such as data centers) up to a specific pre-agreed limit.

In addition to generating revenue from service providers, there are revenue opportunities from connected device suppliers. Many platform providers have partner programs, where the platform provider releases system information to a device partner in order for them to develop a product that speaks directly to the system without the need of a bridge or adjustments to the user interface. This can make up a significant proportion of the platform provider business. While typically, a platform provider will distance themselves from the relationship between the service provider and the device manufacturer, the partner program enables device manufacturer to lobby for integration into the service provider's commercial system.

COST STRUCTURE

Initial investment in the development of a connected home platform varies significantly by company type. Existing platform or software providers such as Arrayent can re-invest existing capital from other ventures or business lines into the development of connected home software.

Alternatively, software providers are often start-up companies. Some are privately funded, whereas others will require external investment. The willingness of external investors to invest in connected home platforms will vary, as will their associated exit strategy, according to factors such as expected return on investment and forecast profitability. According to industry participants, the expected return on investment for connected home platform providers is between five to eight years, depending on the system type, company interest and other external factors.

MAIN COMPETITORS

Software and platform providers occupy a relatively unique position in the connected home market, and they mainly compete with other software or platform providers. Instead of developing the required expertise and knowledge internally, many companies moving into the connected home market opt to partner with dedicated software and platform providers instead.

MAJOR OPPORTUNITIES FOR FUTURE EXPANSION

There are a number of opportunities facing platform providers as the connected home market develops.

TECHNOLOGY AND APPLICATION AGNOSTIC SOLUTIONS

The majority of platform and software solution providers, aside from those contracted exclusively by a specific service provider or those catering to proprietary systems, are both application agnostic and technology agnostic. This provides an interesting opportunity for expansion from these platform providers. Other segments of the industry, such as service providers, can be constrained by the technology that they choose: it would be both costly and time-consuming for service providers to switch from Z-Wave to ZigBee provision, for example, due to the costs of recertifying devices under different standards, or potentially even changing device manufacturer to cater to different technological requirements. However, by providing a technology-agnostic overlay software solution, platform providers can still cater to many different segments of the industry, whether systems run on Z-Wave, ZigBee or a proprietary standard.

PLATFORM FUNCTIONALITY EXPANSION

Platform providers have the flexibility to expand the platforms offered to existing and emerging connected home providers in a number of ways. For example, through application expansion, (e.g., a company previously providing home monitoring services beginning to offering energy management services or A/V control). In addition, platforms can be designed based on specific service provider goals, such as increasing up-sell, powering user interfaces designed to promote related products or services. As service provider requirements evolve, platform providers have the opportunity to enhance the value created for the service provider, developing effective business relationships and moving from a software vendor to a partner.

EXPANDED PARTNERSHIP OPPORTUNITIES

As more companies move into the connected home market, there are growing opportunities for platform providers to form partnerships. For example, device suppliers are also starting to enter this market, and typically employ third-party platforms. While there are proprietary communications technologies

and platforms being used (e.g., by companies such as Schneider Electric), the investment required to transition from device manufacturer to end-to-end solution provider may exceed the investment companies are willing to make to move into this market. As such, partnering with platform providers can offer a cost-effective alternative for the device manufacturer.

In many ways, this can be linked to the potential for partnerships with service providers. Many major existing providers (such as TWC, Verizon and Comcast) are using third-party software from companies such as iControl, primarily because in-house investment in platform development is too costly and time-consuming.

Partnerships with service providers are only one type of partnership opportunity; as more companies enter the connected home market, this opens up new partnership opportunities with a broader range of companies, such as utility companies or device suppliers. Partnerships with device suppliers can take many forms, from creating a connected home platform to allow device suppliers to offer branded device management service, to working with device suppliers to enable interoperability with third-party service provider systems.

MOVEMENT INTO ADJACENT SECTORS

Connected home suppliers have the opportunity to use existing expertise and systems in order to move into adjacent sectors, such as telehealth, utility-driven demand response and residential load control or commercial building services, utilizing their core capabilities to move into new areas of business. Examples could include:

- Consumer-driven health monitoring: working with service providers to enable a means for consumers to log, chart and compare health metrics, with value-added service such as alerts or recommendations.
- Telehealth: extending health measurement portals to provide institutional healthcare partners with patient data and alerts when specific data parameters are crossed (e.g., working with healthcare organizations rolling out blood pressure monitors to all patients in a given location with cardiomyopathy)
- Residential load control: partnering with utility companies or demand response aggregators to provide the system infrastructure to deploy cloud-based residential load shedding programs.
- Commercial building automation: working with building managers, system integrators or device providers to enable cloud-based building automation optimization and control.

CREATION OF A SEAMLESS USER INTERFACE

As more devices become connected, ranging from wireless audio systems to smart thermostats and smart appliances, there is the opportunity for the development of a software platform which can interconnect a range of devices from multiple suppliers, without specific agreements or partnerships being in place. Existing connected home platform providers could be well-placed to work on the development of a platform which can enable seamless interoperability at a cloud-level, across multiple profiles, protocols and suppliers. This could help towards resolving the issue of a fragmented user experience (for example, as device suppliers launch their own apps or user interfaces, and a customer ends up with multiple connected home systems which cannot interact). Although this is not a major issue today, as more companies enter the connected home market, there is significant concern that this situation could start to emerge.

LEVERAGING CONNECTED HOME DATA

The connected home platform is at the center of much of the data generated by activities in the connected home. Platform providers could form agreements with service providers to find a way to leverage this data. Please refer to section 3.3 for further analysis of the connected home data opportunity.

MAJOR CHALLENGES TO FUTURE EXPANSION

However, there are fewer challenges facing platform providers in the connected home.

BACKWARDS INTEGRATION OR INTERNAL CAPABILITY INVESTMENT FROM SYSTEM PROVIDERS

There is the risk that more connected home system providers could seek to internalize the platform provision, either through investing internally in developing the required systems and expertise, or through acquisition. For example, AT&T acquired Xanboo in 2010. A number of platform providers are still relatively small companies which formed out of start-ups, and as such could be potential acquisition targets.

Should this happen on a wider scale, this could reduce the opportunity for platform providers to partner with existing service providers, as the associated platform requirements could already be fulfilled in-house.

RELATIVELY LOW BARRIERS TO ENTRY

Many connected home platform providers today are relatively small start-up companies that have only in recent years, since existing service providers started to enter the market, seen significant traction. The main investment required to enter this market is the development of a connected home platform. With the required software expertise, this may require relatively low capital costs to enter the market. While not all entrants would be successful, as connected home subscriber numbers grow, it is expected that more companies will start to develop platform solutions.

3.3 BUSINESS MODELS IN THE CONNECTED HOME MARKET

This section highlights the current and emerging business models employed in the connected home market. These are supplemented by findings from the recent consumer survey from IHS.

3.3.1. RECURRING REVENUE MODELS

INTRODUCTION

Recurring revenue models, which are common within the connected home market, are typically based around the charge of monthly subscription fees to enable cloud-based home control or home monitoring services. Typically it is the service features which are monetized on a monthly basis, following the initial hardware transaction.

There are a number of variations within recurring revenue models:

- Free basic level of service: some systems, such as those from dedicated smart home automation providers, or some start-ups, offer a basic level of service without a monthly fee, with the option to upgrade for additional features.
- Standard subscription fee: other systems include a standard subscription fee, irrespective of the number or types of devices included in the end system.

- Tiered subscription models: increasingly, cloud-based home management systems are offered under tiered subscription models which have a basic monthly fee for a 'standard' or 'starter' pack of services (in the North American market, these are typically based around basic home monitoring features), with additional hardware and service fees associated with adding further features, such as more extensive home monitoring packages, energy management, or lighting control.

EFFECT ON THE VENDOR

There are a number of characteristics specific to vendors which employ a recurring revenue model:

- Continuous, stable revenue generation. Recurring monthly revenue is inherent to this model: as a result, their future cash flow can be projected. Users are contracted to remain with the service for a pre-specified duration, which provides better visibility into longer-term revenue forecasts than 'one-off' sales models, which may be harder hit by external factors, such as the economic environment. For example, if new demand for connected home services were to decline, a business with a 'one-off' sales model would be hit hard by the resulting lack of new business; whereas a subscription-based business would still be generating monthly income from its existing clients under contract.
- A subscription model enables the vendor to maintain regular contact with the consumer, leading to up-sell opportunities. As the consumer is contacted on a monthly, or at least quarterly basis, the vendor can utilize these customer touch-points (such as account statements or other mail outs) to inform the consumer about new products, packages or discounts available, which potentially increases direct revenue per consumer. In addition to this, this regular consumer contact can help to build awareness and, in some cases, brand credibility.
- Subscription service models can lead to 'vendor lock-in', not just for the smart home service itself, but for additional services, such as broadband, cable or security services. Many connected home service providers have entered the market following extensive activities in other subscription-driven markets (for more information, please refer to Section 3.2). In most of these cases, the original service (whether home security, broadband, cable, etc.) is a prerequisite to subscribing to the connected home service, which is seen as a means of tying consumers in to a new subscription package, increasing average revenue per user, and reducing customer churn (the rate at which subscribers leave a particular product or service provider for a competitor).

EFFECT ON THE CONSUMER

There are a number of characteristics specific to the recurring revenue model which impacts the consumer:

- Recurring revenue subscriptions are often thought to be more convenient for the consumer, and easier to budget for, as typically the upfront costs are relatively low (see examples in section 3.3.2). Where connected home system suppliers are able to generate profits in subscription fees rather than high margin upfront hardware costs, this has helped to move the 'connected home' into the mainstream.
- In addition, in many cases, consumers will already have accounts set up with their connected home service providers for other subscriptions such as electricity, security, or

telecommunications. Opting for a service they can 'add-on' to an existing supplier contract can be more convenient than setting up a new service contract with a new supplier.

- As mentioned, subscription services can lead to vendor lock-in, where a consumer can be dependent on a specific vendor for products and services, unable to switch to another vendor without significant switching costs. Partly, this is due to the length of service contracts, the obligated consumer may find repeated payments of a service they no longer wish to have as onerous: this could be detrimental to the vendor's brand credibility. Additionally, this issue may become more apparent as consumers in existing subscriber relationships with clients are 'up-sold' to connected home services. For example, if a consumer subscribes to a connected home system via their broadband supplier, they might be tied to those broadband services in order to continue with their connected home package, irrespective of whether an alternative supplier offers better broadband tariffs, speeds or quality of service.
- Continuing the theme of 'vendor lock-in', an addition barrier for consumers considering switching connected home service providers is the issue with compatibility with existing hardware. In some cases, changing service providers will require additional hardware, such as bridging devices or new gateway/hub devices – and this can lead to their own challenges of interoperability, compatibility and even managing the transition from one system type to another.

EVOLUTION OF THE COMPETITIVE ENVIRONMENT

Subscription models in the marketplace today are varied, and can be adopted by a number of different company types.

Looking back a number of years, it was predominantly dedicated connected home services providers involved in this market, with companies such as Alarm.com or AlertMe paving the way. However, in the past few years, existing service providers, such as telecommunications companies or security providers, have started to take connected home services more mainstream.

Existing service providers, such as security service providers or telecommunications companies, are considered well-placed to offer connected home services; in part because it offers them a means of reducing customer churn (the rate at which subscribers leave a particular product or service provider for a competitor) and increasing average revenue per user. In addition, these types of companies have strong backgrounds in services marketing, maintaining subscriber relationships, and also already have a target list of potential customers in their current subscribers.

In many cases, the customer-facing service providers partner with platform providers, such as iControl, Control4 or Arrayent order to implement cloud-based home control systems. This can enable the customer-facing service provider to focus on marketing these services to their subscriber base (and beyond), while the platform provider manages the back-end system requirements.

Subscription-based systems are arguably most-suited to systems with relatively low upfront costs, as opposed to high-end home automation systems. Within the high-end automation systems, profits are often generated by the margin built into the cost of the hardware itself, with expectations from some customers that with high upfront fees, the ongoing remote management aspect of the system should be included in the initial investment.

FUTURE OPPORTUNITIES

Today, the penetration rate of cloud-based home control systems is relatively low, even in North America which is at the forefront of the market. The main opportunities within this market lie in increasing the availability, and subscribers, of such systems, by targeting the most appropriate prospects, and offering connected home systems with features which matter most to them, at attractive price points.

The end-user survey indicated that security devices were the most important to consumers to control remotely, with the most typical host device identified as the smartphone. However, many consumers still wished to use centralized control panels to view energy and security data and be able to control devices remotely. Intruder notifications, climate control, window/door lock status and viewing energy consumption were the four most chosen use-cases in the end-user survey. For more information on this, please see section 4.

The emerging connected home services market is a major opportunity for any company with an existing subscriber base, and as such, IHS expects that within the coming years an increasing number of telecommunications companies, security providers and utility companies will enter this market. For these companies with multiple business lines, there is the opportunity to adjust the pricing and margin on a specific offering in order to gain market share and generate profit elsewhere. For example, a company offering both broadband and home control services might be able to offer home control services at a lower cost than competitors which only offer home control services, as the reduction in margin could be offset by an increased margin on broadband services. This also presents a major opportunity for platform providers and device suppliers who can partner with existing service providers to enable them to effectively develop and go to market relatively quickly with connected home solutions. For platform providers and device suppliers, this approach allows them to take advantage of the existing subscriber base, brand names and B2C marketing expertise of the existing service provider.

The use of tiered subscription models – where a consumer can start with a basic 'starter-pack' and expand their connected home system in a modular basis – is expected to become increasingly common within the connected home market. For service providers, this presents the opportunity to continue to upsell consumers to additional devices or services, and to reduce customer churn (the rate at which subscribers leave a particular product or service provider for a competitor) by becoming increasingly entrenched in a customers' lifestyle.

Today, some companies providing cloud-based home control services opt to reduce the ability of consumers to interconnect other devices, for example by using proprietary wireless technologies, or employing a proprietary profile over an existing standard technology, in order to maintain a closed system. However, many in the industry argue that it is in the best interests of a variety of company types to promote wider interoperability at a device level. Currently, cloud-based home control service providers often need to short-list or recommend compatible devices so that the consumer is able to add additional devices to their network. However, if challenges around interoperability can be resolved, in the future consumers can be educated to understand for themselves which standards could be used to add further devices to their connected home network. This scenario presents an opportunity for many company types. For device suppliers, it presents a larger opportunity to sell directly to consumers. For platform providers, it represents a higher number of nodes under management. For service providers, it can lead to a higher number of devices networked in the home which are being controlled under their home management services – making the subscriber more 'sticky', and reducing customer churn (the rate at which subscribers leave a particular product or service provider for a competitor).

There is also the opportunity for companies to approach the market without trying to enable vendor lock-in; instead reducing contractual barriers to switching, but aiming to maintain competitive advantage through a superior offering, such as a wider range of compatible products, lower costs, or better levels of service. While this may seem counter-intuitive, many SaaS businesses have managed to retain customers based on developing their value proposition in such a way that many who leave to go elsewhere end up returning. Companies such as Netflix, for example, have put increasing emphasis on how easy it is for consumers to subscribe and unsubscribe from the service. As the consumer has the option to be released from the contract, a frictionless relationship is developed between the two

parties. While each subscriber's revenues are not assured as with more rigid contracts, the development of a strong – and unique – value proposition can naturally reduce the level of customer churn (the rate at which subscribers leave a particular product or service provider for a competitor), while increasing customer goodwill. In addition, some of the initial hardware costs associated with a cloud-based home management system – such as the initial purchase of a gateway which might be redundant with an alternative provide – can act as a barrier to switching suppliers, even without lengthy service fees.

Today, there is the risk that as the penetration of cloud-based home control systems grow, consumers could end up with multiple service providers per household, which could lead to a fragmented user interface experience for consumers – for example, needing to open and close multiple apps to control different devices in the home, and not being able to realize the value of truly interconnected systems (for example, for scenario creation). This is both a challenge and a major opportunity for the industry.

Over 70% of consumers in the end-user survey indicated that they would find a single app/platform across multiple systems valuable, rather than having separate apps for different connected devices (for example, one app for lights, one app for the temperature, etc.). Specifically, 37% of respondents selected that they would only choose a system which allows them to use a single app or program.

As more consumer devices are connected, and data is transferred into the cloud as part of managed home control platforms, this presents a major opportunity for service and platform providers to monetize this data. This is a key topic within this study, and is addressed in section 3.2 of this report.

FUTURE THREATS AND RISK FACTORS

There are numerous examples of industries where subscription models have successfully become the norm, such as cellular phone contracts. However, typically these are most commonly associated with goods or services which consumers have come to view as a necessity rather than a luxury. While mass market availability of connected home systems is making such systems more affordable and accessible to a wider range of end-users, they are still arguably a luxury rather than a necessity, which could threaten the willingness of consumers to pay for systems in this way. However, over time, the perception of connected home systems as a luxury could change. Even 10 years ago cellphones were considered a luxury, and now they are arguably a necessity; the same could be true of the future connected home, particularly with focused use-case based marketing and growing consumer adoption.

The cloud-based home control market – which is at the center of the recurring revenue model – has already undergone a number of changes to the competitive environment. As more existing service providers, such as security companies or telecommunications companies, enter this market, it represents a major threat to the dedicated home control providers. Companies with an existing subscriber base in other areas have typically already invested in extensive B2C marketing activities, have strong customer recognition, and have a list of existing subscribers to market home control services to. The smaller, more niche dedicated home control suppliers will need to either innovate their offerings to demonstrate unique customer value (such as by providing a means to aggregate disparate user interfaces) or partner with the service providers to jointly offer smart home services.

In addition, there is threat from other companies entering this market, ranging from device suppliers themselves to retailers. Today, remote home control (which underpins the recurring revenue model) is still an emerging market, and overall penetration rates remain low. Typically, the main service providers role out this offering by service region, and availability for consumers continues to grow. As penetration rates grow, the focus will inevitably start to shift from obtaining new customers to winning market share from rivals; as with many industries, this presents the threat of price-based competition, which could erode the average revenue per user significantly over time. In addition, the use of

recurring revenue models is already at threat from device suppliers or other companies which offer affordable devices, with the monthly fee rolled into the upfront cost. If this should become more commonplace, it will start to threaten the expectation that the ongoing cloud-based home control service is something that has additional recurring fees associated with it, with consumers starting to expect that this should be provided as standard. Should this happen, service providers would need to look for other ways to monetize connected home services, as highlighted in section 3.3.4

An additional threat, as highlighted in the previous section, is that as more companies enter this market – many focusing on specific aspects of the connected home, such as appliances, home monitoring, or energy management – the consumer could become faced with a home which is more fragmented than connected. Much of the value of the connected home comes from simple, easy, and quick to use control of in-home devices, and the automated interaction between different device types. If the connected home industry continues to develop in a fragmented manner, much of this value will be lost.

Even where a consumer has a single connected home system, they may want the flexibility to select and add their own devices to the network. With a range of issues around interoperability – even where standard technologies are used – this can lead to customer dissatisfaction.

While there is the opportunity to educate consumers to understand which devices can and cannot be added to a specific network, there are still some issues around the associated customer service and troubleshooting requirements. For example, if a consumer cannot add their new smart plug to their home control system which they obtained through their broadband supplier, who do they call to resolve this? If the issue lies with the backend platform underpinning the system, would either the broadband supplier or the smart plug manufacturer be responsible for resolving this? While logically the answer might be 'no', from the consumer perspective this can lead to discord with both the device supplier and customer-facing service provider alike. With issues such as this set to become more common, this does present an opportunity for companies to aid in the installation and expansion of connected home systems.

3.3.2. UPFRONT COSTING MODELS

INTRODUCTION: UPFRONT COSTING MODELS

The upfront costing model applies to companies which sell systems with a single one-off cost, generally based around specific hardware, although in some cases additional services (such as cloud-based home control) are also included. In some cases, credit might be available with these purchases (such that the consumer pays the upfront costs over a number of months or years).

Companies can differentiate their offerings in a vast number of ways, with products varying dramatically across a range of parameters. Examples include price, route-to-market and system type.

- **Price** – within this segment, there is a very broad price range for devices. Some companies, such as Crestron, Lutron and VIA are very focused on the high-end, premium segment of the market. Premium suppliers are often end-to-end solution providers (in some cases in conjunction with partner companies), rather than simply hardware providers. In contrast, others, such as Lowe's are more focused on competing based on value for money, at the lower end of the price scale.
- **Route-to-market** – there are multiple ways to bring connected home devices to market. In some cases, device suppliers will sell these directly to consumers, such as via their Web site. Consumers can also purchase systems via retailers, both online and physical. In addition, many devices are available via contractors or installation companies, as well as through

other service providers, depending on whether they need to be professionally installed or are designed as DIY solutions.

- **System type** – connected home systems can vary in many ways, one of the notable ways is whether devices are designed as self-install (DIY) or need to be professionally installed. This will impact other factors, such as price and route-to-market. In addition, vendors must decide whether to implement 'open' or 'closed' networks. An open network would allow customers to add compatible devices from other vendors to the system; whereas a closed network would be designed to only enable devices from the original vendor to be integrated into the system (e.g., via the use of a proprietary protocol).

EFFECT ON THE VENDOR

There are a number of key features specific to vendors pursuing the upfront purchase model:

- More sporadic customer touch points. Unlike with recurring revenue models, where a consumer enters into an ongoing billing relationship with a vendor, there are fewer natural opportunities to upsell to additional features. For example, a consumer might purchase a connected home system upfront, and not interact with the vendor for many years.
- Without recurring revenue generation, such as monthly service fees, revenues are based exclusively on upfront sales. This can cause challenges when projecting future revenue generation, and can make the vendor more sensitive to external events – for example, fluctuations in consumer spending – than for companies with ongoing service contracts.
- The connected home market offers strong potential revenue growth, with annual revenues from devices alone projected to more than double from 2012 to 2017 (Source: IHS, 'Connectivity Opportunities in the Smart Home – World – 2012'). Premium or cost plus models could have good profit margins, based on quality of service over volume, whereas low cost models could reap high revenue gains from low profit margins, basing the model on high volumes of relatively inexpensive products.
- Where vendors have implemented 'open' systems, which can use hardware from multiple suppliers, the consumer is able to implement a system from one company, and add to the system, or replace existing devices, with those from other suppliers. This can provide the consumer with a wider range of options, but for the vendor it can lead to price competition with other vendors, and a less predictable market for replacement or add-on devices.
- Where vendors have implemented 'closed' systems, the consumer is effectively tied to using devices from the original vendor. For the vendor, this means that the market for add-on or replacement devices is more assured; however, aspects such as pricing and device availability will need to be carefully managed to ensure consumer satisfaction. For example, if a game-changing function becomes available on a different platform, the consumer may become disappointed if they cannot add this to their own system.

EFFECT ON THE CONSUMER

There are a number of key features specific to the recurring revenue model which impacts the consumer:

- The upfront pricing model – whether high-end, mass market or other – is easy for the consumer to understand and budget for, without recurring repayments, terms and conditions, or unexpected recurring costs. Consumers can determine whether or not they can afford the upfront cost, and purchase a system accordingly. Many consumers can be wary of recurring

subscription fees for a good or service that is viewed as a luxury rather than a necessity, as there is a fear that even though it might be affordable now, personal financial circumstances could change.

- With vendors needing to generate profit exclusively through the upfront fee, this can make the cost of some connected home systems prohibitively high for some consumer segments. However, with more lower-cost, often DIY devices available, this is making connected home systems more affordable across a range of customer segments.
- While consumers are not tied into a contractual agreement in the same way as with the recurring revenue model, consumers can still be locked in to a specific vendor, depending on whether they have opted for an open or closed system type. Some consumers today are not familiar enough with the technical challenge of interoperability to know initially if their system is open or closed; particularly with closed systems, this is not a main feature of most marketing collateral. This could lead to consumer dissatisfaction if they expect to be able to use devices from multiple vendors.

EVOLUTION OF THE COMPETITIVE ENVIRONMENT

Upfront costing models in the marketplace today are varied, and can be adopted by a range of different company types.

Traditionally, connected home device vendors have been the main users of the upfront costing model. Examples are varied from device suppliers which make their devices available through dedicated retail channels, such as the Internet-based Smarthome.com, which sell a wide range of typically DIY connected home devices from multiple device vendors, to high-end connected home specialists which have established strong brand names and go to market via contractors, such as Crestron or Lutron. As the trend towards cloud-based home control continues, companies which have previously followed the upfront costing model will need to decide whether to offer the ongoing service element with no recurring revenues (e.g., built into the existing cost of the system), whether to move to a recurring revenue model, or whether to monetize this trend through other means.

This same decision will need to be made by companies entering the connected device market, such as appliance manufacturers or HVAC suppliers. For companies which only supply one element of a connected home system, there can be a challenge of how to integrate this into a wider system. Arguably the true worth of a connected home system relies on multiple device interoperability, and if each device is connected via a different system or user interface, this can reduce system value to the consumer. This can also be a challenge for retailers which offer connected home devices from multiple vendors using an upfront costing model. This is an issue which has been tackled by Lowe's, which has partnered with a platform provider, AlertMe, to launch the Iris platform. Rather than deploy disparate devices, device suppliers can market their devices as compatible with the Iris system (which Lowe's monetizes through a gateway and tiered recurring revenue model), to allow consumers to purchase compatible devices from multiple suppliers.

High-end home automation companies often utilize the premium upfront business model to monetize connected home products. Typically, fewer total systems are shipped, but margins could be higher to reflect the customized solutions involved. Systems are often priced based on the associated cost, length of project, complexity of the system and the level of customization involved. Upfront costing is often considered most appropriate for these projects, as the length of time associated with the solution set-up and development requires large expense, so an initial full or partial fee is paramount to system deployment. As the systems are very expensive, aftercare service or extended system care is often provided as part of the initial price.

The upfront costing model may not be suited to companies which are using connected home systems as a means of tying users into other services, particularly where there is no element of ongoing service (such as complimentary cloud-based home control). For example, if an existing provider of other services such as broadband, used the upfront costing model alone to offer connected home hardware – while this may attract more subscribers initially – it would not have the long-term impact of tying consumers into their broadband services (which are often a prerequisite to purchasing the connected home system).

FUTURE OPPORTUNITIES

As cloud-based home control becomes more widely available to the mass market, there is a major opportunity for companies which provide devices or systems under an upfront costing model to expand from hardware alone to offering associated services, such as remote home management. This could be done by moving to a recurring revenue model, or including the fee for ongoing services in the original device cost, either building in estimate lifetime pricing or offering the service at no add-on cost in order to pursue increased sales, competitive advantage, customer loyalty, or monetize the service in another way. By adding a service element to the upfront sales of connected home hardware, this can help companies move from one-off hardware suppliers to ongoing service providers. This provides the vendors with more ways to reach the customer (such as via a Web portal or app) and potentially upsell to other products, or improve their prospects in the replacement market. In addition, this presents the opportunity for platform providers to partner with device vendors or others (such as retailers) in order to develop collaborative services.

As more cloud-based home control systems become available to the mass market, and subscriber penetration starts to grow, this in itself creates an opportunity for companies pursuing the upfront pricing model. For example, as the installed base of connected households using an open system grows, this presents an example for device suppliers to provide easy-to-integrate, interoperable devices to this wider customer base. Even as the installed base of closed connected home networks grows, this poses the opportunity for companies to develop systems which can integrate with these closed systems, such as by the use of gateways or developing systems where device interoperability can be enabled in the cloud, without requiring communication directly between individual devices. This could lead to a situation where a consumer has multiple connected home gateways. Typically, for connected home gateways that form part of mass market systems, the gateway cost is included in a wider initial hardware package, along with other devices such as motion sensors, window/door contacts or smart plugs. This avoids having to test whether or not consumers would pay for the gateway alone, instead marketing a solution-based package instead of a device-centric package. This application-based marketing is considered key to connected home success, focusing on solution-based messaging rather than taking a hardware-centric focus. Connected home gateways available today are typically relatively unobtrusive and IHS believes that, provided they are part of a solutions-based package which offers attractive applications and enables valuable features, consumers are unlikely to be put off by having 'yet another box', provided the installation and utilization of the system is simple. However, it is important to note that this assumption has not been specifically verified by an end-user survey.

This issue does also raise the opportunity for a new approach to this market. For those that feel multiple gateways will be unattractive to consumers, there could be an industry effort to create a common 'box' featuring standard connected home hardware and connectivity into an open platform, with multiple USB ports. As more connected home entrants move into the market, they could work under this initiative to enable their solutions through a USB-connected mini-gateway featuring their unique requirements (such as a specific connectivity technology) to result in a single connected home

gateway with a number of vendor-specific, relatively unobtrusive, USB-connected mini-gateway additions. Importantly, IHS makes this suggestion from a market perspective, and has not tested the technical feasibility or implications of such as approach.

Improving interoperability across different vendor devices would present an opportunity for companies which rely on upfront hardware revenues. This is important not only at the device level, but also on a system control level, for example by enabling a seamless user interface across many device types.

FUTURE THREATS AND RISK FACTORS

Companies pursing the one-off costing model may be at risk from new entrants offering lower cost upfront charges based on recurring revenue models where they can recoup lower margin hardware revenues with ongoing service fees.

As revealed in the interviews that IHS conducted as part of this research, some industry experts feel that the recurring service fee model will continue to prevail over the upfront costing model, primarily because the consumer may be 'priced out' by upfront cost model, which requires a larger up-front cost to the consumer. Instead, some feel that if the recurring revenue fee is added on top of an existing recurring subscription charge (such as for broadband, cable, security or electricity), then it can represent an overall more attractive package. This assumption was tested in the recent consumer survey conducted by IHS as part of this study, which revealed that while respondents that wanted to perform connected home functions were generally willing to pay a monthly fee to enable this, overall up-front cost models also had a significant level of support. For more information, please refer to Section 4.

For consumers with recurring revenue services, this usually dictates which devices they buy to comprise their connected home systems, often as part of a shortlist of devices or vendors supplied by the connected home service provider. For consumers purchasing multiple devices under the upfront costing model, they could easily end up with a number of disparate connected home devices, without a seamless user interface or the ability to interoperate. This is a major risk for the connected home industry as a whole: as more companies enter the market, some aiming to be whole-home solution providers, and some aiming to just offer connected versions of their existing product ranges, without careful management there could be a number of connected home users left with a dissatisfying user experience. For companies offering a service, this risk is managed by pointing the consumer in the direction of devices which are pre-qualified as interoperable. However, under the upfront costing model, a user might have a variety of connected home vendors, and it is unclear where the ultimate responsibility for providing a seamless experience lies.

Many companies following the upfront cost model do not have an ongoing service relationship with their consumers. Without this, companies often need to differentiate themselves based on hardware alone. This is more the case for mass market providers, rather than high-end system providers which can differentiate based on services (such as installation) and levels of customization.

As more companies enter the connected home market, there is a major risk that some connected home devices could become commoditized very quickly, severely eroding margins, particularly for companies which don't already have strong, low-cost manufacturing bases or partners. This is likely to be more of a risk for products where the main value proposition is its 'connectedness', such as a meter clamp, connected window/door sensors or smart plugs. Whereas for other devices, such as connected appliances, these devices can continue to be differentiated based on other value propositions, such as efficiency, style, or by the multiple ways of control that could be used (e.g., remotely controlling the device in response to a demand response or energy saving alert).

Companies currently pursuing an upfront cost model can include additional ongoing services within the upfront device or system cost as a means of offering an ongoing service plan without pursuing the recurring revenue model. While this presents its own opportunities, it will need to be carefully judged and managed, as there is the potential that lifetime service costs could severely eat into profit margin.

Complete home automation system providers, such as Crestron and VIA, are examples of companies which pursue the upfront cost model. Many companies which pursue this model offer whole-home systems which are sold via contractors or professional installation companies. As existing service providers, such as Verizon, AT&T and Comcast launch mass market home control systems aimed at enabling DIY installation, this could impact on consumer willingness to pay for professionally installed systems which often have high upfront costs.

3.3.3. FURTHER CONNECTED HOME MONETIZATION STRATEGIES

INTRODUCTION

Aside from monetizing smart home offerings through upfront or recurring revenues, there are a number of other approaches which can be employed as part of a connected home strategy. For example, the monetization of value-added services, which are often dependent on a system or device having already been deployed to the consumer. Existing and emerging examples include the monetization of connected home data, user interface advertising, e-commerce and auxiliary product ordering, demand response or peak load control, and remote diagnostics and maintenance. The examples below have been broadly grouped into two sections: the monetization of data to improve industry-driven revenue (expanded cloud service, data monetization and remote diagnostics, for example), and the expansion of system functionality to generate consumer-driven revenue (such as connected neighborhoods, the addition of PV integration and home health services). However, there is not always a finite distinction between these two groups.

EXPANDED CLOUD SERVICES AND 'BIG DATA' ANALYTICS

Typically, cloud services and 'big data' analytics underpin many of the monetization strategies outlined below.

Cloud services are pivotal to the development of connected home solutions: by their very nature, connected devices require a central point of connectivity and data storage in order to operate 'intelligently' – i.e. to learn patterns, use online information such as weather forecasts, or interact with other devices in a pre-defined and adjustable manner. The cloud is an effective way to enable this type of functionality: whereas traditionally this operational data would have been stored in central servers (and still is in some high-end home automation solutions), the cloud can enable exceptionally higher storage of data at relatively low overhead costs.

In addition to reducing overhead costs and enabling additional device functionality, utilizing the cloud for data storage and back up can help companies realize the monetization of 'big data'. While this concept can be unnerving for consumers, big data analytics can help to monetize the data from the connected home consumer – such as device functionality, times of use, length of cycle – to help target marketing and advertising campaigns and enable the remote diagnostics and e-commerce applications highlighted later in this section of the report.

Data analytics can be used in a multitude of ways to monetize the connected home. By using the cloud, data can be easily shared and distributed across multiple sources. This includes:

- Sharing data between connected home systems, such as the use of 'neighborhood' systems where information can be passed and shared between individual houses and the service

provider in order to actuate connected functions. For example, if one house has a light sensor installed, all houses in the local area can sign up for the service to lower their blinds at sunset.

- Centralizing data to allow for consumer access or comparison. For example, hosting electricity consumption data in the cloud and allowing consumers to opt-in to making this visible to certain parties, such as sharing this data between neighbors or friends in order to compete for energy saving incentives.
- Using freely available public information on the Internet, such as local weather forecasts, to make the operation of devices more responsive to external factors. In the recent consumer survey from IHS, almost three quarters (74%) of respondents with an interest in connected home applications considered it valuable (either very or moderately so) to be able to use online information to automatically adjust device or system operation.

The above scenarios present only a limited number of examples of the value of cloud services and big data analytics. However, both themes are common across the vast majority of further monetization strategies outlined in the remainder of this section.

MONETIZATION OF CONNECTED HOME DATA

As more consumer devices become connected into the cloud, the data generated by such systems will continue to grow. This creates the opportunity to monetize this data in a number of potential ways.

Data can be used in-house by connected home device suppliers in order to assist in cross-selling or up-selling to other products or services from that suppliers range. Alternatively, connected home data could, within the realms of country-specific data laws, be sold to third-party companies, in order to enable them to target advertisement or marketing plans to specific groups of individuals. The vast amount of data provides a significant opportunity for service providers looking to expand product lines, or third-party companies looking to monetize the connected home space via value added services. Connected home data can also be used to improve the performance or operation of connected home devices. For example, a number of smart thermostat providers collect data from homes to optimize in-home climate control for both energy efficiency and comfort purposes. In addition, some thermostats use online weather forecasts in combination with this user-generated data, presenting major opportunities for companies that can enable this level of analytics and associated automation.

Initially, some connected home device or service providers view this as a means of increasing revenue from existing smart home users. However, other companies are expected to use the potential revenue generation from connected home data as a way to offer connected devices at no additional premium to unconnected devices; reducing profit margin on the upfront hardware sale, but creating a wider installed base of connected home users to generate data from. This is viewed as a means of resolving the issue that some people are unwilling to pay a premium for connected home devices, even if they do perceive the connected variants to offer some benefits.

This approach could have a number of implications for the market: if connected home devices are offered at no premium to unconnected variants by some device suppliers, this is likely to squeeze the ability of other vendors to obtain a premium.

It is very important to note that the use of, and particularly the sale of, personal data is subject to a range of privacy laws. With some consumers already wary of the vast amount of personal data generated in the connected home, the industry will have to very carefully manage the ways in which it monetizes this data moving forwards.

Section 4 provides insight into consumer expectations and concerns about data privacy and data sharing based on the recent consumer survey conducted by IHS. Interestingly, almost two-thirds (63%)

of respondents that wanted to be able to perform connected home functions would be willing to allow the device supplier or other associated company to use and securely distribute their device-related data to its partner companies in exchange for an incentive, such as a lower cost device or instead of a monthly subscription fee.

There is a very broad range of companies which could benefit from the data generated by connected home systems. Examples include:

- **Home insurance providers**. Currently, a consumer with a professionally monitored security system is eligible for a rebate on their home contents insurance of up to 20% (depending on the provider). Some expect this rebate effect to trickle down into the self-managed and self-monitored market within the coming five years. A number of industry players have proposed that insurance companies could use connected home data to assess the risk profiles of individuals, and target them with appropriate offers, such as reduced contents insurance. For example, those who purchase remote flood detectors but do not live in a premises considered prone to flooding may be a lower risk customer than those that live in flood-prone areas and do not have connected alerts. Equally, those that have a connected intruder alert but have had no unexpected triggers may be a better prospect than those who never set an alarm or have repeated triggers.
- **Utility providers**. As connected home systems can generate data which shows when, and how, different devices are activated, this type of data could be used by utility companies to target non-customers, recommend appropriate tariffs to existing customers, cross-sell relevant devices, such as in-home displays or energy efficiency improvements, or even assess suitability for demand response programs.
- **Device suppliers**. Connected home data can be fairly far-reaching, and could be used to estimate when devices are approaching end-of-life, or where major performance or efficiency improvements could be made. For example, if data from a connected home system indicated that a washing machine was reaching the end of its service time, or was a low-volume machine being used multiple times per day, this data could be very useful to appliance manufacturers looking to target marketing activities around new washing machines or trying to upsell existing users to higher capacity machines.

Some of the examples above raises the issue of who 'owns' the data that is generated, and how connected home companies can utilize it to their advantage while maintaining strong relationships – and trust – with consumers. As companies launch connected home devices, they need to consider how this data will be used. For example, if an appliance manufacturer launches a range of connected appliances which are compatible with a range of with third-party platforms to enable cloud-based control or monitoring, the appliance manufacturer needs to be aware that the data generated could, depending on any agreements in place, end up in the hands of competing suppliers.

USER INTERFACE ADVERTISING AND E-COMMERCE SOLUTIONS

One of the key trends anticipated for the future connected home is the ability for companies to use user interfaces, such as control panels, smartphones, or tablets to advertise additional products and services, warranty discounts, and other up-sell services to the consumer. Vendors could monetize this by leasing or renting advertising space on connected home user interfaces to third-parties to promote relevant products, as well as use these displays to cross-sell their own products and services. Alternatively, connected home system providers could advertise devices or services from partner

companies in exchange for a proportion of direct revenues. Examples include advertising a light bulb offer from a third-party when the user controls their lighting via their smartphone, or recommending the purchase of new auxiliary products, such as air filters for an A/C unit, when connected devices indicate they will be needed shortly. Alternatively, if a consumer reaches the expiration of the warranty for a particular device, an advertisement for extended aftercare services can be sent remotely to the consumer's user interface.

An extension to the monetization of connected home data is the use of this data to enable e-commerce as part of the system for add-on or auxiliary devices, so that device offers can be linked to payment details stored on the system to enable easy, or even automatic (based on preset preferences) ordering of devices. For example, a rule might be set up by the consumer such that if their pool pump filter is about to wear out, the system will automatically order a replacement to be delivered a few days before it needs to be replaced, using pre-entered credit card details.

User interface advertising, e-commerce solutions and leveraging connected home data can present advantages for both consumers and service or device providers.

Consumers have the opportunity to receive information about complementary or ancillary products that they might previously have not been aware of – for example, some appliance manufacturers could investigate partnerships with soap or washing powder manufacturers – in order to offer discounted products to connected appliance owners.

Consumers have the opportunity to pre-order ancillary or complementary products directly from the in-home system, provided a credit or debit card is associated with the system itself. Based on pre-specified consumer preferences, certain products can be ordered automatically. This can lead to better convenience and improved brand loyalty. For example, if a connected home system automatically orders a specific type of washing powder after a pre-specified number of washes, the consumer may be less likely to be swayed by other brand offers they see in physical stores.

As highlighted in section 4, peripheral product replacement was considered valuable by more than 65% of respondents to the recent survey from IHS that wanted to be able to perform connected home functions. In addition, a further 123 respondents outside of this sample frame (i.e., those that did not want to be able to perform the connected home applications outlined in the survey) also indicated that peripheral product replacement would be valuable, which indicates significant interest in this feature outside of those interested in the typical home automation based features of connected home systems.

Connected home vendors and partner companies can benefit from increased contact with the consumer by repurposing the user interface to display messages, notifications, advertisements or offers. This also creates improved revenue generation opportunities through cross-sell and up-sell messaging, and the monetization of the advertising space or associated data.

However, there are also a number of challenges associated with the strategies outlined above. For example, there is ongoing concern from consumers about the use of their personal data, with companies such as Facebook, Google, and others all coming under fire in the recent years. While data protection and privacy laws do affect the storage, usage and sale of personal data, some consumers feel that these laws do not do enough to protect them. With the climate of suspicion around the use of personal data, connected home vendors will need to carefully manage how they pursue the use of data to generate new revenue streams, and avoid consumer backlash.

Connected home system vendors will need to ensure that advertising – either of their own products or services or those of others – does not detract from the user experience. For example, if a consumer has to battle past various adverts every time they want to use a smartphone app to interact with their system, this could be considered annoying and tantamount to 'spamming'. This feeling is likely to be

exacerbated if the user pays for the service or system; whereas if the user interface is provided free of charge, as in the world of smartphone gaming apps, advertisements might be considered acceptable.

REMOTE DIAGNOSTICS, FIRMWARE UPDATES AND MAINTENANCE

Connected devices can, with the owner's permission, use remote diagnostics features to allow information about the device performance to be communicated back to, for example, an appliance manufacturer. Notwithstanding previous comments regarding data privacy and security, services such as remote diagnostics, firmware updates and maintenance features can offer significant value to both the consumer and the device vendor.

This information can be used in a number of ways. Vendors can remotely pre-empt expensive repairs by analyzing device diagnostic information, letting the consumer know that a device needs servicing or a part may need to be replaced. It could also be used as an upsell tool to extend warrantees or service contracts, for example by highlighting the parts of the device at risk of failure over the coming warranty period.

Remote diagnostics can enable the consumer to stay informed about the status of their device, warranty and other potential information. This enables consumers to make informed decisions about purchasing new devices or renewing warranties. When a device is reaching the end of its lifecycle and not performing at full capacity, the vendor can use this information to promote a new device, for example by offering a trade-in bonus.

In addition, remote diagnostics capabilities can save time and associated costs for both the vendor and the consumer by automatically diagnosing a fault, without needing to send out a repairman to assess the problem before ordering and returning on a separate day with the required parts or tools. This type of information could be beneficial in developing further revenue generation opportunities by contracting out repair work.

As with some of the other features outlined above, such as e-commerce, remote diagnostics can create an additional link between the consumer and the vendor. In some cases, the additional functionality and convenience can help to differentiate the device vendor, and also build further brand loyalty. In the recent consumer survey from IHS (analyzed in chapter 4 of this report), more than 80% of respondents that wanted to be able to perform other connected home functions considered remote diagnostics to be a valuable function. In addition, further respondents that had not reacted positively to the home automation-like functions typically associated with the connected home considered this feature to be valuable, indicating a wider target market outside of standard connected home customers.

CONNECTED NEIGHBORHOODS – EXPANDING THE CONNECTED HOME ECOSYSTEM

As connected home systems become more common, this presents an opportunity to expand the connected home network to create a connected neighborhood, driving a number of value-adding features and associated service revenues (e.g., through a service premium). This can be approached in a number of ways. For example, consumers can opt to share certain data on a common platform, for comparative or competitive purposes. This approach has already been promoted by a number of companies. For example, Wireless Maingate – while a primarily European enterprise – hosts links to social media sites such as Facebook, where consumers can compare their energy consumption or compete against one another within a close neighborhood.

These systems do not need to be focused on energy alone. For example, an online 'neighborhood watch' could be an interesting proposition for North American consumers. The recent consumer survey from IHS indicated that home monitoring functions were most likely to be considered desirable for

respondents, with applications such as interactive intruder alerts, network camera feeds and hazard alerts (such as flood notifications) all proving popular. Connected home systems could be extended to enable users to create 'connected home networks' with their friends, family or neighbors, such that an alert is also shown on other pre-defined connected home users' interfaces (whether a smartphone, tablet, Smart TV, etc.) if an alarm is triggered.

This would become particularly valuable for consumers that travel frequently or have a second home. For example, if an individual is abroad, they may have disabled 3G/4G connectivity (due to high data roaming charges) and may not always be connected via Wi-Fi. In these instances, a connected 'neighborhood watch' system could be particularly valuable. The multiple host-device functionality that has become typical with mass market connected home systems (i.e., when an alert is activated, the same notification will appear on, and can be switched off from, multiple devices) can be extended to selected family and friends. This could mean that each time there is an alert on the system, this is extended across a pre-defined network of family or friends which can investigate the alert. Additional notifications on the system (such as '"Friend: Jane" has resolved the security breach') could be used to reduce the number of duplicate actions on a particular alert. The creation of these types of systems could also help to leverage 'word of mouth' promotion and be deployed in conjunction with 'recommend a friend' offers, as connected home users consider who they would like to be part of their neighborhood networks.

The above example involves consumers creating a named network within a neighborhood or community. However, the growing installed base of connected homes also presents the opportunity for the creation of an anonymous system which leverages the growing rate of data gained through connected home systems to improve individual system functionality.

As long as the data is made available by individuals in the neighborhood, the service provider can utilize the data to improve the service provided to less 'smart' connected home systems. Reiterating the example provided earlier in this section, consumers living in a primarily shaded environment (such as in a canyon or in a high-rise close to other high-rises), there could be a challenge to using a light sensor to detect when the sun sets and automate the closing of window dressings (e.g., lowering blinds). If an individual in the same vicinity (e.g., at the top of the canyon or outside of the highly built up location) also has a connected home system which includes a light sensor, then information could be used from this sensor to automate the connected window dressing in a separate home.

An alternative example is where a connected home system features a flood alert. If this is triggered, the service provider could correlate this information with Internet-based weather information to assess whether this is likely to be household specific (e.g., a burst water pipe) or a more general hazard (e.g., a flooded river) in order to alert other connected home users in a similar area, without indicating the household or location where the original alert was triggered. This sort of 'unknowing' neighborhood intelligence could be offered as a value-added service for consumers.

INSURANCE PROVIDER PARTNERSHIPS

Home insurance providers could play a key role in the deployment of connected home systems. Home insurance providers often already offer reduced insurance premiums for households with a monitored home security system. Typically, this discount can be up to 20% (Source: ADT Website, www.adt.com, November 2013). Considering the number of homes worldwide with monitored security systems, this represents a significant potential aggregate cost saving. These savings could contribute to the cost of the monitored system. Connected home system providers could work with insurance companies to provide similar discounted rates for further connected home features, such as connected hazard detectors (e.g., smoke alarms) or leak detectors.

While the above example monetizes the connected home through cost savings for consumers, home insurance providers could also provide a direct revenue stream. For example, a home insurance provider may partner with a connected home system supplier to facilitate the deployment of relevant connected devices in order to reduce the value of claims made by the insurance provider's customers each year. An insurance provider may cover claims totaling millions of dollars each year for a recurring fault. A connected home system supplier could deploy a system using sensors to detect and alert insurance providers or customers to early signs of this particular fault, so that they can subsequently facilitate the dispatch of a professional to fix the fault before substantial damage has occurred. For example, the detection of a leaking pipe and its subsequent repair may significantly reduce the damage sustained by the individual's property. Crucially, these systems may be able to be used to reduce the value of the claim made by the insurance provider's customer, with this reduced pay out covering the cost of the connected home system.

To this end, connected home system or service providers could target home insurance providers, citing the potential for connected home systems to reduce insurance claims. For the insurance provider, this may result in the ability to reduce associated premiums provided to customers, allowing them to compete more effectively in the marketplace by attracting and retaining customers. Importantly, they could also reduce the value of pay-outs by reducing the level of damage sustained through 'early warning' systems.

WARRANTY AND INSURANCE PROVISION

The topic of warranties is important to consumers. In the recent survey from IHS, almost 90% of respondents expected their connected home systems or services to come with a warranty, with 32% expecting a lifetime warranty. Typically, a warranty is the responsibility of the original device supplier. However, as many device suppliers are primarily B2B companies, warranties can also be supported by channel partners, such as retailers or service providers. The consumer may deal with the device supplier directly, e.g., through hardware support helplines, or via a channel partner which has contracted with the device OEM to provide hardware support or warranty services.

While not responsible for the device warranties, others in the channel may have their own responsibilities for effective system operation. For example, installation companies or contractors may be required to pass system or device quality standards checks before completing system setup, to ensure that the system itself is installed correctly. These companies would often be held accountable by consumers for the quality of the installation, and faced with charges or re-installation if problems develop as a result of incorrect installation. However, if issues are caused by the devices themselves, or the software associated with the system, the onus will fall onto the respective supplier organizations.

Installation companies can also be contracted by service providers to perform fault and maintenance operations to detect where a fault in the system lies if it malfunctions. Installation companies can then determine the cause of system failure and work to correct the fault, or pass on the information to the service provider or device manufacturer if the issue lies with these aspects of the system.

Aftercare offering vary significantly by company and system type. For example, specialized home automation companies often provide high-end whole-home solutions, where some aspects may even be integrated into the structure of the home. Insurance is often an optional extra, and would generally have to be purchased alongside personal/home contents insurance. However, many providers – such as members of VIA – offer aftercare services: as the price of such systems is typically very high, the hardware and system installation is considered to be only a part of the solution. Aftercare services are popular with high-end providers as a core differentiator, as it provides the 'personal touch' that is not typically seen with mass market solution.

Connected home device and system insurance is an interesting topic. The majority of industry participants interviewed in the process of this research were dismissive of the suggestion of dedicated connected home system insurance, partly as it may to some extent be covered under existing programs. However, the recent consumer survey from IHS revealed that more than 63% of respondents that would like to be able to perform connected home functions would like the option to purchase insurance on a connected home system, with younger age groups more likely to select this response. This presents a further monetization avenue for companies in the connected home market, from device suppliers to system or service providers, through to retailers or installation companies.

DEMAND RESPONSE OR PEAK LOAD CONTROL

Demand response and peak load control has been deployed in different parts of the world for a number of years, with a wide range of associated models and varying levels of success.

Looking back a number of years, demand response or peak load control was often the main focus of some connected device deployments. However, the response from customers was often lukewarm at best, with some groups of customers displaying quite open hostility to the premise as a whole. While there are many examples of successful demand response programs – such as the Florida Power & Lights 'On Call' program (which, according to the company Web site has more than 780,000 customers enrolled)– a number of lessons have been learned from early demand response deployments, such as the fact that concerns around privacy and security need to, in some way, be relieved, and that demand response programs will only be a success if there is a tangible benefit to the consumer. For example, this might include significant savings on electricity bills, through either a rebate or lower pricing tariffs. In addition, if there is sufficient automation built into the system, demand response can also alleviate any manual response from the consumer: for example, disabling the refrigerator defrost cycle during peak hours, or automatically scheduling a dishwasher to run overnight, based on pre-defined customer preferences.

In more recent years, the focus of connected devices has shifted to focus on aspects that the consumer values – ranging from remote home management to automated energy savings through intelligent connected devices (such as the Nest learning thermostat).

It is not the role of this report to focus extensively on the prospects for utility-driven demand response programs, for which patchwork approaches have developed across North America's fragmented utility industry. However, it is interesting to note that with a growing installed base of connected devices, this represents an increasing amount of energy demand which could, with the permission of the user, theoretically be harnessed for demand response activities.

There are a number of ways in which connected home programs could develop in this direction. For example, connected home service providers could purchase consumer permission to remotely, incrementally, adjust device operation at times of peak demand through offers such as rebates or discounts as part of direct load control programs. A similar model is today employed for certain industrial and commercial applications. The connected home service provider could then partner with local utility companies to offer the use of this service in times where the grid is reaching capacity or to avoid the use of inefficient, expensive 'peaker' plants which are sometimes fired up for a matter of hours per year. Alternatively, as the installed base of connected devices grows, utility companies could directly approach their customers (for example, by partnering with a connected home provider to obtain a list of customers with connected devices) in order to arrange such services with consumers directly, for example in exchange for lower electricity rates.

While this concept is considered to be an opportunity more for the longer-term than immediately

(in part because the installed base of connected devices is still relatively low), it is important to note the potential for connected devices to be used in this way. This becomes even more of an interesting concept once electric vehicles begin to become more commonplace, as there is the potential for an electric vehicle to be used as an energy storage device – for example, charging to capacity when electricity demand is low (for example, at 3am), using this stored electricity at peak times. This concept in itself, while of interest to many, is currently being disputed by some parties connected with the electric vehicle industry over concerns surrounding the impact that this would have on the electric vehicle battery and its performance or longevity.

As the installed base of connected devices grows, and new devices become part of a connected home system, it is important to continue to monitor and assess the potential for new business models, such as this.

HOME HEALTH SERVICES

According to the recent consumer survey from IHS, conducted as part of this study, 57% of respondents that selected personal health monitoring as a desirable connected home function also rated this as a 'top five' connected home function. 55% of those respondents would also be willing to pay a monthly fee to be able to self-monitor their personal health data. This indicates health monitoring may be an interesting avenue for connected home providers to investigate further, as it aligns well with the core connected home architecture in terms of connected devices and associated software platforms. For further detail on the findings of the consumer survey as they relate to home health services, please refer to sections 4.1, and 4.2.

IHS makes the distinction between two types of connected health applications – telehealth and consumer health monitoring. Telehealth refers to the remote exchange of physiological data between a patient at home and medical staff in a hospital or healthcare provider, to assist in diagnosis and monitoring. Consumer health monitoring is the use of connected health devices by individuals to monitor their own personal health data.

TELEHEALTH

As highlighted in a recent study from IHS, 'Telehealth – World – 2012', the ageing population has led to a larger proportion of patients requiring long-term care, further increasing healthcare expenditure. It is suggested that as more people are living longer they are more likely to develop chronic diseases. This is increasing the demand for facilities that can offer assistance in long-term treatment. As a result, there is a growing desire for patients to be monitored in their home environment using telehealth technologies to reduce regular hospital visits for routine check-ups, as a means of increasing treatment experience and reducing costs.

The United States is the most market-based healthcare system in world, and despite the current healthcare reform, this will continue to be the case through the mid-term. It is also the only developed country that has not offered some form of universal coverage. Because of this, the U.S. health system is focused more on curative measures than preventive. For this reason, U.S. healthcare systems today are not in a good position to provide nationwide preventative telehealth systems: as the majority of reimbursement is provided by insurance companies, the monetization of telehealth programs in this region are not conducive to effective national telehealth systems.

Healthcare in Canada is partially market-based, and will therefore still be – to some extent – reliant on the efforts of insurance companies in order for telehealth or consumer health monitoring systems to evolve. However, approximately 70% of Canadian health expenditures come from public sources, with the rest paid privately (both through private insurance, and through out-of-pocket payments). The

development of telehealth in Canada is therefore expected to be dependent on the actions of both public healthcare organizations and private providers.

It is IHS' expectation that telehealth may be too much of a specialist market for many companies in the connected home ecosystem to become involved, particularly as consumers cannot 'opt in' unless they have specific conditions and are under the care of a participating healthcare provider. Telehealth programs will be primarily led by health providers (public or private), health insurance companies and dedicated health device manufacturers, and cannot be easily penetrated by external providers with a more general focus. The exception, however, is for software and platform providers which may be able to partner with those in the healthcare ecosystem to enter this market, enabling the back end platforms and network infrastructure.

Companies entering this market will need to be aware of the stringent, and often country-specific, regulations impacting this market. For example, in the U.S., moving electronic protected health information into cloud computing platforms requires compliance to the Health Insurance Portability and Accountability Act of 1996 (HIPAA) and the Health Information Technology for Economic and Clinical Health Act (HITECH). The HIPAA Privacy Rule (which protects the privacy of individually identifiable health information), the HIPAA Security Rule (which sets standards for the security of PHI), and the HIPAA Patient Safety Rule (which protects information being used to analyze patient safety events) are enforced by the Office of Civil Rights (OCR).

CONSUMER HEALTH MONITORING

Consumer health monitoring can use similar healthcare devices to telehealth systems, these systems are not connected to a healthcare body, instead only allowing consumers themselves (or those they opt to share the data with) to monitor health metrics. This segment is in part driven by the prevalence of personal mobile devices, namely smartphones, and the growing penetration rate of connectivity in consumer healthcare devices, such as blood pressure monitors and weight scales. There is currently a wealth of mobile health apps, allowing users to transfer readings from a medical device. Measurements from these devices can be viewed and stored locally, on devices such as smart phones, or uploaded to independent cloud-based systems. Unlike in the telehealth market, consumers purchase their own devices from retail channels, instead of being provided with them by healthcare professionals.

As interest in consumer-driven health monitoring grows, there could be the potential to have a common platform across the wider 'connected home', adding a further application strand, and becoming more entrenched in consumer lifestyles.

As with telehealth applications, it is vital to understand the associated legislation. Developing a thorough understanding of the regulatory environment can be time-consuming, especially when addressing the HIPAA "grey-area" of connected home health device data storage. IHS recommends that connected home providers looking to migrate into the consumer health monitoring market should do so by partnering with specialist connected health device manufacturers who understand the regulatory market and have experience in developing HIPAA-compliant health devices.

INDEPENDENT LIVING OR ELDERLY MONITORING

Independent living systems are one of the most interesting and attainable opportunity areas for connected home providers looking to migrate and expand into health-related applications. These kits can provide remote monitoring capabilities for individuals concerned for their own well-being, or caregivers who are looking to ensure the safety and wellbeing of a relative, spouse or friend. While consumer health monitoring devices may be included in this system (for example, blood pressure monitors may be linked into the system so the relative is notified if the blood pressure monitor is not used within

a 24 hour period), the independent living packs typically include a number of devices that are more commonly seen in home monitoring kits. Typically, these kits use devices such as motion sensors, pressure sensors or window/door contacts (used on anything from a pill cabinet to a fridge) to monitor information on the daily routine of an individual and notify the caregiver if the individual deviates from their daily routine.

Independent living systems are considered by IHS to be an appropriate extension of current connected home capabilities as much of the core hardware and software functionality can be enabled with familiar solutions. As mentioned, home monitoring hardware shares a lot of commonality with the devices used in independent living systems, and existing backend platforms already typically include data analytics which can be extended to detect and monitor daily routines, sending notifications to relatives or caregivers if there is a deviation, in much the same way that intruder alerts can be sent to multiple system users. As a result, the level of re-investment to move into this market is considered to be relatively low, as it builds heavily upon current connected home expertize. In addition, these systems can be targeted not only at the individuals themselves, but more likely at their family, typically their adult children, who can also obtain piece of mind from such a system.

IHS' end-user survey indicated that more than half of respondents that had a panic button or emergency response system in place to monitor elderly relatives also indicated they would like a system that uses technology such as motion sensors or alerts on a pill cabinet that automatically alerts them if their elderly relative or spouse deviates from their standard routine. While the sample size was low, this may indicate a potential marketing avenue of those who already own basic systems but could be upsold to wider functionality.

RESIDENTIAL PHOTOVOLTAIC (PV) INTEGRATION

Market information in this section of the study is based on a recent report from IHS, "Integrated PV Market Tracker – 2013".

The cost of domestic electricity is on the rise in the U.S. and Canada; for this reason, many individuals are looking to invest in residential PV systems. As energy management becomes an increasingly common component of connected home offerings, the integration of residential PV systems can present a value-adding opportunity.

The attractiveness of investing in residential PV systems will vary by location and the associated legislative framework in place. In 2012, California, New Jersey and Arizona dominated the PV market in the U.S., with PV deployment driven by renewable portfolio standards (RPS), state policies which require utilities to supply a specified amount of electricity from renewable energy. As of Q3 2013, 37 states have RPS policies in place. California is the largest RPS market for PV as costs have become competitive with other renewable power sources. Other states have solar carve-outs which require that a certain portion of the required renewable power come from solar. Other incentives for PV vary from state to state and commonly take the form of rebates covering some of the cost of systems, aimed at both commercial and residential PV installations; however, states such as California and Hawaii have state-level incentives to induce residential adoption of PV. For example, the California Solar Initiative (CSI) is a state rebate program offering incentive payments to the purchaser after the system has been installed. The incentive amount varies by sector and system size and the minimum system size eligible for rebate is 1 kW.

Although Ontario currently dominates the Canadian PV market, other provinces in Canada are beginning to introduce incentive schemes. Some other provinces offer net-metering for renewable energy, allowing the sale of any excess electricity after one year, and Alberta offers small grants which are aimed mostly at farmers in remote areas. Due to energy prices in Canada being fairly low,

installations outside of Ontario are mostly off-grid and are built in remote regions where grid-connection is not possible.

IHS expects that the relative increase in uptake of residential PV systems via incentive schemes, particularly within Ontario, will increase awareness of 'smart' alternatives to connected home energy management systems, where the PV system can be directly linked into a utility-led residential load control solution and can act as a determinant for demand-response activities.

There are a number of ways that PV providers and connected home device or system providers can work together to leverage this market. For example, Sunrun, which leases PV systems to consumers and purchases or sells the associated output, has partnered with Nest Labs in order to help users get more out of both their PV systems and their thermostat. The companies are offering a free Nest smart thermostat, as well as $250 worth of electricity for Sunrun customers. Meanwhile, Nest customers that wish to use solar installations will get $500 worth of electricity if they sign up for Sunrun's service.

Service providers can work with PV providers to leverage the growing interest in residential PV installation through improved services driven by integration into a connected home system. In addition, utilities could also increase the use of PV systems in conjunction with connected home energy management systems by providing incentives to integrate PV systems – prolific on the West Coast – into connected home energy management systems, for example, by providing the consumer with improved electricity tariffs or rebates when they use solar energy and an associated energy management system to reduce net grid electricity consumption during peak hours.

CONNECTED CAR

The 'connected car' concept has a number of facets, principally driven by connection to other devices within the car itself via technologies such as Bluetooth or Wi-Fi, and broader, longer range connectivity provided by cellular technologies such as 3G or LTE and location-based technologies such as GPS. The inclusion of these technologies, for applications such as navigation, vehicle tracking or media content distribution is projected to grow over the coming years [Source: IHS, Automotive Infotainment Market Tracker 2013].

For many people, the daily commute to and from work involves the use of a car. In many countries, however, the use of a cellular handset while driving is prohibited. The smartphone is expected to be a pivotal device when interacting with connected home systems, both when consumers are in the home and outside of the home. There is the potential for the integration of the connected car into the connected home system, using an in-car infotainment system to display notifications or enable the control of connected home devices. An example may include the ability to control a connected HVAC system, via an in-car infotainment system, while driving back to your home.

Further, many of the 'control' aspects associated with the integration of the connected car into the connected home system could be automated. For example, making use of the connected car's global navigation satellite system [GNSS] solution to track location and, the proximity of the car to the individual's home could be used to raise its temperature or turn on the lights. IHS believes that this increased automation based on the interaction between multiple connected systems will provide the greatest value to the end-user.

Alternatively, the connected car could facilitate the transfer of media content between devices in the home and the in-car infotainment system, reducing the need for portable storage media and improving convenience for the end-user.

The connected car, then, presents itself as an opportunity for connected home system or service providers to generate additional revenue. Connected car integration could be offered as an 'upgrade' to typical connected home services or systems, with an associated price premium. Alternatively, it

could be used to create differentiation from the services or systems otherwise available in the marketplace. This could generate additional direct revenue, through either increased subscribers or system sales, or increased recurring or one-off revenues for either of these company-types.

To enable this, the widespread availability of in-car infotainment systems that support the downloading of apps, or the tethering of a smartphone and the support of its associated apps, is critical. Due to low replacement rates and long design cycles in the automotive industry, it is unrealistic to assume that a connected home software program introduced at the beginning of a model's lifetime will necessarily remain relevant at the end. The fast-paced nature of change in technology and the rapidly evolving services available in the connected home therefore require an in-car platform that is dynamic and can be updated. The use of apps here is ideal, as, when new services are available, the app can simply be updated over-the-air to reflect any changes in the services offered.

Connected home integration will likely include benefits for tier one component suppliers to the automotive industry. As infotainment device suppliers will inevitably look to continue to differentiate from competing products, the connected home may provide them with a means of doing so. Ultimately, as the uptake of connected home systems continues to grow, vehicle manufacturers may view the inclusion of connected home services within the infotainment system as a differentiator, selecting devices that incorporate this functionality.

Additionally, there is the potential for vehicle manufacturers to monetize connected home integration through an additional fee charged to the consumer, passing on any potential premium incurred from the tier one supplier. This could be achieved through the provision of 'packs', including connected home integration for a premium price, which customers are able to specify when purchasing the vehicle.

Connected home service and system providers could collaborate with in-car infotainment device suppliers to develop software solutions and ensure the relevant connectivity technologies are included within these devices to enable connected car integration with the connected home. As highlighted above, one of the critical components will be a dynamic in-car platform that facilitates the updating of in-car connected home solutions, whatever format these may ultimately take.

As highlighted previously, as more companies become involved in different facets of the connected home, there is the potential for a fragmented user experience to develop with a lack of interoperability between connected systems. This issue is considered in further detail in Section 2.4 of this report.

4 END-USER SURVEY ANALYSIS

4.0 INTRODUCTION

This section of the report analyses responses to questions in the consumer survey conducted by IHS, and designed in conjunction with project steering committee members, as part of this landmark study.

Chapter Four of this report utilizes a number of sources to help form and develop the analysis presented, as follows:

- End-user survey – The recent survey conducted by IHS, with input from the CABA "Monetization of the Connected Home" project steering committee, forms the basis of the analysis of consumer perception or attitudes toward the various issues facing the connected home. This survey is the main source of data presented within this chapter.
- Industry knowledge within the IHS project team obtained as part of the research process for recent reports, such as "Connectivity Opportunities in the Smart Home", "Smart Home Energy Management Systems" and "Smart Home Consumer Survey – US, Brazil, UK, Germany & China".

Recommendations included in this section of the report represent the view of IHS, formed in conjunction with the above research methods.

Additional demographic analysis can be found in Appendix Two, with Appendix Three containing additional end-user survey analysis not deemed to be key for inclusion in the main text of the report.

4.1 CONNECTED-HOME DEVICE OWNERSHIP

SUMMARY AND KEY IMPLICATIONS

This section presents the key implications from the analysis contained within Section 4.1. Each subsequent section of this chapter begins with its own summary of findings.

- Over 70% of respondents indicated they did not own any of the connected home devices listed in the end-user survey. As this is not a stratified sample, the intention of this question was not to determine the overall ownership levels of connected home devices, but to identify

connected home device owners as a sub-sample population to cross-analyze against other responses or demographics. Many respondents that did not currently own a connected home device still indicated that they would like to be able to perform connected home functions, highlighting the opportunity to expand the current user base.

- Respondents with higher household income levels, more positive attitudes to technology adoption and energy efficiency and those that own security systems were most likely to have owned connected devices, highlighting a potential "sweet spot" with respect to target demographic. Additionally, this emphasizes the relatively restricted appeal (with respect to demographic segments) that connected home devices have had so far and highlights the need to broaden appeal.
- On average, respondents owning connected devices owned approximately three different connected home devices suggesting potential upsell and 'bundling' opportunities, both within an application segment and for wider application ranges. For example, while the sample size was low, more than half of respondents which had a panic button or emergency response system in place to monitor elderly relatives also indicated they would like a system that uses technology such as motion sensors or alerts on a pill cabinet that automatically alerts you if your elderly relative or spouse deviates from their standard routine.
- Interestingly, respondents with positive technology adoption scores were more have paid an installation fee for their systems, rather than install them personally. This is in-line with findings in Section 4.3. Crucially, respondents with a more negative attitude toward technology adoption were less likely to opt for professional installation, most commonly due to the perception it may command a higher fee. This is consistent with the finding that respondents from lower income households were less likely to have a high technology adoption rating. This indicates that to appeal to consumers with less positive technology adoption scores the system should be offered as "self-install".

OVERVIEW

Table 4.1 presents an overview of responses to Question 2.1: "Which of the following connected device do you currently own?" As this is not a stratified sample, the intention of this question was not to determine the overall ownership levels of connected devices, but to identify connected device owners as a sub-sample population to cross-analyze against other responses or demographics.

Table 4.1: Question 2.1 - Connected Device Ownership
Overview; Number of Respondents

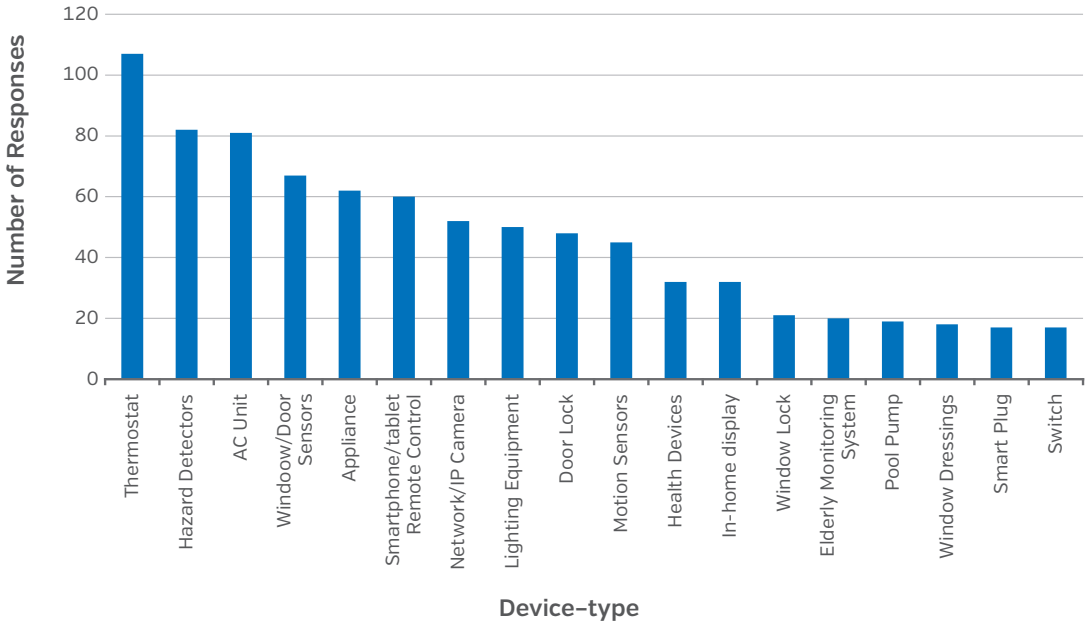
	Number of Respondents
Thermostat	107
	11%
Hazard Detectors	82
	8%
AC Unit	81
	8%

	Number of Respondents
Windoow/Door Sensors	67
	7%
Appliance	62
	6%
Smartphone/tablet Remote Control	60
	6%
Network/IP Camera	52
	5%
Lighting Equipment	50
	5%
Door Lock	48
	5%
Motion Sensors	45
	5%
Health Devices	32
	3%
In-home display	32
	3%
Window Lock	21
	2%
Elderly Monitoring System	20
	2%
Pool Pump	19
	2%
Window Dressings	18
	2%
Smart Plug	17
	2%
Switch	17
	2%
None of the above	722
	72%
Total (n)	1,000

Source: IHS © 2013 IHS

- The number of respondents owning connected devices was relatively low, with almost three-quarters (72%) of respondents indicating they did not own any of the connected devices listed.
- The most common devices were based around HVAC control (connected thermostats or connected A/C units), home monitoring (motion sensors, window/door contacts, hazard detectors, network/IP cameras or door locks), appliances, lighting control or smartphone/tablet-based home entertainment control.
- Collectively the 278 respondents owned 830 connected devices, suggesting that respondents that own connected devices typically own more than one. On average, each respondent with at least one connected device owned approximately 3.
- It is worth noting that the connected device ownership levels appear higher than might be expected for certain devices, such as A/C units or appliances. This could be due to inherent bias in the survey (e.g., people owning connected devices might be more willing to take part in a connected device survey), or it could suggest that some consumers are still unclear on what constitutes a connected device, despite the detailed definition provided by IHS in the survey.
- Typically, there was a correlation between the types of connected devices already owned by respondents and the use-cases they expressed an interest in during their response to Question 2.2. For example, those that owned connected thermostats or air conditioning units were more likely to select the climate control use-case, while those indicating they owned connected hazard detectors or windows or door sensors were more likely to opt for a home monitoring use-case.
- Respondents with a major decision-making role were more likely to own at least one connected device. Forty percent of these respondents selected that they owned one or more connected devices, compared with only 22% of respondents with a minor decision-making role, and 13% of respondents with no role in the household decision-making process.

Chart 4.1: Question 2.1 – Connected Device Ownership



Source: IHS © 2013 IHS

Table 4.2 shows connected device ownership by household income level.

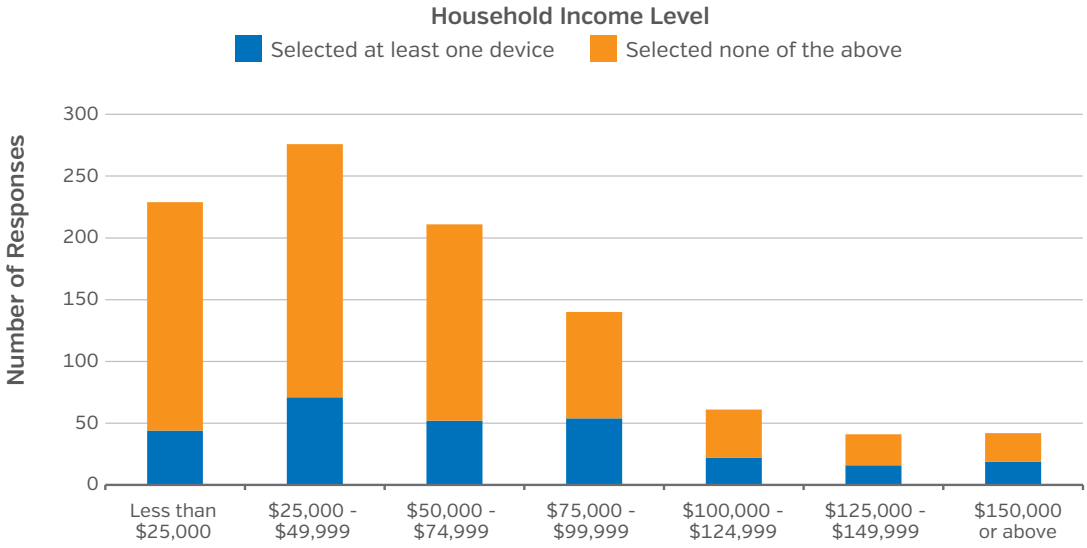
Table 4.2: Question 2.1 - Connected Device Ownership
By Household Income Level; Number of Respondents

	Less than $25,000	$25,000 - $49,999	$50,000 - $74,999	$75,000 - $99,999	$100,000 - $124,999	$125,000 - $149,999	$150,000 or above
Selected at least one device	44	71	52	54	22	16	19
	19%	26%	25%	39%	36%	39%	45%
Selected none of the above	185	205	159	86	39	25	23
	81%	74%	75%	61%	64%	61%	55%
Total (n)	229	276	211	140	61	41	42

Source: IHS © 2013 IHS

- Respondents with higher household income levels were more likely to own a connected device.

Chart 4.2: Question 2.1 – Connected Device Ownership



Source: IHS © 2013 IHS

Table 4.3 shows connected device ownership by technology adoption score.

Table 4.3: Question 2.1 - Connected Device Ownership
By Technology Adoption; Number of Respondents

	Positive	Neutral	Negative
Selected at least one device	188	62	28
	52%	16%	11%
Selected none of the above	173	320	229
	48%	84%	89%
Total (n)	361	382	257

Source: IHS © 2013 IHS

- Respondents with a positive technology adoption score were significantly more likely to own one of the connected devices listed.

Table 4.4 shows connected device ownership by attitude to energy efficiency.

Table 4.4: Question 2.1 - Connected Device Ownership
By Energy Efficiency Rating; Number of Respondents

	Positive	Neutral	Negative
Selected at least one device	215	57	6
	38%	16%	9%
Selected none of the above	353	309	60
	62%	84%	91%
Total (n)	568	366	66

Source: IHS © 2013 IHS

- Respondents with positive energy efficiency attitudes were more likely to own one or more connected devices. They were also more likely to own a connected device focused on energy management.

Table 4.5 presents connected device ownership by security system ownership.

Table 4.5: Question 2.1 - Connected Device Ownership
By Security System Ownership; Number of Respondents

	Security System Owners	Non-Security System Owners
Selected at least one device	154	124
	61%	17%
Selected none of the above	100	622
	39%	83%
Total (n)	254	746

Source: IHS © 2013 IHS

- According to the data, respondents with security systems were far more likely to own a connected device than those without a security system.

DEVICE COST

Table 4.6 presents respondent answers to Question 4.1, "How much did you pay for each of the following devices?" Only respondents that indicated they owned a connected device in Question 2.1 were asked this question.

Table 4.6: Question 4.1 - Connected Device Cost
Overview; Number of Respondents

	<$21	$21 - $40	$41 - $60	$61 - $100	$101 - $150	$151 - $200	$201 - $300	$301 - $500	$500+	Unsure	Total (n)
Thermostat	12	18	7	9	8	3	3	0	1	46	107
	11%	17%	7%	8%	7%	3%	3%	0%	1%	43%	
Hazard Detectors	9	14	4	4	6	1	2	0	3	39	82
	11%	17%	5%	5%	7%	1%	2%	0%	4%	48%	
AC Unit	9	9	8	7	7	4	2	1	3	31	81
	11%	11%	10%	9%	9%	5%	2%	1%	4%	38%	
Windoow/ Door Sensors	12	15	2	2	2	2	2	1	1	28	67
	18%	22%	3%	3%	3%	3%	3%	1%	1%	42%	
Appliance	6	9	3	5	2	2	2	1	2	30	62
	10%	15%	5%	8%	3%	3%	3%	2%	3%	48%	
Smartphone/ tablet App	12	7	6	1	2	0	3	1	1	27	60

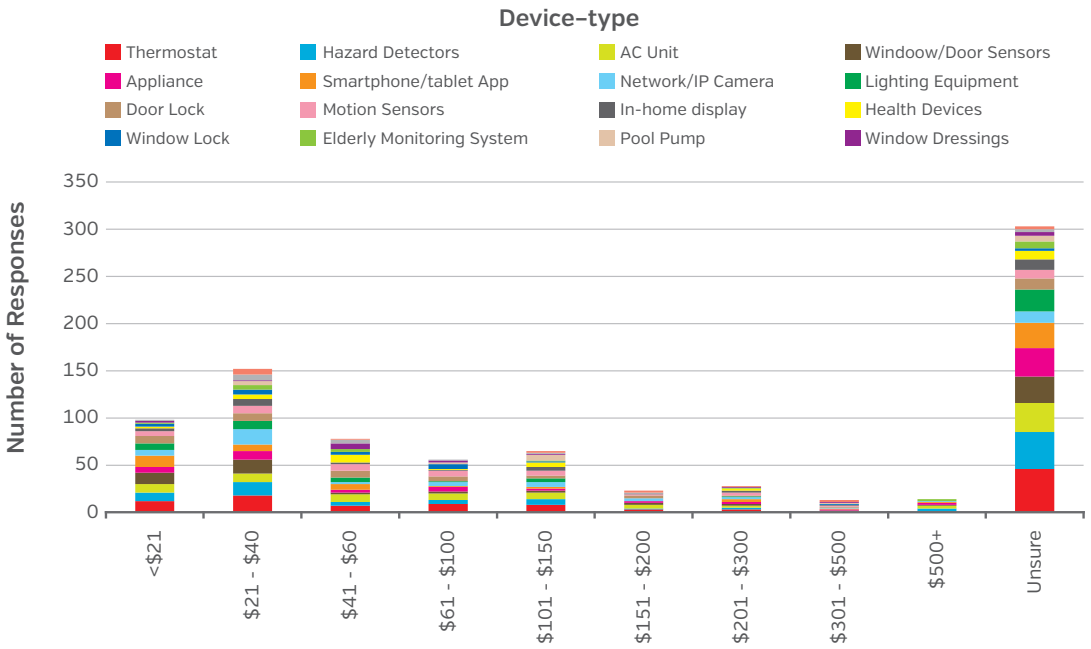
	<$21	$21 - $40	$41 - $60	$61 - $100	$101 - $150	$151 - $200	$201 - $300	$301 - $500	$500+	Unsure	Total (n)
	20%	12%	10%	2%	3%	0%	5%	2%	2%	45%	
Network/IP Camera	6	16	2	4	5	3	2	1	1	12	52
	12%	31%	4%	8%	10%	6%	4%	2%	2%	23%	
Lighting Equipment	7	9	5	1	4	0	1	0	0	23	50
	14%	18%	10%	2%	8%	0%	2%	0%	0%	46%	
Door Lock	8	8	7	5	3	3	1	1	0	12	48
	17%	17%	15%	10%	6%	6%	2%	2%	0%	25%	
Motion Sensors	5	8	7	6	5	1	3	1	0	9	45
	11%	18%	16%	13%	11%	2%	7%	2%	0%	20%	
In-home display	3	7	2	1	4	1	2	1	0	11	32
	9%	22%	6%	3%	13%	3%	6%	3%	0%	34%	
Health Devices	2	5	8	1	5	0	2	0	0	9	32
	6%	16%	25%	3%	16%	0%	6%	0%	0%	28%	
Window Lock	3	5	3	5	1	0	0	1	0	3	21
	14%	24%	14%	24%	5%	0%	0%	5%	0%	14%	
Elderly Monitoring System	1	5	3	0	1	0	1	0	2	7	20
	5%	25%	15%	0%	5%	0%	5%	0%	10%	35%	
Pool Pump	0	4	0	2	6	0	0	1	0	6	19
	0%	21%	0%	11%	32%	0%	0%	5%	0%	32%	
Window Dressings	2	1	6	2	1	0	1	1	0	4	18
	11%	6%	33%	11%	6%	0%	6%	6%	0%	22%	
Smart Plug	1	6	4	1	1	1	0	0	0	3	17
	6%	35%	24%	6%	6%	6%	0%	0%	0%	18%	
Switch	0	6	1	0	2	2	1	2	0	3	17
	0%	35%	6%	0%	12%	12%	6%	12%	0%	18%	

Source: IHS © 2013 IHS

- In many cases, respondents indicated they were unsure of the price they had paid for these devices. This may be because they came as part of a package, or because the devices had already been installed in their homes when they moved in.

- These responses provide a top-level overview of what respondents paid for their devices; however, due to the small sample frames involved, further demographic analysis of limited value.
- The number of people indicating they paid less than $20 for a connected appliance suggests possible confusion between a connected home appliance and that of a module to enable connected features.

Chart 4.3: Question 4..1 – Connected Device Cost



Source: IHS © 2013 IHS

SYSTEM FEES

UPFRONT COST

Table 4.7 presents respondent answers to Question 4.2, "How much did you pay upfront for your connected home package?" Only respondents that suggested their connected device came as part of a package in Question 4.1 were asked this question.

Table 4.7: Question 4.2 - Upfront System Cost
Overview; Number of Respondents

	Number of Respondents
Less than $100	7
	5%
$100 - $199	2
	2%

	Number of Respondents
$200 - $299	5
	4%
$300 - $399	5
	4%
$400 - $499	0
	0%
$500 - $749	3
	2%
$750 - $999	1
	1%
More than $1000	3
	2%
Nothing - Monthly Sub	22
	17%
Nothing - Installed Previously	42
	32%
Unsure	41
	31%
Total (n)	131

Source: IHS © 2013 IHS

- Interestingly, most respondents indicated they were either unsure of the "upfront" system cost or that it was previously installed in their homes.
- Again, the small sample frame makes further demographic analysis of limited value.

INSTALLATION FEE

Table 4.8 presents respondent answers to Question 4.3, "Did this include an installation fee?" Only respondents that selected they owned a connected device in Question 2.1 were asked this question. It should be noted that the option entitled "partial" referred to systems where some devices required an installation fee and some did not. This was explained to respondents in the survey.

Table 4.8: Question 4.3 - System Installation Fee
Overview; Number of Respondents

	Number of Respondents
Yes	83
	30%

	Number of Respondents
Partial	24
	9%
No	98
	35%
Unsure	73
	26%
Total (n)	278

Source: IHS © 2013 IHS

- Almost 40% of respondents that owned a connected device indicated they paid an installation fee, either for the full system or for certain devices.

Table 4.9 presents this information by technology adoption score.

Table 4.9: Question 4.3 - System Installation Fee
By Technology Adoption; Number of Respondents

	Positive	Neutral	Negative
Yes	70	9	4
	37%	15%	14%
Partial	16	5	3
	9%	8%	11%
No	63	23	12
	34%	37%	43%
Unsure	39	25	9
	21%	40%	32%
Total (n)	188	62	28

Source: IHS © 2013 IHS

- Interestingly, respondents with a positive technology adoption score were more likely to have paid an installation fee. This is consistent with findings earlier in the survey, which indicated a relationship between technology adoption score and likelihood of wanting professional installation.

Table 4.10 presents this information by household income level.

Table 4.10: Question 4.3 - System Installation Fee
By Household Income Level; Number of Respondents

	Less than $50,000	$50,000 - $99,999	$100,000 - $149,999	$150,000 or over
Yes	33	28	16	6
	29%	26%	42%	32%
Partial	11	9	3	1
	10%	8%	8%	5%
No	46	33	13	6
	40%	31%	34%	32%
Unsure	25	36	6	6
	22%	34%	16%	32%
Total (n)	115	106	38	19

Source: IHS © 2013 IHS

SERVICE FEES

MONTHLY SERVICE FEE

Table 4.11 presents an overview of responses to Question 4.4, "Do you pay a monthly fee for services associated with this device or system, such as remote home control?" Only respondents that suggested they owned a connected device were asked this question.

Table 4.11: Question 4.4 - Associated Service Monthly Fee
Overview; Number of Respondents

	Number of Respondents
Yes - professionally managed	48
	17%
Yes - personally managed	81
	29%
Yes - other	4
	1%
No	145
	52%
Total (n)	278

Source: IHS © 2013 IHS

- Almost half (46%) of respondents indicated they paid a monthly service fee for their connected home system. Over a quarter of respondents (29%) paid a monthly fee for a personally managed system where they personally receive alerts or notifications.

Table 4.8 presents this information by technology adoption score.

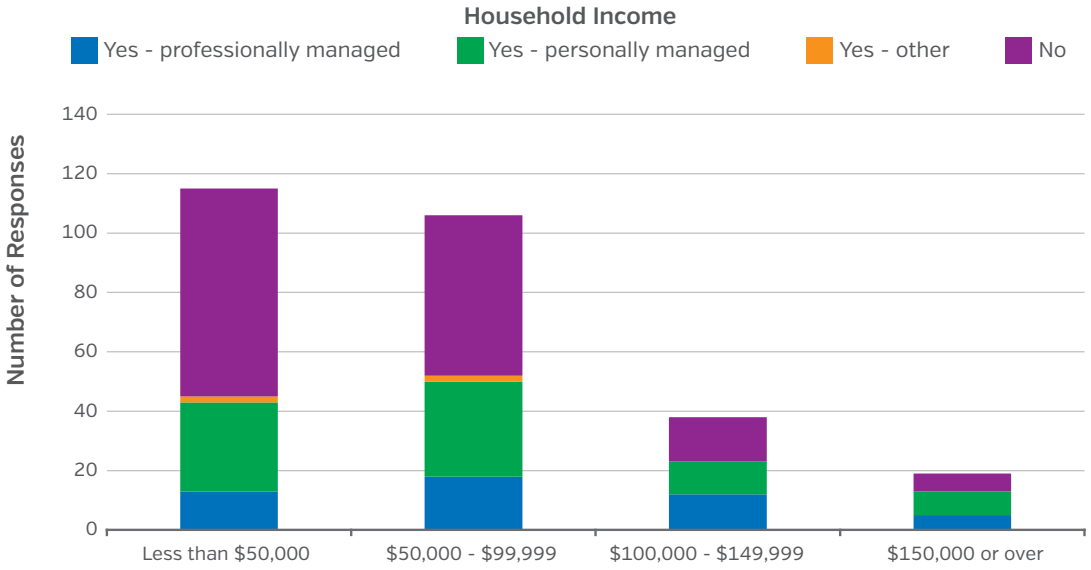
Table 4.12: Question 4.4 - Associated Service Monthly Fee
By Technology Adoption; Number of Respondents

	Positive	Neutral	Negative
Yes - professionally managed	30	12	6
	16%	19%	21%
Yes - personally managed	68	8	5
	36%	13%	18%
Yes - other	3	0	1
	2%	0%	4%
No	87	42	16
	46%	68%	57%
Total (n)	188	62	28

Source: IHS © 2013 IHS

- Respondents with positive technology adoption scores were more inclined to opt for a personally managed system than other respondents.

Chart 4.4: Question 4.4 – Associated Service Monthly Fee



Source: IHS © 2013 IHS

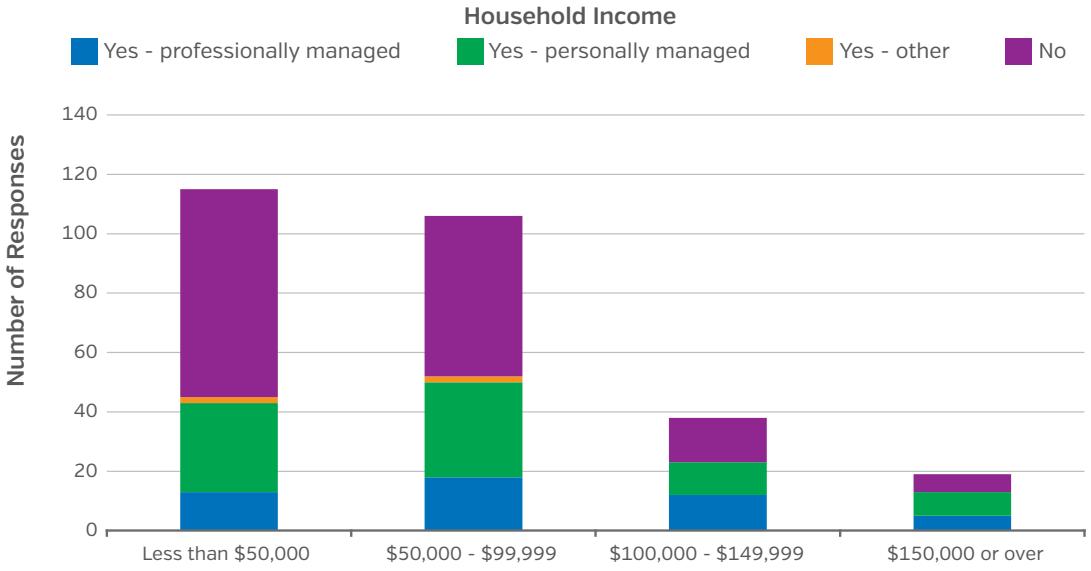
Table 4.13 presents this information by household income level.

Table 4.13: Question 4.4 - Associated Service Monthly Fee
By Household Income Level; Number of Respondents

	Less than $50,000	$50,000 - $99,999	$100,000 - $149,999	$150,000 or over
Yes - professionally managed	13	18	12	5
	11%	17%	32%	26%
Yes - personally managed	30	32	11	8
	26%	30%	29%	42%
Yes - other	2	2	0	0
	2%	2%	0%	0%
No	70	54	15	6
	61%	51%	39%	32%
Total (n)	115	106	38	19

Source: IHS © 2013 IHS

Chart 4.5: Question 4.4 – Associated Service Monthly Fee



Source: IHS © 2013 IHS

COST

Table 4.14 presents responses to Question 4.5 “How much do you pay per month? If you have multiple monthly subscription charges for these devices, please select the total monthly cost.” Only respondents that suggested they paid a monthly fee in Question 4.4 answered this question.

Table 4.14: Question 4.5 - Associated Service Monthly Cost
Overview; Number of Respondents

	Number of Respondents
Less than $11	4
	3%
$11 - $20	19
	14%
$21 - $30	36
	27%
$31 - $40	36
	27%
$41 - $50	24
	18%
$51 - $70	6
	5%
$71 - $100	7
	5%
Over $100	1
	1%
Total (n)	133

Source: IHS © 2013 IHS

- The most common responses were $21-$30 and $31-$40, with $41-$50 the third most common response. The size of the sample frame means further demographic analysis is of limited value.

MAIN PURCHASE REASON

This section presents analysis of the main reason behind the respondents' purchase of connected devices.

ENERGY MANAGEMENT

Table 4.15 presents responses to Question 4.6, "This question relates to devices such as thermostats, in-home displays, smart plugs, AC units and appliances, pool pumps and pool pump switches. Please complete the following sentence with the selection most appropriate to you: 'I purchased this connected device because…'" Only respondents that indicated they owned an energy management focused connected device were asked this question.

Table 4.15: Question 4.6 - Purchase Reason: Energy Management
Overview; Number of Respondents

	Number of Respondents
Reduction in Electricity Consumption	60
	35%
Remote Device Schedule Control	42
	24%
Awareness of Electricity Consumption	32
	19%
Alternative Features	17
	10%
Lower Cost than Alternatives	13
	8%
Other	8
	5%
Total (n)	172

Source: IHS © 2013 IHS

- The most commonly selected reason was to attempt to reduce energy consumption, followed by a desire to be able to control or program the schedule on the device remotely.
- The relatively small sample frame means further demographic analysis is of limited value.

SAFETY AND SECURITY

Table 4.16 presents responses to Question 4.7 "This question relates to devices in a security system such as network/IP cameras, connected door and window locks, motion sensors, sensors to detect if a window is open, closed, locked or unlocked, and connected smoke, fire, carbon monoxide, and water detectors. Please complete the following sentence with the selection most appropriate to you: 'I purchased this connected device because…'" Only respondents that indicated they owned safety and security focused connected devices were asked this question.

Table 4.16: Question 4.7 - Purchase Reason: Safety & Security
Overview; Number of Respondents

	Number of Respondents
Intruder Alert	73
	41%
Crime Deterrent	37
	21%

	Number of Respondents
Family Monitoring	21
	12%
Offered with Other Services	13
	7%
Lower Cost than Alternatives	10
	6%
Relative Safety	9
	5%
Remote Device Schedule Control	5
	3%
Assist Emergency Services or Insurance Providers	4
	2%
Other	5
	3%
Total (n)	177

Source: IHS © 2013 IHS

- Over 40% of respondents indicated that being able to receive intruder alerts was the reason behind their purchase.
- The relatively small sample frame means further demographic analysis is of limited value.

ELDERLY MONITORING SYSTEM

Table 4.17 presents responses to Question 4.8, "This question relates to elderly monitoring systems which may include network/IP cameras and sensors to identify movement or deviation from a normal routine. What was the primary purpose of purchasing this elderly monitoring system?" Only respondents that indicated they owned an elderly monitoring system answered this question.

Table 4.17: Question 4.8 - Purchase Reason: Elderly Monitoring Overview; Number of Respondents

	Number of Respondents
Monitor Personal Wellbeing	11
	55%
Monitor Personal Residence	6
	30%
Monitor Another Residence	2
	10%

	Number of Respondents
Other	1
	5%
Total (n)	20

Source: IHS © 2013 IHS

- Over half of respondents purchased this system to monitor their own wellbeing rather than the wellbeing of another person.
- Small sample frame means further demographic analysis is of limited value, more than half of responses to this question came from respondents aged 40 or over.

ELDERLY MONITORING AND HEALTH MONITORING SYSTEMS

Table 4.18 presents responses to Question 4.9, "These question relates to elderly monitoring systems which may include network/IP cameras and sensors to identify movement or deviation from a normal routine, and health devices which monitor your own, or someone else's, wellbeing. Please complete the following sentence with the selection most appropriate to you: 'I purchased this elderly monitoring system or health system because…'" Only respondents that indicated they owned either an elderly monitoring system or a health monitoring system answered this question.

Table 4.18: Question 4.9 - Purchase Reason: Elderly Monitoring Overview; Number of Respondents

	Number of Respondents
Elderly Relative Safety	16
	36%
Reduce Physical Check-ups	8
	18%
Independent Living	7
	16%
Elderly Relative Illness Notification	6
	14%
Personal Illness Notification	5
	11%
Other	2
	5%
Total (n)	44

Source: IHS © 2013 IHS

- More than one third of respondents indicated that the awareness of the safety of elderly relatives was the primary reason behind the purchase of these devices.
- The relatively small sample frame means further demographic analysis is of limited value.

ENTERTAINMENT OR CONVENIENCE SYSTEMS

Table 4.19 presents responses to Question 4.10, "This question relates to entertainment and convenience devices such as lighting controls, motorized window dressings, or a media connecting device which allows media devices to be controlled by app-based devices such as a smartphone or tablet. Please complete the following sentence with the statement most appropriate for you. 'I purchased this connected device or system because…'" Only respondents that indicated they owned entertainment or convenience focused connected devices answered this question.

Table 4.19: Question 4.10 - Purchase Reason: Entertainment
Overview; Number of Respondents

	Number of Respondents
Improve Energy Efficiency	33
	32%
Replacement of Legacy Devices	26
	25%
Remote Device Control	18
	17%
Lifestyle Alignment	16
	15%
Media Access Monitoring and Control	5
	5%
Home Automation	3
	3%
Other	3
	3%
Total (n)	104

Source: IHS © 2013 IHS

- Almost one-third of respondents indicated the primary reason behind ownership was to improve energy efficiency, while one quarter suggested they were simply replacing older devices.
- The relatively small sample frame means further demographic analysis is of limited value.

ELDERLY MONITORING SYSTEMS

Table 4.20 presents an overview of responses to Question 2.4: "Which of the following systems is most like the one you already have in place to monitor the wellbeing of an elderly relative or spouse when you are not with them?" This question was only answered by respondents that selected "elderly monitoring system" in Question 2.1. In the full survey, each system was explained to the respondent in more detail than is summarized in the table.

Table 4.20: Question 2.4 - Elderly Monitoring System Type
Overview; Number of Respondents

	Number of Respondents
Sensor incorporated system	7
	35%
Panic buttons and alarm pendants	8
	40%
Both of the above	3
	15%
Other	2
	10%
Total (n)	20

Source: IHS © 2013 IHS

Respondents that selected options other than "sensor incorporated system" were then asked Question 2.5 "Would you like to have a system that uses technology such as motion sensors or alerts on a pill cabinet that automatically alerts you if your elderly relative or spouse deviates from their standard routine?"

Table 4.21: Question 2.5 - Routine Deviation Alert
Overview; Number of Respondents

	Number of Respondents
Yes	7
	54%
No	6
	46%
Total (n)	13

Source: IHS © 2013 IHS

While the overall sample sizes are too low to draw very firm conclusions, it is interesting to note that over half of respondents which have basic elderly monitoring systems in place today (such as panic buttons or alarm pendants) would like a more advanced system using sensors or alerts to provide notifications if a user deviates from their standard routine. This highlights a potential up-sell or cross-sell opportunities amongst these existing users. Section 4.2 includes information on the number of respondents overall interested in this particular use-case.

4.2 CONNECTED-HOME FUTURE USE-CASE

SUMMARY & KEY IMPLICATIONS

This section presents the key implications from the analysis contained within Section 4.2.

- More than half of all respondents (56%) would like to be able to perform at least one connected home function, with intruder notification, hazard detection monitoring and climate control being the three most popular. When asked to rank applications in order of desirability, home monitoring-type functions and use-cases were typically most likely to be ranked of higher importance than those focused on convenience. This suggests that home monitoring holds a higher value proposition to the North American consumer.
- Interestingly, the likelihood of respondents wanting to perform at least one connected home function increased significantly amongst those that already owned some form of security system, highlighting opportunities for targeting and cross-promotion.
- Respondents that selected at least one use-case selected an average of six use-cases they wish to be able to perform, again highlighting the potential for bundling of connected home devices. Responses to the recurring service pricing questions indicate that respondents expect the price per application to decline when they opt for more than one application, but, critically, those that selected a higher number of use-cases tended to select a higher monthly fee.
- Homeowners were more likely to have selected at least one connected home use-case than respondents that rented their homes or lived with family. This was most notable for intruder notification, hazard detection monitoring and lighting control. This may be because homeowners are more likely to remain in the same premises for a longer period of time than renters, and therefore be more willing to invest in connected home systems that might not be easily moveable. There could be the potential to target renters with systems which are easy to install, disconnect and re-install when a consumer moves.
- In general, younger respondents were more likely to want to be able to perform one or more connected home functions than respondents aged 46 or over. In addition, in most use-cases, the proportion of respondents indicating an interest in the use-case increased as household income level increased. This highlights the need to either target these specific demographic segments (e.g., middle to high income households with decision-makers under the age of 46), or develop new use cases, marketing or education programs or value propositions, which can increase demand outside of this target audience.
- There was a positive trend between the number of respondents that would like to perform one or more connected home functions and their attitude to technology adoption, with the most technology-aware respondents being significantly more likely to want to be able to perform connected home functions. This is indicative of the prime target market (i.e., those comfortable with technology), but also highlights the need to do more to appeal to those that are 'technology neutral' to help to drive penetration within the mass market.
- In most use-cases selected by respondents, the majority indicated they would be prepared to pay a monthly fee in order to enable the selected function. Home monitoring-type functions or use-cases were most likely to receive responses indicating the respondent would be prepared to pay a monthly fee, suggesting once more that home monitoring holds a higher value proposition in North America.
- Respondents that selected a higher number of connected home use-cases were more likely to be willing to pay higher monthly fees for these services, again highlighting the importance

of enabling a variety of applications which are valuable to a specific user, and pursuing an appropriate bundling strategy.

- The use of the smartphone as an interface to communicate with the connected home system is critical, with more than 70% of respondents that selected each use case selecting a smartphone as a user interface device, highlighting the need for a strong mobile app strategy. Tablets and Web portals were selected as the second most popular interfaces overall.
- As more companies enter the connected home market, the market could develop in such a way that consumers have to open different apps to control different devices. This would be significantly detrimental to user experience and the development of the market, with more than a third of respondents selected that they would find it very valuable, only choosing a system which allows them to use a single app or program. A further third of respondents selected that they would find this valuable, and would prefer a single app or program.
- Many respondents that would like to be able to perform one or more connected home applications would be prepared to pay a premium for this functionality when purchasing devices, with only 25% of this sample frame not willing to pay extra for connected functionality. This leaves a segment of consumers that want to be able to perform connected home applications but are not willing to pay more for connected devices. Alternative methods of monetization will also need to be considered, such as integrating connectivity with no price premium, but making savings through the use of remote diagnostics or increasing alternative revenue streams through the automatic ordering of peripheral devices. Respondent attitudes to these features are explored further in Section 4.5.
- Importantly, despite the positive levels of desirability of and willingness to pay for connected home devices, when asked about their intentions to purchase a connected home device, a significant proportion of respondents were 'unsure' when this would happen. This may be due to the relatively low awareness levels of connected home devices – almost a third of respondents that would like to be able to perform connected home features only learned about such devices in the survey itself. With this being the case, it's unlikely these respondents would have had sufficient time or insight to consider the purchase decision fully. The data suggested that those respondents only made aware of connected home functions through the examples given in the end-user survey were more likely to indicate that they were unsure of when they would purchase connected devices.
- For respondents that did not want to be able to perform any of the connected home applications, a preference for simplicity was the main reason attributed to this. This highlights the importance of breaking down the belief that connected home systems are complex, and also finding applications which appeal to these respondents, beyond the typical remote home management features. Examples may include remote diagnostics or peripheral device replacement. Please see Section 4.5 for further information on these other services.

OVERVIEW

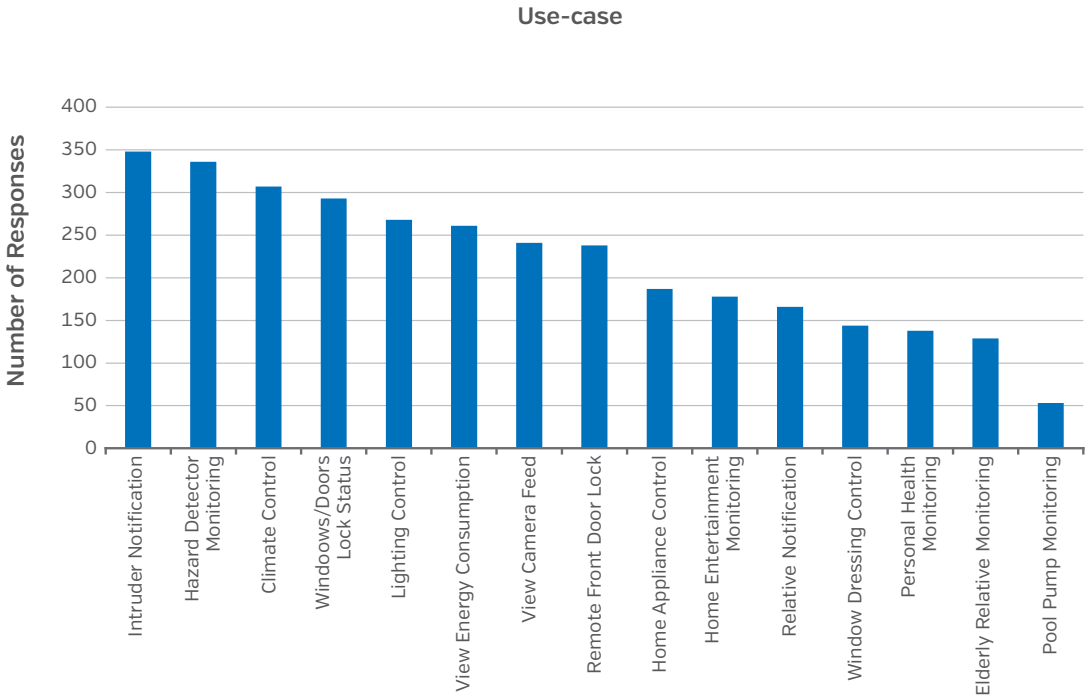
Table 4.22 and Figure 4.6 present an overview of responses to Question 2.2 "Which of the following would you like to be able to do?"

The following options were provided to respondents, with summarized version included in brackets:

- View energy consumption data for your home, such as on-going energy consumption of devices (view energy consumption)
- Control home appliances, such as an oven, washing machine or dishwasher. For example to

remotely operate an appliance at times when electricity charges are lower (home appliance control)
- Control your thermostat or AC system to manage the climate and temperature in your home (climate control)
- Control and monitor your pool pump or connected pool pump switch (pool pump monitoring)
- Receive a notification if you have an intruder in your home (intruder notification)
- Receive a notification when your child, spouse or other relative enters the home (relative notification)
- Lock or unlock your door to let in maintenance workers, friends, or others (remote front door lock)
- Remotely view a camera feed or still-pictures of your home (view camera feed)
- Check whether doors and windows are open, closed, locked or unlocked (windows/doors lock status)
- Monitor and receive alerts on the well-being of an elderly relative or spouse when you are not with them (elderly relative monitoring)
- Monitor and receive alerts on your own health data, such as blood pressure, weight or blood glucose (personal health monitoring)
- Monitor and receive alerts on fire, smoke, carbon monoxide, or water leaks (hazard detection)
- Monitor and control your lighting (lighting control)
- Monitor usage or control your TV, sound system or Blu-Ray/DVD player (home entertainment monitoring)
- Open or close your blinds, curtains or shutters (window dressing control)

Table 4.22: Question 2.2 - Connected Device Use-case Overview; Number of Respondents



Source: IHS © 2013 IHS

- Fifty-six percent of respondents selected that they would like to be able to do at least one connected home function; with just 44% of respondents indicated they would not be interested in any of the use-cases listed.
- There was no significant variation in responses between the North American regions surveyed.
- There was little variation in responses between genders.
- Respondents that selected at least one use-case (i.e., did not select the 'none of the above' option), selected on average six use-cases that they would like to do, highlighting the potential for multi-function systems or 'bundling' opportunities.
- Crucially, respondents that owned a pool pump were significantly more likely to want to remotely control or monitor a pool pump. Almost 30% of respondents that owned a pool pump were interested in this use-case, compared with just approximately 3% that did not own a pool pump.

Table 4.23 and Figure 4.7 present this information segmented by age.

Table 4.23: Question 2.2 - Connected Device Use-case
By Age Category; Number of Respondents

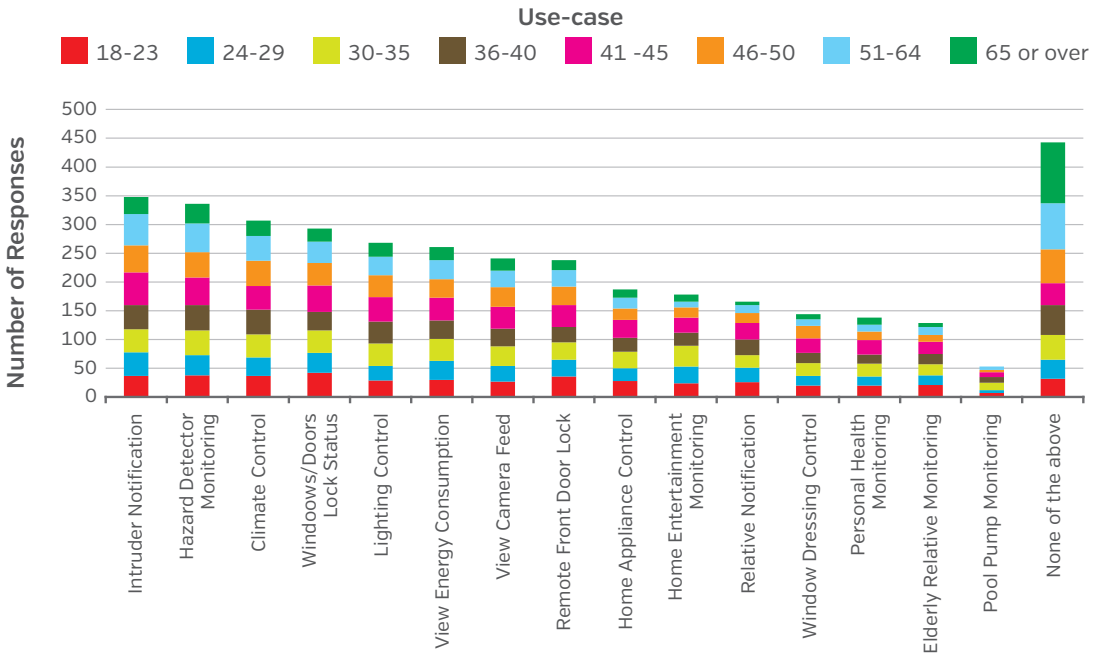
	18-23	24-29	30-35	36-40	41 -45	46-50	51-64	65 or over
Intruder Notification	37	41	40	42	57	47	54	30
	23%	26%	25%	26%	36%	30%	34%	19%
Hazard Detector Monitoring	38	35	43	44	48	44	50	34
	24%	22%	27%	28%	30%	28%	31%	21%
Climate Control	37	32	40	43	41	44	43	27
	23%	20%	25%	27%	26%	28%	27%	17%
Windows/Doors Lock Status	42	35	39	32	46	39	37	23
	26%	22%	25%	20%	29%	25%	23%	14%
Lighting Control	29	25	39	38	43	38	32	24
	18%	16%	25%	24%	27%	24%	20%	15%
View Energy Consumption	30	33	38	32	40	32	33	23
	19%	21%	24%	20%	25%	20%	21%	14%
View Camera Feed	27	27	34	31	38	34	29	21
	17%	17%	21%	19%	24%	21%	18%	13%
Remote Front Door Lock	36	29	30	27	38	32	29	17
	23%	18%	19%	17%	24%	20%	18%	11%

	18-23	24-29	30-35	36-40	41 -45	46-50	51-64	65 or over
Home Appliance Control	28	22	29	24	31	20	19	14
	18%	14%	18%	15%	19%	13%	12%	9%
Home Entertainment Monitoring	24	29	36	23	26	18	10	12
	15%	18%	23%	14%	16%	11%	6%	8%
Relative Notification	26	25	22	27	29	17	14	6
	16%	16%	14%	17%	18%	11%	9%	4%
Window Dressing Control	20	17	22	18	25	22	11	9
	13%	11%	14%	11%	16%	14%	7%	6%
Personal Health Monitoring	20	16	22	16	25	15	12	12
	13%	10%	14%	10%	16%	9%	8%	8%
Elderly Relative Monitoring	21	17	19	18	21	12	14	7
	13%	11%	12%	11%	13%	8%	9%	4%
Pool Pump Monitoring	7	5	13	10	8	4	6	0
	4%	3%	8%	6%	5%	3%	4%	0%
None of the above	32	33	43	52	38	59	80	106
	20%	21%	27%	33%	24%	37%	50%	67%
Total (n)	95	96	118	123	123	135	151	159

Source: IHS © 2013 IHS

- Respondents in higher age bands were typically less likely to be interested in the use-cases listed. This was the case for each individual use-case, with younger respondents typically more likely to have suggested an interest than older respondents. This is clearly evident in the analysis of respondents which selected the option 'none of the above'.
- The most popular use-cases overall generally also proved to be most popular among older respondents, for example intruder notification, hazard detector monitoring and climate control.

Chart 4.7: Question 2.2 – Connected Device Use-case



Source: IHS © 2013 IHS

Table 4.24 presents this information segmented by housing tenure.

Table 4.24: Question 2.2 - Connected Device Use-case
By Housing Tenure; Number of Respondents

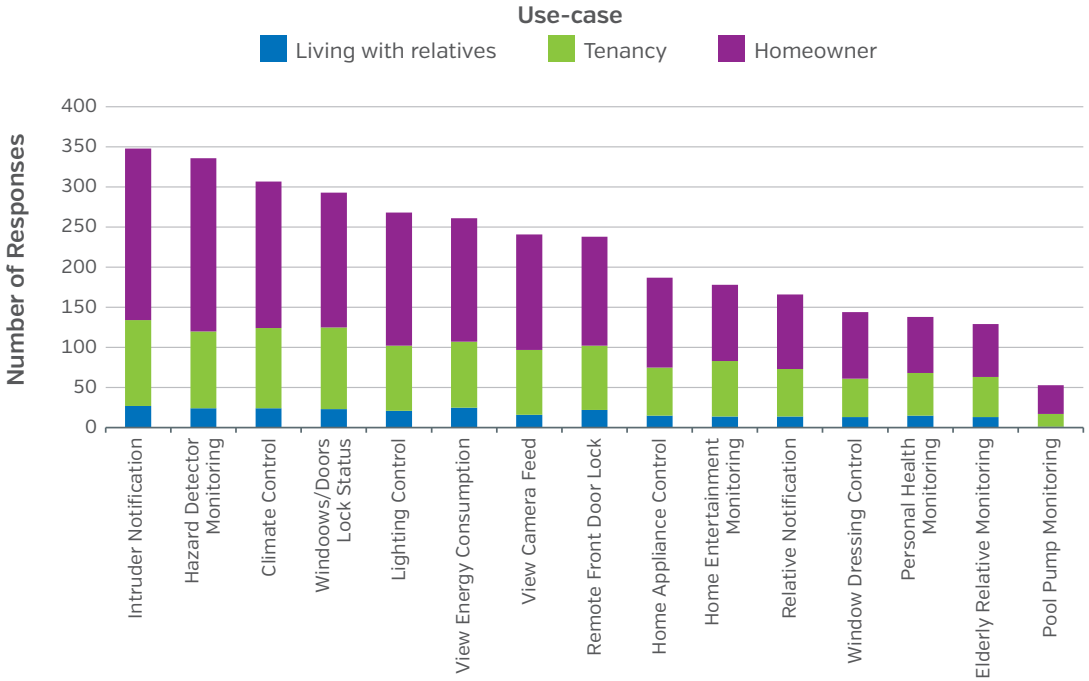
	Living with relatives	Tenancy	Homeowner
Intruder Notification	27	107	214
	35%	32%	37%
Hazard Detector Monitoring	24	96	216
	31%	28%	37%
Climate Control	24	100	183
	31%	30%	31%
Windows/Doors Lock Status	23	102	168
	30%	30%	29%
Lighting Control	21	81	166
	27%	24%	28%
View Energy Consumption	25	82	154
	32%	24%	26%

	Living with relatives	Tenancy	Homeowner
View Camera Feed	16	81	144
	21%	24%	25%
Remote Front Door Lock	22	80	136
	29%	24%	23%
Home Appliance Control	15	60	112
	19%	18%	19%
Home Entertainment Monitoring	14	69	95
	18%	20%	16%
Relative Notification	14	59	93
	18%	17%	16%
Window Dressing Control	13	48	83
	17%	14%	14%
Personal Health Monitoring	15	53	70
	19%	16%	12%
Elderly Relative Monitoring	13	50	66
	17%	15%	11%
Pool Pump Monitoring	1	16	36
	1%	5%	6%
None of the above	39	162	242
	51%	48%	41%
Total (n)	**77**	**338**	**585**

Source: IHS © 2013 IHS

- In many use-cases, the variation in proportion of respondents indicating an interest showed little variance between those that rented properties and those that owned their own home. Notable exceptions include intruder notification, hazard detector monitoring and lighting control, where homeowners were all more inclined to opt for these use-cases.
- Overall, homeowners were more likely to select at least one use-case, with just 41% of these respondents suggesting no interest in any of the use-cases, compared with 48% of those that rented properties.

Chart 4.8: Question 2.2 – Connected Device Use-case



Source: IHS © 2013 IHS

Table 4.25 presents this information segmented by household income level.

Table 4.25: Question 2.2 - Connected Device Use-case
By Household Income; Number of Respondents

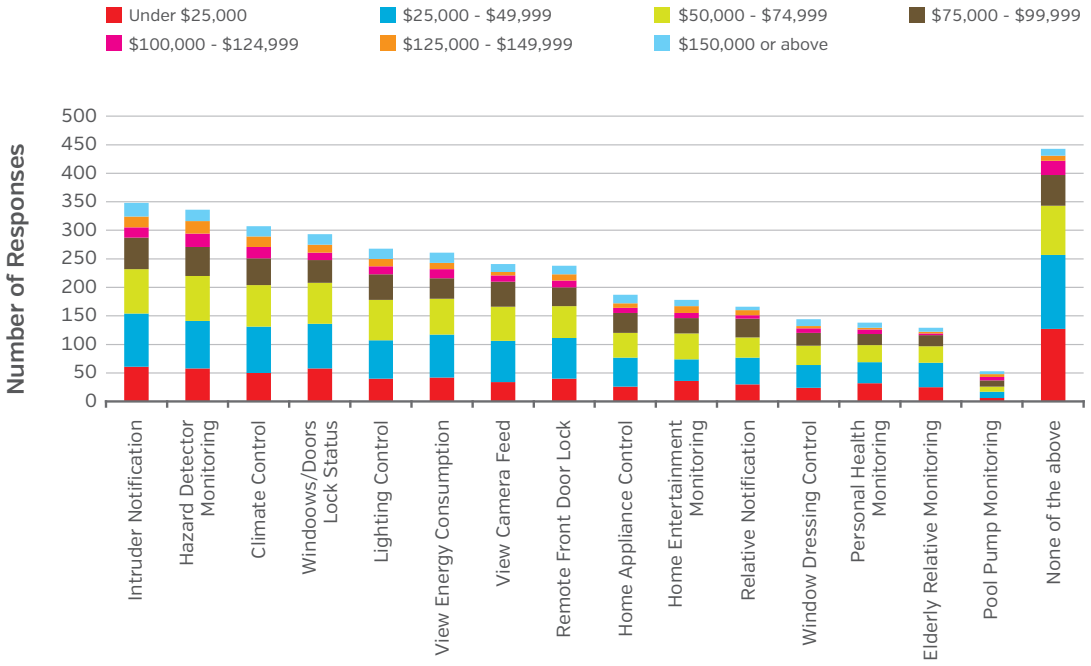
	Under $25,000	$25,000 - $49,999	$50,000 - $74,999	$75,000 - $99,999	$100,000 - $124,999	$125,000 - $149,999	$150,000 or above
Intruder Notification	61	93	78	55	18	19	24
	27%	34%	37%	39%	30%	46%	57%
Hazard Detector Monitoring	58	83	79	51	23	22	20
	25%	30%	37%	36%	38%	54%	48%
Climate Control	50	81	73	47	20	18	18
	22%	29%	35%	34%	33%	44%	43%
Windows/Doors Lock Status	58	78	72	40	13	14	18
	25%	28%	34%	29%	21%	34%	43%
Lighting Control	40	67	71	45	14	13	18
	17%	24%	34%	32%	23%	32%	43%

	Under $25,000	$25,000 - $49,999	$50,000 - $74,999	$75,000 - $99,999	$100,000 - $124,999	$125,000 - $149,999	$150,000 or above
View Energy Consumption	42	75	63	36	16	11	18
	18%	27%	30%	26%	26%	27%	43%
View Camera Feed	34	72	60	44	11	6	14
	15%	26%	28%	31%	18%	15%	33%
Remote Front Door Lock	40	71	56	33	12	11	15
	17%	26%	27%	24%	20%	27%	36%
Home Appliance Control	26	51	43	35	9	8	15
	11%	18%	20%	25%	15%	20%	36%
Home Entertainment Monitoring	36	38	45	27	9	12	11
	16%	14%	21%	19%	15%	29%	26%
Relative Notification	30	47	35	33	6	9	6
	13%	17%	17%	24%	10%	22%	14%
Window Dressing Control	24	40	34	22	8	4	12
	10%	14%	16%	16%	13%	10%	29%
Personal Health Monitoring	32	37	30	19	8	3	9
	14%	13%	14%	14%	13%	7%	21%
Elderly Relative Monitoring	25	43	29	19	3	3	7
	11%	16%	14%	14%	5%	7%	17%
Pool Pump Monitoring	6	11	9	11	6	5	5
	3%	4%	4%	8%	10%	12%	12%
None of the above	127	130	86	54	25	9	12
	55%	47%	41%	39%	41%	22%	29%
Total (n)	**229**	**276**	**211**	**140**	**61**	**41**	**42**

Source: IHS © 2013 IHS

- Household income levels above $150,000 were grouped together for this analysis to ensure there were a significant number of responses.
- In most use-cases, the proportion of respondents indicating an interest in the use-case increased as household income level increased. Notable exceptions include relative notification, where the consumer would receive alerts to notify them of the presence of relatives in their home, and elderly relative monitoring, where the consumer has the ability to check on the wellbeing of an elderly relative remotely.
- Overall, as household income increased, respondents were more likely to have selected at least one use-case, with 55% of respondents with household incomes under $25,000 selecting "none of the above" compared with just 29% selecting this option for respondents with household incomes of $150,000 or above (although this was not a directly linear trend).

Chart 4.9: Question 2.2 – Connected Device Use-case



Source: IHS © 2013 IHS

Table 4.26 shows the number of respondents selecting at least one use-case, and those that did not select any, segmented by dwelling-type.

Table 4.26: Question 2.2 - Connected Device Use-case
By Dwelling-type; Number of Respondents

	Apartment, Flat or Duplex	House or Bungalow	Other
Selected at least one use-case	142	407	8
	49%	60%	27%
Selected none of the above	148	273	22
	51%	40%	73%
Total (n)	**290**	**680**	**30**

Source: IHS © 2013 IHS

- Respondents living in a house or bungalow were more inclined to have indicated an interest in one of the use-cases than those living in apartments, flats or duplexes. This may be explained through the fact that respondents living in houses or bungalows were more likely to own their homes.

Table 4.27 presents this information by monthly electricity expenditure. Please note that the "Over $200" category has been aggregated from smaller bands to provide a larger sample frame.

Table 4.27: Question 2.2 - Connected Device Use-case
By Monthly Electricity Expenditure; Number of Respondents

	Under $50	$50 - $99	$100 - $149	$150 - $199	Over $200	Do not know
Selected at least one use-case	49	127	185	83	69	44
	42%	50%	66%	61%	63%	45%
Selected none of the above	68	129	97	54	41	54
	58%	50%	34%	39%	37%	55%
Total (n)	117	256	282	137	110	98

Source: IHS © 2013 IHS

- As highlighted in Table 2.12, respondents with higher monthly expenditure on electricity were generally more inclined to have selected at least one use-case. This was also the case with individual use-cases.
- This is consistent with analysis by household income level above, where respondents with higher household income levels were more likely to have higher monthly electricity expenditure.

Table 4.28 presents this information by the respondent's household decision-making role.

Table 4.28: Question 2.2 - Connected Device Use-case
By Decision-making Role; Number of Respondents

	Major	Minor	None
Selected at least one use-case	254	230	73
	62%	55%	42%
Selected none of the above	158	185	100
	38%	45%	58%
Total (n)	412	415	173

Source: IHS © 2013 IHS

- Respondents with a larger decision-making role were more inclined to have suggested an interest in at least one of the use-cases listed in Question 2.2.

Table 4.29 shows this information by the respondent's technology adoption score.

Table 4.29: Question 2.2 - Connected Device Use-case
By Technology Adoption; Number of Respondents

	Positive	Neutral	Negative
Selected at least use-case	278	201	78
	77%	53%	30%
Selected none of the above	83	181	179
	23%	47%	70%
Total (n)	361	382	257

Source: IHS © 2013 IHS

As shown, respondents with a positive technology adoption rating were more likely to have selected at least one connected home use-case. As expected, those with negative technology adoption ratings were the least likely.

Table 4.30 presents this information by the respondent's energy efficiency rating.

Table 4.30: Question 2.2 - Connected Device Use-case
By Energy Efficiency Rating; Number of Respondents

	Positive	Neutral	Negative
Selected at least one use-case	373	169	15
	66%	46%	23%
Selected none of the above	195	197	51
	34%	54%	77%
Total (n)	568	366	66

Source: IHS © 2013 IHS

- Respondents with more positive attitudes to energy efficiency indicated higher levels of interest the use-cases listed in Question 2.2.
- Interestingly, higher levels of interest were also shown for use-cases not specifically related to energy management, for example intruder notification.

Table 4.31 presents this information by security system ownership.

Table 4.31: Question 2.2 - Connected Device Use-case
By Security System Ownership; Number of Respondents

	Security System Owners	Non-Security System Owners
Selected at least one use-case	194	363
	76%	49%

	Security System Owners	Non-Security System Owners
Selected none of the above	60	383
	24%	51%
Total (n)	254	746

Source: IHS © 2013 IHS

RESPONDENT LACK OF INTEREST

As highlighted in Table 4.22, 443 of the 1,000 respondents indicated they were not interested in any of the connected device use-cases listed. These respondents were then asked why they were not interested in controlling in-home devices, respondents were asked to choose between the following options:

- "I already have all the connected devices I need or want" (summarized in Table 2.18 as necessity concerns)
- "I am not technologically able: I wouldn't know what to do if the system broke, or how to set up the network" (summarized in Table 2.18 as technical concerns)
- "I do not consider this type of system to be worth paying for" (summarized in Table 2.18 as value concerns)
- "I would prefer to keep my network 'in-home' and not have remote-control enabled" (summarized in Table 2.18 as preference for in-home control only)
- "I would prefer to keep things simple in my home" (summarized in Table 2.18 as preference for simplicity) respectively.

Table 4.32: Question 2.3 - Lack of Use-case Selection
Overview; Number of Respondents

	Number of Respondents
Necessity Concerns	39
	9%
Technical Concerns	30
	7%
Value Concerns	119
	27%
Preference for In-home Control Only	34
	8%
Preference for Simplicity	221
	50%
Total (n)	443

Source: IHS © 2013 IHS

- Interestingly, technical concerns were not a major barrier to connected devices, with this selected by only 7% of respondents as the main reason they are not interested in connected home systems. The main reason why these respondents were not interested in the connected home was that they prefer to keep things simple in their homes.
- The implication of the above is that consumer's associate the connected-home with complexity and emphasizes the importance of solutions that can help reduce or remove this perception. Initiatives may include the provision of technical support hotlines as part of a service, or solutions that help simplify the network on-boarding process, such as Qualcomm's AllJoyn software framework.

In the following tables, analysis of only "value concerns" and "preference for simplicity" is included, due to small sample frames in the other options.

Table 4.33 presents this information by household income level.

Table 4.33: Question 2.3 - Lack of Use-case Selection
By Household Income Level; Number of Respondents

	Under $25,000	$25,000 - $49,999	$50,000 - $74,999	$75,000 - $99,999	$100,000 - $124,999	$125,000 - $149,999	$150,000 or above
Value Concerns	30	28	24	17	10	6	4
	31%	28%	35%	45%	48%	86%	57%
Preference for Simplicity	67	73	45	21	11	1	3
	69%	72%	65%	55%	52%	14%	43%
Total (n)	97	101	69	38	21	7	7

Source: IHS © 2013 IHS

- Interestingly, the data would suggest that as household income increases, respondents were more inclined to select value concerns as the primary reason.

Table 4.34 presents this information by technology adoption score.

Table 4.34: Question 2.3 - Lack of Use-case Selection
By Technology Adoption; Number of Respondents

	Positive	Neutral	Negative
Value Concerns	23	51	45
	40%	36%	32%
Preference for Simplicity	34	90	97
	60%	64%	68%
Total (n)	57	141	142

Source: IHS © 2013 IHS

- Respondents with negative technology adoption scores were more inclined to select "preference for simplicity" as the primary reason.

Table 4.35 presents this information by age category.

Table 4.35: Question 2.3 - Lack of Use-case Selection
By Age Category; Number of Respondents

	18-23	24-29	30-35	36-40	41 -45	46-50	51-64	65 or over
Value Concerns	6	10	14	14	10	17	19	29
	25%	42%	47%	36%	38%	35%	28%	36%
Preference for Simplicity	18	14	16	25	16	31	49	52
	75%	58%	53%	64%	62%	65%	72%	64%
Total (n)	24	24	30	39	26	48	68	81

Source: IHS © 2013 IHS

- Interestingly, there did not appear to be much of an obvious trend surrounding age and the reason for a lack of selection of a use-case in Question 2.2.

IMPORTANCE RANKING

Table 4.36 presents how respondents ranked the importance of the use-cases they had selected.

Respondents were asked Question 3.5 "Please rank the following based on how much you would like to be able to do these things. 1 is your most desirable option"

Table 4.36: Question 3.5 - Use-case Ranking
Overview; Number of Respondents

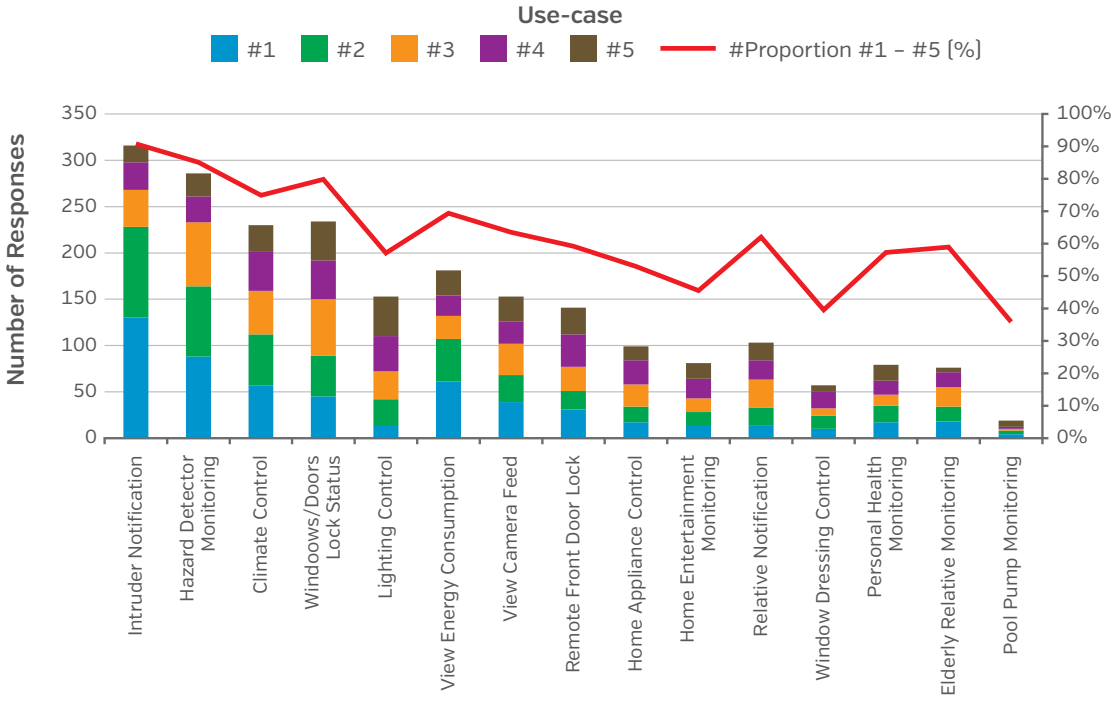
	#1	#2	#3	#4	#5	Total (n)
Intruder Notification	130	98	40	30	18	348
	37%	28%	11%	9%	5%	91%
Hazard Detector Monitoring	88	76	69	28	25	336
	26%	23%	21%	8%	7%	85%
Climate Control	57	55	47	42	29	307
	19%	18%	15%	14%	9%	75%
Windoows/Doors Lock Status	45	44	61	42	42	293
	15%	15%	21%	14%	14%	80%
Lighting Control	13	29	30	38	43	268
	5%	11%	11%	14%	16%	57%

	#1	#2	#3	#4	#5	Total (n)
View Energy Consumption	61	46	25	22	27	261
	23%	18%	10%	8%	10%	69%
View Camera Feed	39	29	34	24	27	241
	16%	12%	14%	10%	11%	63%
Remote Front Door Lock	31	20	26	35	29	238
	13%	8%	11%	15%	12%	59%
Home Appliance Control	17	17	24	26	15	187
	9%	9%	13%	14%	8%	53%
Home Entertainment Monitoring	13	15	15	21	17	178
	7%	8%	8%	12%	10%	46%
Relative Notification	14	19	30	21	19	166
	8%	11%	18%	13%	11%	62%
Window Dressing Control	10	14	8	18	7	144
	7%	10%	6%	13%	5%	40%
Personal Health Monitoring	17	18	12	15	17	138
	12%	13%	9%	11%	12%	57%
Elderly Relative Monitoring	18	16	21	16	5	129
	14%	12%	16%	12%	4%	59%
Pool Pump Monitoring	4	4	2	2	7	53
	8%	8%	4%	4%	13%	36%

Source: IHS © 2013 IHS

- Proportionally, intruder notification was considered highest importance by those that selected it. Additionally, 91% of those that selected it ranked it between first and fifth most important.
- Despite being selected fewer times, viewing energy consumption was considered highly important by those that selected it.
- While receiving a large number of selections, lighting control was considered relatively unimportant by those that selected it, with just 57% of these respondents ranking it fifth most important or higher.

Chart 4.10: Question 3.5 – Use-case Ranking



Source: IHS © 2013 IHS

MONTHLY COST

Table 4.37 displays the monthly cost respondents indicated they would be prepared to pay for the use-cases they selected in Question 2.2.

Respondents were asked Question 3.1 "Some connected home services require a monthly subscription fee. How much would you pay per month to be able to do each of the following?"

Table 4.37: Question 3.1 - Use-case Monthly Cost
Overview; Number of Respondents

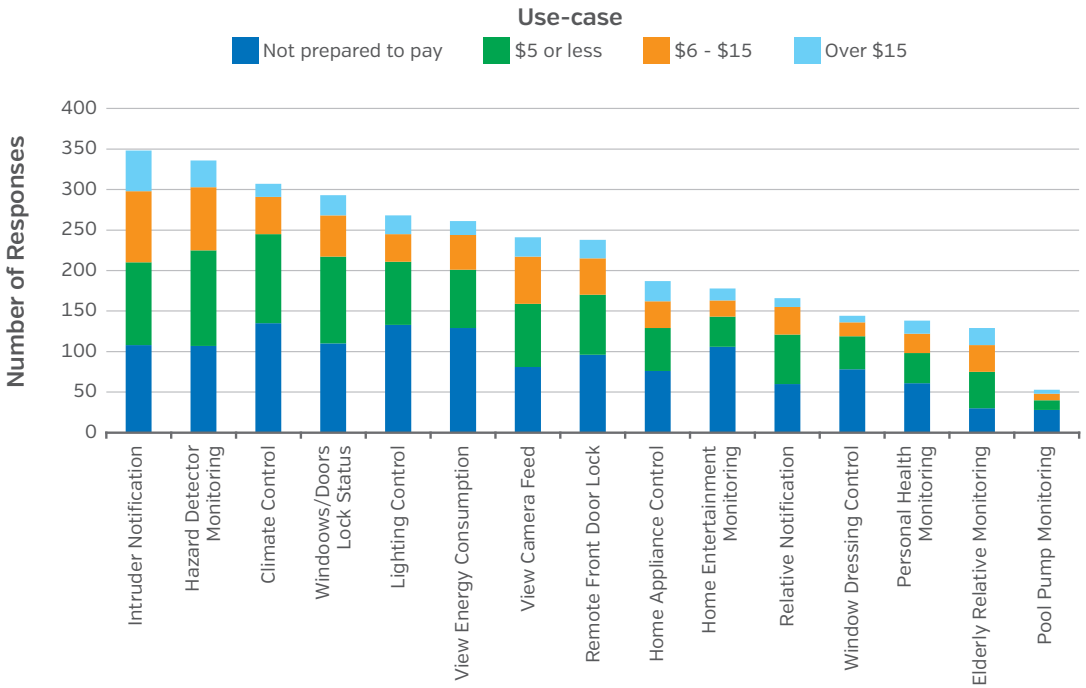
	Not prepared to pay	$5 or less	$6 - $15	Over $15	Total (n)
Intruder Notification	108	102	88	50	348
	31%	29%	25%	14%	
Hazard Detector Monitoring	107	118	78	33	336
	32%	35%	23%	10%	
Climate Control	135	110	46	16	307
	44%	36%	15%	5%	
Windoows/Doors Lock Status	110	107	51	25	293
	38%	37%	17%	9%	

	Not prepared to pay	$5 or less	$6 - $15	Over $15	Total (n)
Lighting Control	133	78	34	23	268
	50%	29%	13%	9%	
View Energy Consumption	129	72	43	17	261
	49%	28%	16%	7%	
View Camera Feed	81	78	58	24	241
	34%	32%	24%	10%	
Remote Front Door Lock	96	74	45	23	238
	40%	31%	19%	10%	
Home Appliance Control	76	53	33	25	187
	41%	28%	18%	13%	
Home Entertainment Monitoring	106	37	20	15	178
	60%	21%	11%	8%	
Relative Notification	60	61	34	11	166
	36%	37%	20%	7%	
Window Dressing Control	78	41	17	8	144
	54%	28%	12%	6%	
Personal Health Monitoring	61	37	24	16	138
	44%	27%	17%	12%	
Elderly Relative Monitoring	30	45	33	21	129
	23%	35%	26%	16%	
Pool Pump Monitoring	28	12	8	5	53
	53%	23%	15%	9%	

Source: IHS © 2013 IHS

- In most use-case selections, the majority of respondents indicated they would be prepared to pay a monthly fee. Exceptions include pool pump monitoring, window dressing control, home entertainment monitoring and lighting control.

Chart 4.11: Question 3.1 – Use-case Monthly Cost



Source: IHS © 2013 IHS

Table 4.38 presents responses to the monthly price respondents would pay to for multiple functions as a bundle.

Table 4.38: Question 3.1 - Use-case Monthly Cost: All Selections
Overview; Number of Respondents

	Not prepared to pay	$1-$5	$6-$10	$11-$15	$16-$20	$21-$30	$31-$40	$41-$60	$61-$80	Over $80	Total (n)
All Selected Applications	115	92	68	55	76	64	34	32	17	4	557
	21%	17%	12%	10%	14%	11%	6%	6%	3%	1%	100%

Source: IHS © 2013 IHS

- The average number of use-cases selected by respondents that selected more than one use-case was more than six.

Table 4.39 presents responses to the monthly price respondents would be prepared to pay for all their selections, by the number of selections they made.

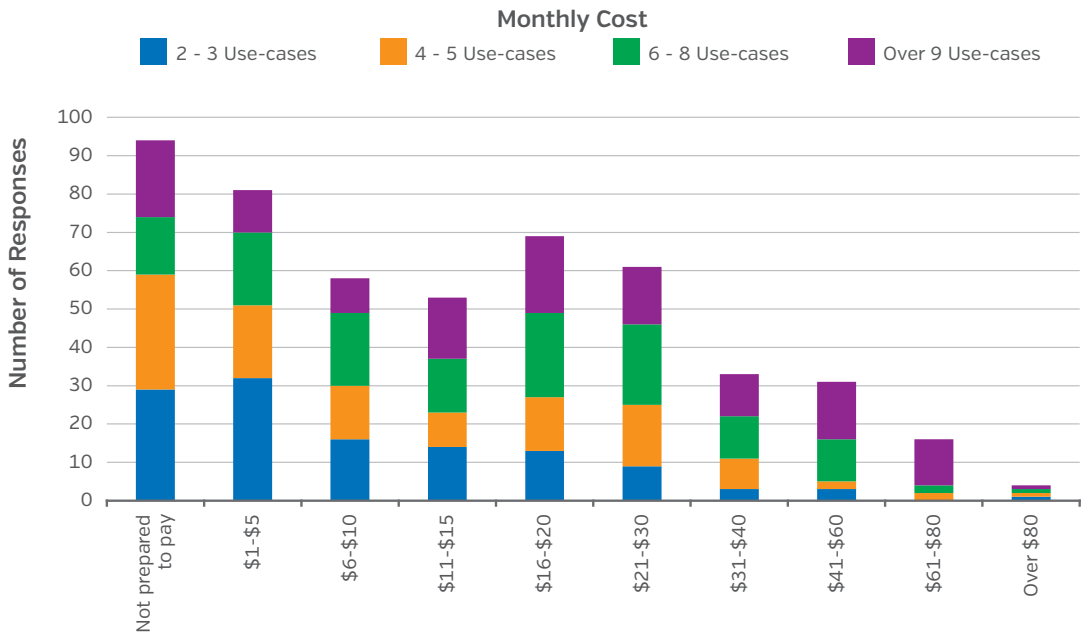
Table 4.39: Question 3.1 - Use-case Monthly Cost: All Selections
By Number of Use-case Selections; Number of Respondents

	Not prepared to pay	$1-$5	$6-$10	$11-$15	$16-$20	$21-$30	$31-$40	$41-$60	$61-$80	Over $80	Total (n)
2 - 3 Use-cases	29	32	16	14	13	9	3	3	0	1	120
	24%	27%	13%	12%	11%	8%	3%	3%	0%	1%	
4 - 5 Use-cases	30	19	14	9	14	16	8	2	2	1	115
	26%	17%	12%	8%	12%	14%	7%	2%	2%	1%	
6 - 8 Use-cases	15	19	19	14	22	21	11	11	2	1	135
	11%	14%	14%	10%	16%	16%	8%	8%	1%	1%	
Over 9 Use-cases	20	11	9	16	20	15	11	15	12	1	130
	15%	8%	7%	12%	15%	12%	8%	12%	9%	1%	
	94	81	58	53	69	61	33	31	16	4	500

Source: IHS © 2013 IHS

- As is apparent, respondents selecting more use-cases were more inclined to pay higher monthly costs.

Chart 4.12: Question 3.1 – Use-case Monthly Cost: All Selections



Source: IHS © 2013 IHS

USER INTERFACE

DISPLAY DEVICE

Table 4.40 presents the devices selected by respondents to display or control the use-case they had selected in Question 2.2. Respondents could select more than one option.

Respondents were asked Question 3.2 “Which devices would you like to use to display information or control each of the following?”

Table 4.40: Question 3.2 - Use-case Display
Overview; Number of Respondents

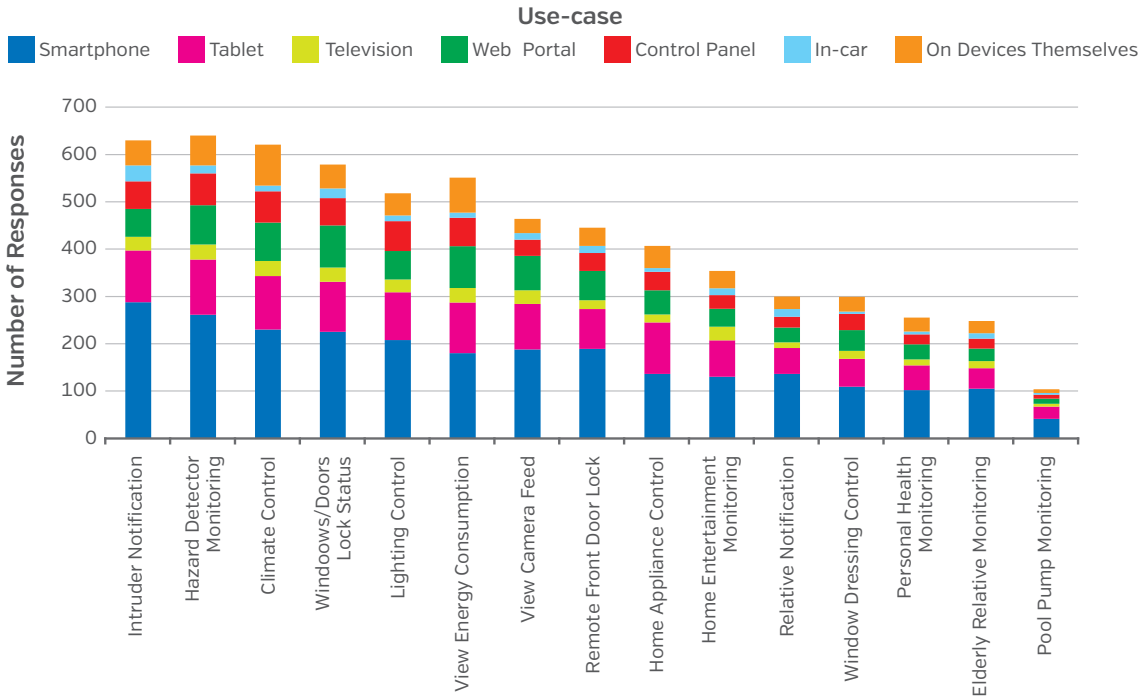
	Smartphone	Tablet	Television	Web Portal	Control Panel	In-car	Total (n)
Intruder Notification	288	109	29	59	58	34	348
	83%	31%	8%	17%	17%	10%	100%
Hazard Detector Monitoring	261	117	32	83	67	17	336
	78%	35%	10%	25%	20%	5%	100%
Climate Control	230	113	32	81	66	12	307
	75%	37%	10%	26%	21%	4%	100%
Windoows/Doors Lock Status	225	106	30	89	58	20	293
	77%	36%	10%	30%	20%	7%	100%
Lighting Control	208	101	27	60	63	12	268
	78%	38%	10%	22%	24%	4%	100%
View Energy Consumption	180	107	31	88	60	11	261
	69%	41%	12%	34%	23%	4%	100%
View Camera Feed	188	96	29	73	34	14	241
	78%	40%	12%	30%	14%	6%	100%
Remote Front Door Lock	189	84	19	62	38	15	238
	79%	35%	8%	26%	16%	6%	100%
Home Appliance Control	136	109	17	51	39	8	187
	73%	58%	9%	27%	21%	4%	100%
Home Entertainment Monitoring	130	77	29	38	29	14	178
	73%	43%	16%	21%	16%	8%	100%
Relative Notification	136	55	12	31	23	16	166
	82%	33%	7%	19%	14%	10%	100%
Window Dressing Control	109	59	17	44	34	5	144
	76%	41%	12%	31%	24%	3%	100%
Personal Health Monitoring	102	52	13	32	21	6	138

	Smartphone	Tablet	Television	Web Portal	Control Panel	In-car	Total (n)
	74%	38%	9%	23%	15%	4%	100%
Elderly Relative Monitoring	105	43	15	27	21	11	129
	81%	33%	12%	21%	16%	9%	100%
Pool Pump Monitoring	41	26	6	11	8	4	53
	77%	49%	11%	21%	15%	8%	100%

Source: IHS © 2013 IHS

- The desire to use the smartphone as a user interface was evident across all use-cases, receiving the majority of responses. This outlines how crucial the smartphone is to any connected-home system.
- Tablet and Web portal were second and third most prevalent in each use-case, except in lighting control where a control panel was preferred to a web portal.

Chart 4.13: Question 3.2 – Use-case Display



Source: IHS © 2013 IHS

SINGLE APPLICATION USER INTERFACE

Table 4.41 and Table 4.42 display analysis on the value of a single application user interface to seamlessly control all use-cases selected by the respondent in Question 2.2.

Respondents were asked Question 3.3 “How valuable would it be if all of the different functions listed above could be controlled from a single app or program on your smartphone, tablet or other device?”

In the question, the following options were available to choose from:

- Very valuable – I would only choose a system which allows me to use a single app or program
- Moderately valuable – I would prefer a single app or program
- Neutral – I am happy with either
- Not of value – I would prefer separate apps or programs

Table 4.41: Question 3.3 - Single Application Value
By Location; Number of Respondents

	Canada	U.S. – East Coast	U.S. – Midwest	U.S. – South	U.S. – West Coast
Very Valuable	94	35	25	30	24
	38%	42%	34%	35%	37%
Moderately Valuable	73	30	31	29	28
	29%	36%	42%	34%	43%
Neutral	75	17	16	23	12
	30%	20%	22%	27%	18%
Not of Value	8	1	1	4	1
	3%	1%	1%	5%	2%
	250	83	73	86	65

Source: IHS © 2013 IHS

Overall, 37% of respondents selected that they would find it very valuable, only choosing a system which allows them to use a single app or program. A further 34% selected that they would find this valuable, and would prefer a single app or program.

- There was some variation in responses by location. Approximately a third of respondents in Canada and the South of the United States indicated they had either a neutral attitude to a single user interface or that it was not of value, with only 67% and 69% (respectively) considering this to be moderately or very valuable. This contrasts to a high of 80% on the West Coast of the US, and 78% on the East Coast.
- In all locations, the majority of respondents suggested a single application would be of value, highlighting the importance of intuitive control and seamless integration across a connected home system.

Table 4.42: Question 3.3 - Single Application Value
By Age Category; Number of Respondents

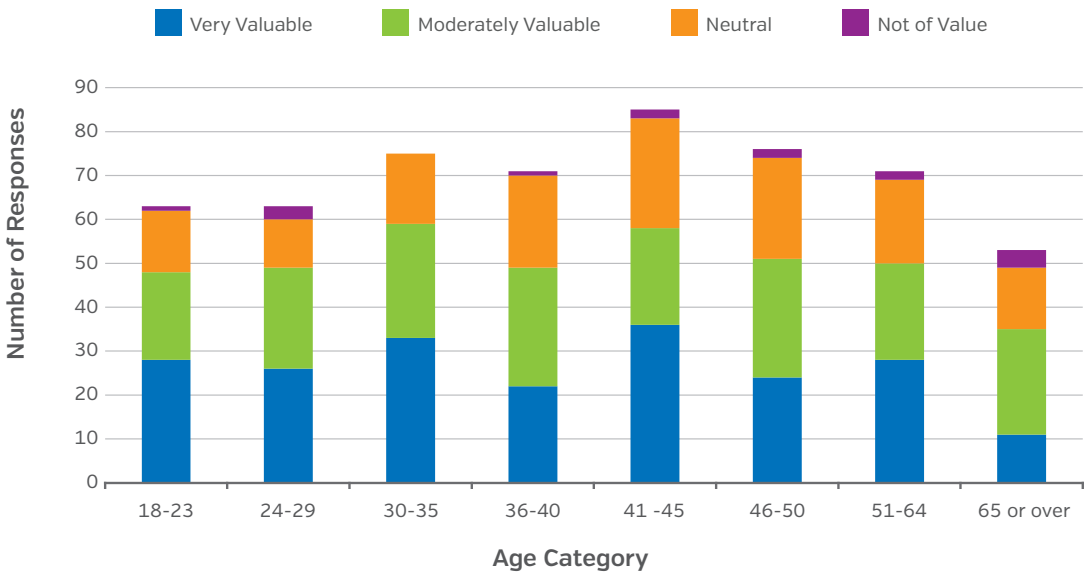
	18-23	24-29	30-35	36-40	41 -45	46-50	51-64	65 or over
Very Valuable	28	26	33	22	36	24	28	11
	44%	41%	44%	31%	42%	32%	39%	21%

	18-23	24-29	30-35	36-40	41 -45	46-50	51-64	65 or over
Moderately Valuable	20	23	26	27	22	27	22	24
	32%	37%	35%	38%	26%	36%	31%	45%
Neutral	14	11	16	21	25	23	19	14
	22%	17%	21%	30%	29%	30%	27%	26%
Not of Value	1	3	0	1	2	2	2	4
	2%	5%	0%	1%	2%	3%	3%	8%
	63	63	75	71	85	76	71	53

Source: IHS © 2013 IHS

- The main trend to highlight when analyzing the responses by age category is that the value of this feature declines amongst older respondents. This may be due to lower familiarity with smartphone or tablet applications.

Chart 4.14: Question 3.3 – Single Application Value



Source: IHS © 2013 IHS

ENERGY DATA-TYPE

Table 4.43 presents the types of data respondents were interested in receiving. Respondents were asked Question 3.4 “Which of this energy data would you like to be able to monitor?” Only respondents that indicated they would be interested in monitoring their energy consumption in Question 2.2 answered this question.

Table 4.43: Question 3.4 - Data-type
Overview; Number of Respondents

	Number of Respondents
Home Energy Cost	168
	64%
Home Energy Consumption	143
	55%
Appliance Energy Cost	128
	49%
Appliance Energy Consumption	108
	41%
Total (n)	261

Source: IHS © 2013 IHS

- Overall, electricity information relating to the whole home was more commonly selected than appliance-level data.
- For both appliances and whole-home energy data, respondents were more interested in seeing this information in terms of cost than consumption.

Table 4.44 shows this information by age category.

Table 4.44: Question 3.4 - Data-type
By Age Category; Number of Respondents

	40 and under	Over 40
Home Energy Cost	94	74
	71%	58%
Home Energy Consumption	70	73
	53%	57%
Appliance Energy Cost	74	54
	56%	42%
Appliance Energy Consumption	59	49
	44%	38%
Total (n)	133	128

Source: IHS © 2013 IHS

- Due to a relatively small sample frame, age categories are consolidated into two groups, “40 and under” and “Over 40”.

- Respondents that were aged 40 and under showed higher levels of interest, broadly speaking, with the exception being home energy consumption data.
- Almost three quarters (71%) of respondents aged 40 and under were interested in viewing energy cost for the entire home.

Table 4.45 shows this information by monthly electricity expenditure.

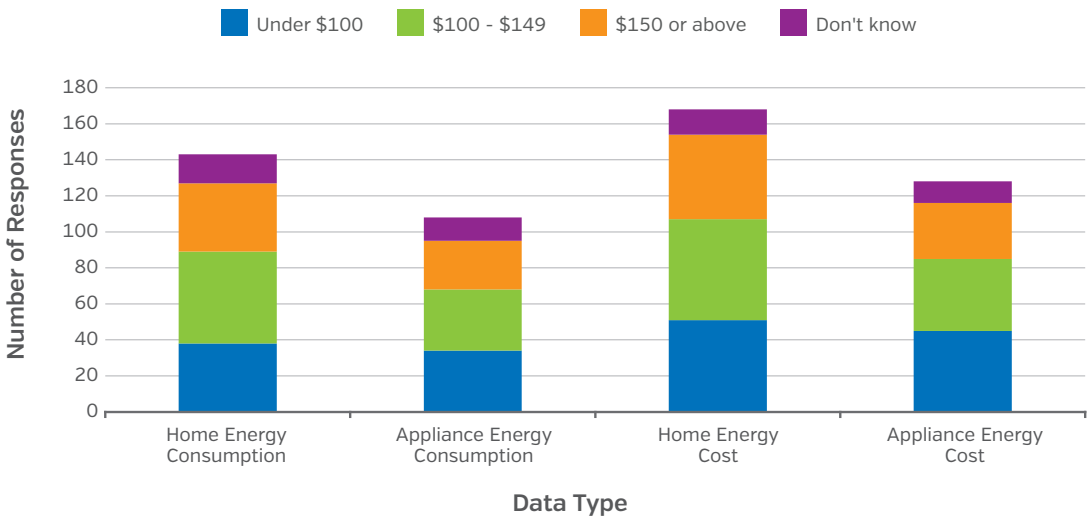
Table 4.45: Question 3.4 - Data-type
By Monthly Electricity Expenditure; Number of Respondents

	Under $100	$100 - $149	$150 or above	Don't know
Home Energy Cost	51	56	47	14
	62%	67%	64%	64%
Home Energy Consumption	38	51	38	16
	46%	61%	51%	73%
Appliance Energy Cost	45	40	31	12
	55%	48%	42%	55%
Appliance Energy Consumption	34	34	27	13
	41%	41%	36%	59%
Total (n)	82	83	74	22

Source: IHS © 2013 IHS

- Interestingly, there is not an obvious trend when this question was analyzed by monthly electricity expenditure.

Chart 4.15: Question 3.4 – Data-type



Source: IHS © 2013 IHS

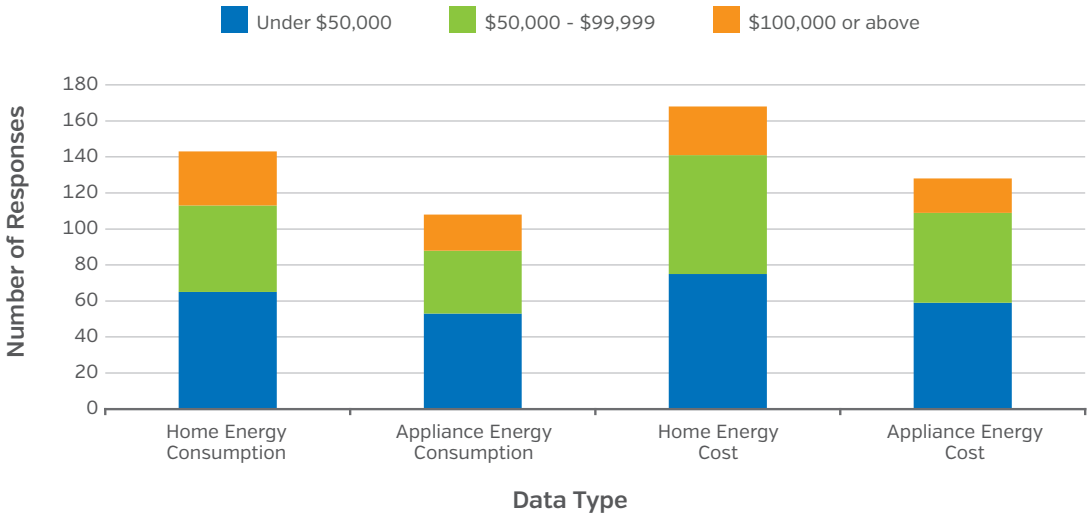
Table 4.46: Question 3.4 - Data-type
By Household Income Level; Number of Respondents

	Under $50,000	$50,000 - $99,999	$100,000 or above
Home Energy Cost	75	66	27
	64%	67%	60%
Home Energy Consumption	65	48	30
	56%	48%	67%
Appliance Energy Cost	59	50	19
	50%	51%	42%
Appliance Energy Consumption	53	35	20
	45%	35%	44%
Total (n)	117	99	45

Source: IHS © 2013 IHS

The only notable trend when looking at this data by household income level is that those in the upper bands ($100,000 or above) are more likely to be interested in electricity consumption data rather than cost, whereas lower income brackets are more likely to be focused on cost data than consumption data. This applies at both the household and appliance level.

Chart 4.16: Question 3.4 – Data-type



Source: IHS © 2013 IHS

DEVICE PURCHASE

SPEND

Respondents were asked how much they would pay for connected devices, or, in the case of devices that already exist in non-connected form, what premium they would be prepared to pay for a connected-variant. Question 3.6 explained, "In order to perform the functions you listed, you would need to purchase some connected devices. Please consider the following statements. How much would you be willing to spend on these devices? Prices below refer to a single device only. In some cases, you may want more than one of these devices depending on how big your home is and how many things you want to be connected."

Respondents were then presenting with an explanation of which devices might be needed for the top five applications they had selected, and asked how much they would spend on these devices.

Table 4.47 presents responses to this question on device cost.

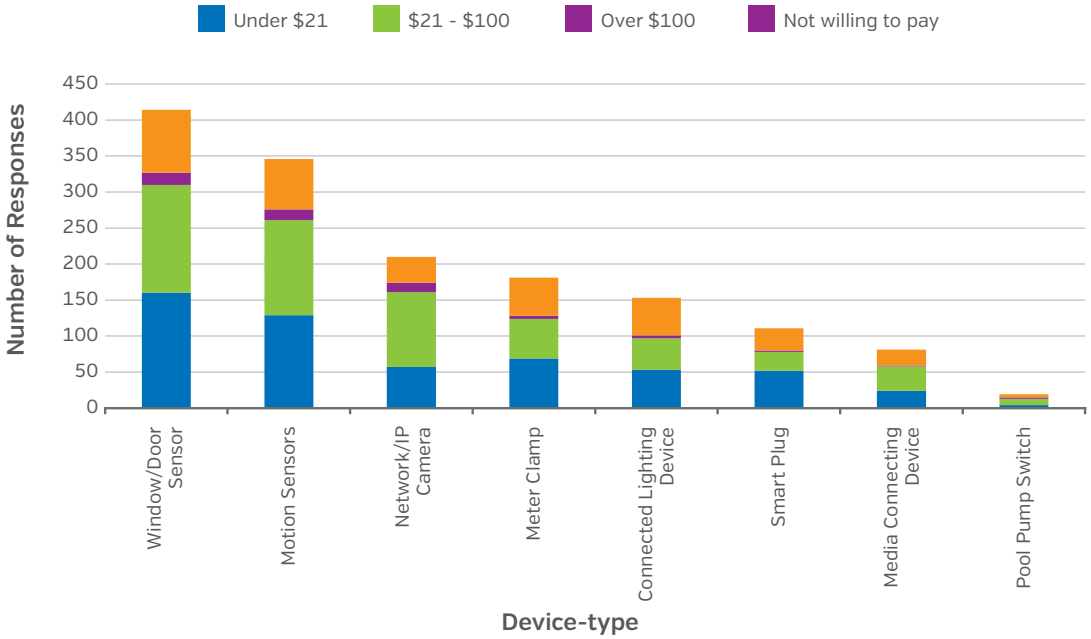
- For each connected device type, more than half of respondents suggested they would be prepared to either pay for a connected device, or pay a premium for a connected-variant of a device.

Table 4.47: Question 3.6 - Device Cost
Overview; Number of Respondents

	Under $21	$21 - $100	Over $100	Not willing to pay	Total (n)
Window/Door Sensor	160	150	17	87	414
	39%	36%	4%	21%	100%
Motion Sensors	129	132	15	70	346
	37%	38%	4%	20%	100%
Network/IP Camera	57	104	13	36	210
	27%	50%	6%	17%	100%
Meter Clamp	69	55	4	53	181
	38%	30%	2%	29%	100%
Connected Lighting Device	53	44	4	52	153
	35%	29%	3%	34%	100%
Smart Plug	52	26	2	31	111
	47%	23%	2%	28%	100%
Media Connecting Device	24	34	1	22	81
	30%	42%	1%	27%	100%
Pool Pump Switch	4	9	2	4	19
	21%	47%	11%	21%	100%

Source: IHS © 2013 IHS

Chart 4.17: Question 3.6 – Device cost



Source: IHS © 2013 IHS

Table 4.48 present responses to the question on device premium.

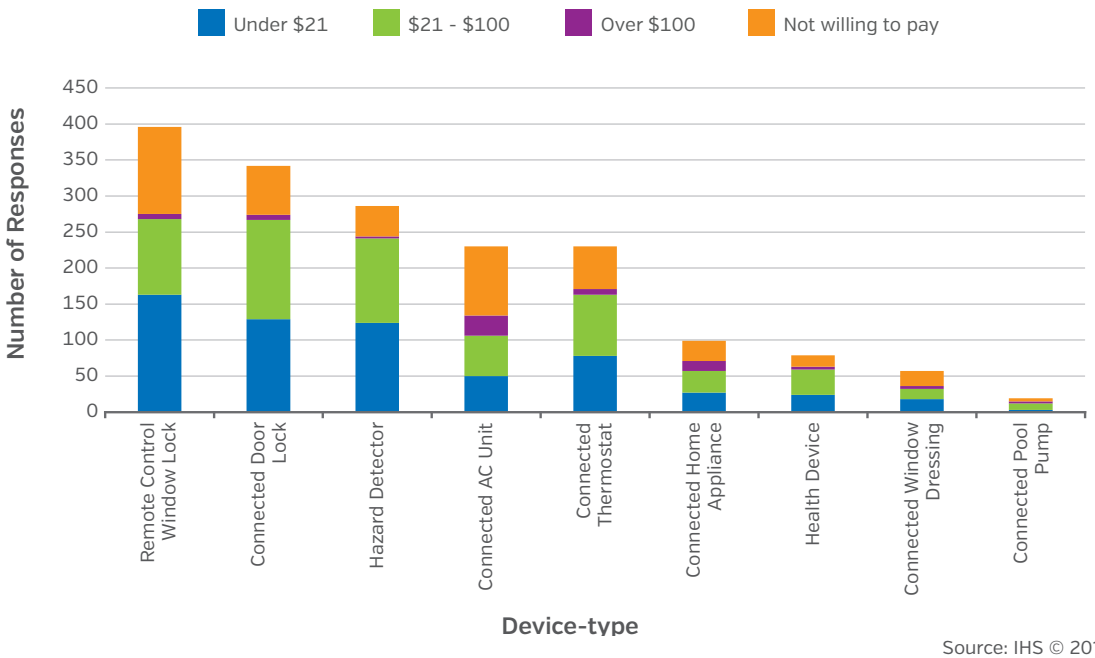
Table 4.48: Question 3.6 - Device Premium
Overview; Number of Respondents

	Under $21	$21 - $100	Over $100	Not willing to pay	Total (n)
Remote Control Window Lock	163	105	7	121	396
	41%	27%	2%	31%	100%
Connected Door Lock	129	138	7	68	342
	38%	40%	2%	20%	100%
Hazard Detector	124	117	3	42	286
	43%	41%	1%	15%	100%
Connected AC Unit	50	56	28	96	230
	22%	24%	12%	42%	100%
Connected Thermostat	78	85	8	59	230
	34%	37%	3%	26%	100%
Connected Home Appliance	27	30	14	28	99
	27%	30%	14%	28%	100%
Health Device	24	35	4	16	79

	Under $21	$21 - $100	Over $100	Not willing to pay	Total (n)
	30%	44%	5%	20%	100%
Connected Window Dressing	18	14	4	21	57
	32%	25%	7%	37%	100%
Connected Pool Pump	3	9	3	4	19
	16%	47%	16%	21%	100%

Source: IHS © 2013 IHS

Chart 4.18: Question 3.6 – Device Premium



Source: IHS © 2013 IHS

The top four selected devices with sample frames above 300 respondents were analyzed by age category in Tables 4.49 to 4.53.

Table 4.49: Question 3.6 - Window/Door Sensor
By Age Category; Number of Respondents

	18-23	24-29	30-35	36-40	41 -45	46-50	51-64	65 or over
Under $21	17	25	14	20	27	17	24	16
	36%	50%	27%	38%	40%	31%	44%	44%
$21 - $100	20	20	26	22	21	17	16	8
	43%	40%	51%	42%	31%	31%	29%	22%
Over $100	4	1	4	2	3	1	0	2
	9%	2%	8%	4%	4%	2%	0%	6%

	18-23	24-29	30-35	36-40	41 -45	46-50	51-64	65 or over
Not willing to pay	6	4	7	8	17	20	15	10
	13%	8%	14%	15%	25%	36%	27%	28%
	47	50	51	52	68	55	55	36

Source: IHS © 2013 IHS

Table 4.50: Question 3.6 - Connected Window Lock
By Age Category; Number of Respondents

	18-23	24-29	30-35	36-40	41 -45	46-50	51-64	65 or over
Under $21	18	24	20	22	30	14	26	9
	40%	50%	42%	46%	46%	26%	48%	26%
$21 - $100	19	13	18	10	15	13	9	8
	42%	27%	38%	21%	23%	25%	17%	23%
Over $100	0	3	2	1	0	1	0	0
	0%	6%	4%	2%	0%	2%	0%	0%
Not willing to pay	8	8	8	15	20	25	19	18
	18%	17%	17%	31%	31%	47%	35%	51%
	45	48	48	48	65	53	54	35

Source: IHS © 2013 IHS

Table 4.51: Question 3.6 - Motion Sensors
By Age Category; Number of Respondents

	18-23	24-29	30-35	36-40	41 -45	46-50	51-64	65 or over
Under $21	16	24	16	22	33	29	37	22
	37%	50%	40%	44%	47%	52%	54%	55%
$21 - $100	20	16	17	18	22	16	16	7
	47%	33%	43%	36%	31%	29%	23%	18%
Over $100	3	2	5	1	2	0	0	2
	7%	4%	13%	2%	3%	0%	0%	5%
Not willing to pay	4	6	2	9	13	11	16	9
	9%	13%	5%	18%	19%	20%	23%	23%
	43	48	40	50	70	56	69	40

Source: IHS © 2013 IHS

Table 4.52: Question 3.6 - Connected Door Lock
By Age Category; Number of Respondents

	18-23	24-29	30-35	36-40	41 -45	46-50	51-64	65 or over
Under $21	19	21	18	20	16	10	18	7
	40%	47%	38%	44%	31%	24%	45%	29%
$21 - $100	23	16	21	18	24	13	12	11
	49%	36%	44%	40%	46%	32%	30%	46%
Over $100	1	2	2	0	1	1	0	0
	2%	4%	4%	0%	2%	2%	0%	0%
Not willing to pay	4	6	7	7	11	17	10	6
	9%	13%	15%	16%	21%	41%	25%	25%
	47	45	48	45	52	41	40	24

Source: IHS © 2013 IHS

Table 4.53: Question 3.6 - Hazard Detector
By Age Category; Number of Respondents

	18-23	24-29	30-35	36-40	41 -45	46-50	51-64	65 or over
Under $21	14	12	14	16	20	15	16	17
	47%	44%	38%	44%	49%	39%	37%	50%
$21 - $100	14	11	14	16	14	16	17	15
	47%	41%	38%	44%	34%	42%	40%	44%
Over $100	0	0	3	0	0	0	0	0
	0%	0%	8%	0%	0%	0%	0%	0%
Not willing to pay	2	4	6	4	7	7	10	2
	7%	15%	16%	11%	17%	18%	23%	6%
	30	27	37	36	41	38	43	34

Source: IHS © 2013 IHS

In general, the older respondents were less likely to be prepared to pay for connected devices.

INFLUENCING FACTORS

Respondents were asked to select the main factor which influenced their purchase of a connected energy management device. Table 4.54 presents an overview of responses. Respondents were asked Question 3.7, “Please select the most important attribute that would influence your purchase of a connected energy device: This question assumes that the device is able to perform its primary function well, and to meet your requirements for its performance [such as a thermostat being able to

successfully control the climate in your home to your pre-set limits]. Devices that should be considered in this question are: thermostats, in-home displays, smart plugs, air conditioning units, appliances, pool pumps and pool pump switches."

Only respondents that indicated an interest in the use-cases associated with the devices listed above, in Question 2.2, were asked this question.

Table 4.54: Question 3.7 - Device Purchase Influence
Connected Energy; Number of Respondents

	Number of Respondents
Energy Efficiency	119
	28%
Durability	86
	20%
Ease of Set up and Use	72
	17%
Outside Home Control	64
	15%
Automated Efficiency	62
	15%
Brand	9
	2%
Other	10
	2%
Total (n)	422

Source: IHS © 2013 IHS

Brand was least selected, with only 2% of responses. As expected due to the application, 'energy efficiency' was most selected by respondents, following by 'durability' and 'ease of set-up and use'.

Analysis by housing tenure is included in Table 4.55, with homeowners most likely to purchase these devices.

Table 4.55: Question 3.7 - Device Purchase Influence
By Housing Tenure; Number of Respondents

	Homeowner	Tenancy	Living with relatives
Energy Efficiency	77	34	8
	44%	38%	38%
Durability	49	27	10
	28%	30%	48%

	Homeowner	Tenancy	Living with relatives
Ease of Set up and Use	43	27	2
	24%	30%	10%
Outside Home Control	44	15	5
	25%	17%	24%
Automated Efficiency	33	25	4
	19%	28%	19%
Brand	4	4	1
	2%	4%	5%
Other	8	1	1
	5%	1%	5%
	177	89	21

Source: IHS © 2013 IHS

Table 4.56 presents an overview of the factors influencing the purchase of connected security and safety devices. Respondents were asked Question 3.8, "Please select the most important attribute that would influence your purchase of a connected safety and security device: This question assumes that the device is able to perform its primary function well, and to meet your requirements for its performance (such as an IP/Network camera being able to provide you with streaming video of your home on request). Devices that should be considered in this question are: network/IP cameras, connected door locks, motion sensors, remote control window locks, window sensors, and fire, smoke, carbon monoxide or water detectors."

Only respondents that indicated an interest in the use-cases associated with the devices listed above, in Question 2.2, were asked this question.

Table 4.56: Question 3.8 - Device Purchase Influence
Connected Safety and Security; Number of Respondents

	Number of Respondents
Durability	115
	23%
Ease of Set up and Use	112
	22%
Outside Home Control	110
	22%
Automated Efficiency	72
	14%
Energy Efficiency	64
	13%

	Number of Respondents
Brand	18
	4%
Other	12
	2%
Total (n)	503

Source: IHS © 2013 IHS

- Unlike connected energy management devices, for connected home security or safety devices, 'durability' was cited as the main purchase criteria, followed very closely by 'ease of set-up and use' and 'control outside of the home'.

Analysis by housing tenure is presented in Table 4.57.

Table 4.57: Question 3.8 - Device Purchase Influence
By Housing Tenure; Number of Respondents

	Homeowner	Tenancy	Living with relatives
Durability	68	40	7
	32%	36%	29%
Ease of Set up and Use	67	40	5
	31%	36%	21%
Outside Home Control	72	28	10
	34%	25%	42%
Automated Efficiency	46	19	7
	21%	17%	29%
Energy Efficiency	42	20	2
	20%	18%	8%
Brand	8	7	3
	4%	6%	13%
Other	7	3	2
	3%	3%	8%
	214	111	24

Source: IHS © 2013 IHS

Homeowners found being able to control the system from outside the home more influential than those that rented their properties.

Table 4.58 presents an overview of the factors influencing the purchase of connected health monitoring. Respondents were asked Question 3.9, "Please select the most important attribute that would influence your purchase of a connected health and monitoring device: This question assumes that

the device is able to perform its primary function well, and to meet your requirements for its performance (such as a blood pressure monitor being able to warn you when your blood pressure is too high, or motion sensors in an elderly relative's home that could detect a deviation from normal routine). Devices that should be considered in this question are: connected health devices (such as blood pressure monitor or weight scales), and elderly monitoring or emergency response systems."

Only respondents that indicated an interest in the use-cases associated with the devices listed above, in Question 2.2, were asked this question.

Table 4.58: Question 3.9 - Device Purchase Influence
Connected Health Monitoring; Number of Respondents

	Number of Respondents
Ease of Set up and Use	53
	27%
Automated Efficiency	47
	24%
Durability	35
	18%
Outside Home Control	35
	18%
Energy Efficiency	15
	8%
Brand	9
	5%
Other	6
	3%
Total (n)	200

Source: IHS © 2013 IHS

Analysis by housing tenure is included in Table 4.59

Table 4.59: Question 3.9 - Device Purchase Influence
By Housing Tenure; Number of Respondents

	Homeowner	Tenancy	Living with relatives
Ease of Set up and Use	28	22	3
	43%	36%	20%
Automated Efficiency	16	23	8
	25%	38%	53%

	Homeowner	Tenancy	Living with relatives
Durability	18	14	3
	28%	23%	20%
Outside Home Control	23	8	4
	35%	13%	27%
Energy Efficiency	10	5	0
	15%	8%	0%
Brand	6	3	0
	9%	5%	0%
Other	3	2	1
	5%	3%	7%
	65	61	15

Source: IHS © 2013 IHS

- Again, control outside of the home was more important to homeowners than those renting their properties.

Table 4.60 presents an overview of the factors influencing the purchase of connected entertainment or convenience systems. Respondents were asked Question 3.10, "Please select the most important attribute that would influence your purchase of a connected entertainment and convenience device: This question assumes that the device is able to perform its primary function well, and to meet your requirements for its performance (such as a connecting media device (such as a dongle) allowing you to control your TV from your smartphone). Devices that should be considered in this question are: a device or app that allows you to control your TV, sound system or Blu-Ray/DVD player with your smartphone or tablet, and connected lighting controls."

Only respondents that indicated an interest in the use-cases associated with the devices listed above, in Question 2.2, were asked this question.

Table 4.60: Question 3.10 - Device Purchase Influence
Connected Entertainment/Convenience; Number of Respondents

	Number of Respondents
Ease of Set up and Use	117
	34%
Energy Efficiency	58
	17%
Automated Efficiency	51
	15%
Durability	53
	15%

	Number of Respondents
Outside Home Control	50
	14%
Brand	13
	4%
Other	6
	2%
Total [n]	348

Source: IHS © 2013 IHS

- Ease of set up and use was the most selected purchase influence; this was also the case across the different housing tenures, as shown in Table 4.61.

Table 4.61: Question 3.10 - Device Purchase Influence
By Housing Tenure; Number of Respondents

	Homeowner	Tenancy	Living with relatives
Ease of Set up and Use	68	43	6
	48%	58%	38%
Energy Efficiency	38	13	7
	27%	18%	44%
Automated Efficiency	32	16	3
	23%	22%	19%
Durability	32	15	6
	23%	20%	38%
Outside Home Control	34	14	2
	24%	19%	13%
Brand	5	5	3
	4%	7%	19%
Other	4	2	0
	3%	3%	0%
	142	74	16

Source: IHS © 2013 IHS

DEVICE PURCHASE EXPECTATIONS

Table 4.62 presents responses regarding the timeframe for device purchase within each use-case selected by the respondent. Respondents were asked Question 3.11, “Do you intend to purchase a device or system to allow you to perform the following functions? If so, when would you expect to do this?”

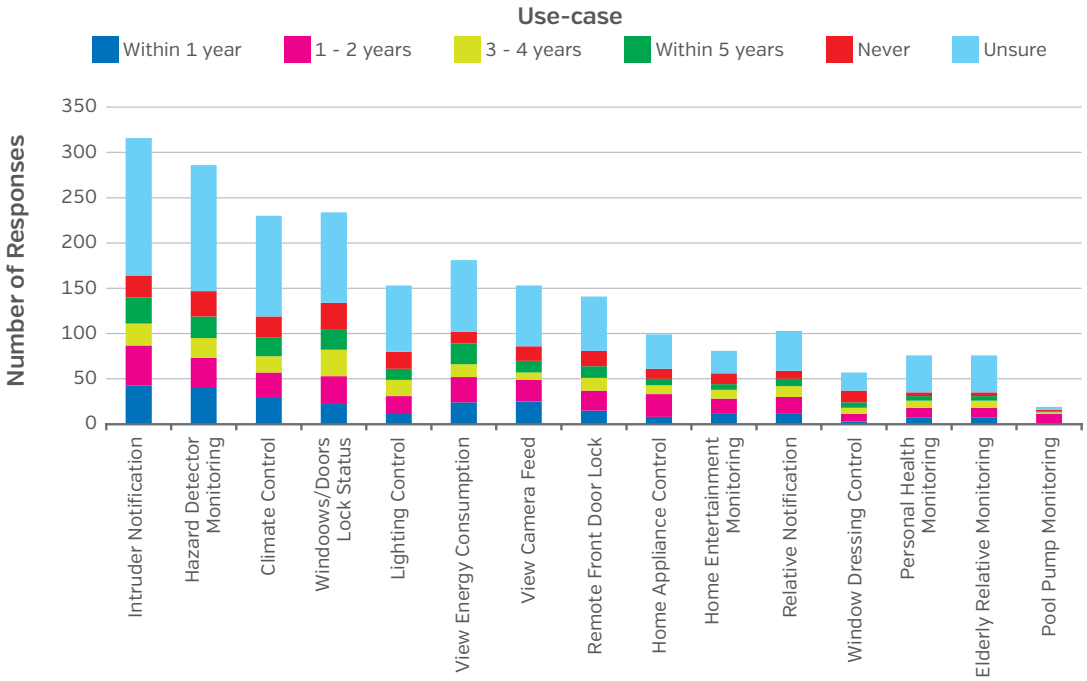
Table 4.62: Question 3.11 - Purchase Timeframe
Overview; Number of Respondents

	Within 1 year	1 - 2 years	3 - 4 years	Within 5 years	Never	Unsure	Total (n)
Intruder Notification	43	44	24	29	24	152	316
	14%	14%	8%	9%	8%	48%	100%
Hazard Detector Monitoring	41	32	22	24	28	139	286
	14%	11%	8%	8%	10%	49%	100%
Climate Control	30	27	18	21	23	111	230
	13%	12%	8%	9%	10%	48%	100%
Windoows/Doors Lock Status	22	31	29	22	30	100	234
	9%	13%	12%	9%	13%	43%	100%
View Energy Consumption	24	28	14	23	13	79	181
	13%	15%	8%	13%	7%	44%	100%
Lighting Control	11	20	18	12	19	73	153
	7%	13%	12%	8%	12%	48%	100%
View Camera Feed	25	24	8	13	16	67	153
	16%	16%	5%	8%	10%	44%	100%
Remote Front Door Lock	15	22	14	13	17	60	141
	11%	16%	10%	9%	12%	43%	100%
Home Appliance Control	8	25	10	7	11	38	99
	8%	25%	10%	7%	11%	38%	100%
Home Entertainment Monitoring	12	16	10	6	12	25	81
	15%	20%	12%	7%	15%	31%	100%
Relative Notification	12	18	12	8	9	44	103
	12%	17%	12%	8%	9%	43%	100%
Window Dressing Control	3	8	7	6	13	20	57
	5%	14%	12%	11%	23%	35%	100%
Personal Health Monitoring	7	11	8	5	4	41	76
	9%	14%	11%	7%	5%	54%	100%
Elderly Relative Monitoring	7	11	8	5	4	41	76
	9%	14%	11%	7%	5%	54%	100%
Pool Pump Monitoring	1	10	2	1	2	3	19
	5%	53%	11%	5%	11%	16%	100%

Source: IHS © 2013 IHS

- Aside from pool pump monitoring, the largest proportion of respondents indicated they were "unsure" when they would purchase a connected device to enable the use-case they selected.
- Crucially, respondents with a larger decision-making role were more inclined to anticipate purchasing devices within five years in all use-cases, excluding intruder notification. Although the difference in this particular use-case was small.
- Younger respondents were more likely to anticipate purchasing devices within five years, with this reaching its peak in the 30 to 35 age category. The only discrepancy was in lighting control and home entertainment monitoring, where the peak was the 24 to 29 age category.
- Respondents that were only made aware of connected home systems through the examples given in the survey itself were typically more likely to indicate they were unsure of the timeframe they would anticipate purchasing connected home devices to enable the functionality they suggested an interest in performing.

Chart 4.19: Question 3.11 – Purchase Timeframe



Source: IHS © 2013 IHS

Table 4.63 presents respondents answers regarding their expectation for purchase of devices to enable the intruder notification use-case, by location. The sample frame is limited to respondents that would like to be able to perform specific connected home applications.

Table 4.63: Question 3.11 - Purchase Timeframe: Intruder Notification
By Location; Number of Respondents

	Canada	U.S. – East Coast	U.S. – Midwest	U.S. – South	U.S. – West Coast
Within 5 years	62	19	23	13	23
	44%	42%	52%	26%	62%
Never	10	4	3	5	2
	7%	9%	7%	10%	5%
Unsure	68	22	18	32	12
	49%	49%	41%	64%	32%
Total (n)	140	45	44	50	37

Source: IHS © 2013 IHS

- There was some regional differences, with respondents in the South of the United States were least likely to indicate they anticipated purchasing devices to enable intruder notification within the next five years, and respondents in the West Coast of the United States most likely.

Table 4.64 presents this information by age category.

Table 4.64: Question 3.11 - Purchase Timeframe: Intruder Notification
By Age Category; Number of Respondents

	18-23	24-29	30-35	36-40	41 -45	46-50	51-64	65 or over
Within 5 years	19	18	22	18	23	18	17	5
	54%	49%	63%	51%	45%	43%	33%	17%
Never	1	1	1	1	6	3	9	2
	3%	3%	3%	3%	12%	7%	17%	7%
Unsure	15	18	12	16	22	21	26	22
	43%	49%	34%	46%	43%	50%	50%	76%
Total (n)	35	37	35	35	51	42	52	29

Source: IHS © 2013 IHS

- Older respondents were less likely to have indicated they anticipated purchasing a device to enable intruder notification within the next five years, with the main differences with respondents aged 51 or above.

Table 4.65 presents this information by decision-making role.

Table 4.65: Question 3.11 - Purchase Timeframe: Intruder Notification
By Decision-making Role; Number of Respondents

	Major	Minor	None
Within 5 years	79	50	11
	57%	37%	26%
Never	8	9	7
	6%	7%	17%
Unsure	51	77	24
	37%	57%	57%
Total (n)	138	136	42

Source: IHS © 2013 IHS

- Respondents with a larger decision-making role were more inclined to suggest that they anticipate purchasing intruder notification devices within the next five years.

Table 4.66 presents this information by security-system ownership.

Table 4.66: Question 3.11 - Purchase Timeframe: Intruder Notification
By Security System Ownership; Number of Respondents

	Security System Owners	Security System Non-owners
Within 5 years	76	64
	59%	34%
Never	2	22
	2%	12%
Unsure	51	101
	40%	54%
Total (n)	129	187

Source: IHS © 2013 IHS

- Respondents that owned security systems were more inclined to indicate they anticipate purchasing intruder notification devices within the next five years.

Table 4.67 presents respondents answers regarding their expectation for purchase of devices to enable hazard detection, by location.

Table 4.67: Question 3.11 - Purchase Timeframe: Hazard Detection
By Location; Number of Respondents

	Canada	U.S. – East Coast	U.S. – Midwest	U.S. – South	U.S. – West Coast
Within 5 years	54	16	17	15	17
	40%	37%	50%	35%	53%
Never	16	4	1	6	1
	12%	9%	3%	14%	3%
Unsure	64	23	16	22	14
	48%	53%	47%	51%	44%
Total (n)	134	43	34	43	32

Source: IHS © 2013 IHS

- Once more, respondents in the South of the U.S. were least likely to have indicated they anticipate purchasing devices within the next five years, with the West Coast of the U.S. respondents most likely, closely followed by the East Coast.

Table 4.68 presents this information by security system ownership.

Table 4.68: Question 3.11 - Purchase Timeframe: Hazard Detection
By Security System Ownership; Number of Respondents

	Security System Owners	Security System Non-owners
Within 5 years	55	64
	56%	34%
Never	5	23
	5%	12%
Unsure	39	100
	39%	53%
Total (n)	99	187

Source: IHS © 2013 IHS

- Again, respondents that owned a security system were more likely to indicate they anticipate purchasing these connected home devices within five years.

Table 4.69 displays responses regarding the purchase of devices to enable the climate control use-case, by respondent location.

Table 4.69: Question 3.11 - Purchase Timeframe: Climate Control
By Location; Number of Respondents

	Canada	U.S. – East Coast	U.S. – Midwest	U.S. – South	U.S. – West Coast
Within 5 years	40	18	14	11	13
	43%	49%	41%	27%	52%
Never	11	1	2	7	2
	12%	3%	6%	17%	8%
Unsure	42	18	18	23	10
	45%	49%	53%	56%	40%
Total (n)	**93**	**37**	**34**	**41**	**25**

Source: IHS © 2013 IHS

- As with the previous use-cases, respondents in the South of the U.S. were least likely to have indicated they anticipate purchasing devices within the next five years, with the West Coast of the U.S. most likely, closely followed by the East Coast.

Table 4.70 presents this information by security system ownership.

Table 4.70: Question 3.11 - Purchase Timeframe: Climate Control
By Security System Ownership; Number of Respondents

	Security System Owners	Security System Non-owners
Within 5 years	40	56
	54%	36%
Never	5	18
	7%	12%
Unsure	29	82
	39%	53%
Total (n)	**74**	**156**

Source: IHS © 2013 IHS

- Again, respondents that owned security systems were more inclined to suggest they would purchase these connected home devices within the next five years, as was the case with the majority of use-cases.

4.3 CONNECTED-HOME SERVICE-SPECIFIC FEATURES & CONSIDERATIONS

SUMMARY & KEY IMPLICATIONS

This section presents the key implications from the analysis contained within Section 4.3.

- When provided with a range of pre-defined monthly and up-front fees, respondents that would like to be able to perform one or more connected home functions were more likely to opt for a lower monthly fee and higher upfront cost, with almost one half of respondents interested in connected home functions opting for a monthly fee lower than $20 and an upfront cost of over $500. Analyzed by household income, those with lower household income levels were more inclined to select higher monthly fees and lower upfront costs, suggesting that cost models need to be designed based on the specific target segment.
- Nearly a quarter of respondents selected that they would not pay for this system at all, regardless of the split between monthly and upfront cost structure. As these respondents were limited to those that had previously stated that they wanted to be able to perform at least one connected home function, this may suggest there is a role for standalone connected devices outside of wider connected home systems. Alternatively, it may point to the need for new business models outside of the upfront cost or recurring subscription options seen today.
- When considering a connected home service provider, respondents were most likely to select a specialist connected home company. More than half of respondents selected a company that already charges a subscription fee. Security providers were the second most commonly selected company. This again indicates the appeal of home monitoring or security functions to North American consumers, as well as highlighting potential partnership opportunities to leverage expertise from specialist providers. When the various telecommunications and cable providers are combined to take into account multi-play operators, their collective score was also high.
- Respondents were significantly more likely to opt for a professionally installed system rather than self-install, despite being informed that these systems can be designed specifically to enable self-install, with respondents harboring concerns over their ability to correctly set-up connected home systems. Interestingly, respondents with lower technology adoption scores were more likely to select self-installation than those with higher scores, with these respondents dissuaded by the perceived higher cost of professionally installed systems. While offering self-install systems can be a means of reducing system cost, work needs to be done to increase consumers' level of comfort with this process. For example, the provision of a service to guide consumers through the self-installation process without the need for the physical presence of a professional is potentially one way of broadening the appeal of connected home systems. Interestingly, once the system is set-up, most respondents feel that they could comfortable add new devices to the network, provided they were designed for self-install. This is aligned to some offerings from North American connected home providers today where the initial system set-up requires professional installation, but consumers have the option to either self-install or select their own contractor for 'add on' packages.

UPFRONT AND SUBSCRIPTION SERVICE FEES

OVERVIEW

Respondents were provided with the following question: "Some connected home systems can have both an upfront and a monthly service fee, with different price combinations available. If you were to purchase this type of system, which of the following price combinations would be most attractive to you?"

Respondents could choose from 15 pricing options, ranging from a system with a $700 upfront cost and no recurring service fees, to a system with no up-front cost and $70 recurring service fees, with a further option that they would not pay for this type of system. This question was not intended to assess specific system costs, which will vary widely based on system functionality, but to indicate preferences surrounding the balance between upfront costs and ongoing service fees.

Six hundred and eleven (611) respondents were asked this question, with the sample frame limited to those who had responded positively to the concept of connected devices in previous questions. Table 4.71 and Figure 4.39 present the responses.

Key points to note from this data include:

Table 4.71: Question 5.1 - Upfront and Monthly Service Fees
Overview; Number of Respondents

	Number of Respondents
$0 per month / $700 upfront	152
	24.9%
$5 per month / $650 upfront	23
	3.8%
$10 per month / $600 upfront	43
	7.0%
$15 per month / $550 upfront	11
	1.8%
$20 per month / $500 upfront	59
	9.7%
$25 per month / $450 upfront	29
	4.7%
$30 per month / $400 upfront	32
	5.2%
$35 per month / $350 upfront	21
	3.4%
$40 per month / $300 upfront	24
	3.9%
$45 per month / $250 upfront	9
	1.5%

	Number of Respondents
$50 per month / $200 upfront	19
	3.1%
$55 per month / $150 upfront	6
	1.0%
$60 per month / $100 upfront	4
	0.7%
$65 per month / $50 upfront	8
	1.3%
$70 per month / no upfront cost	32
	5.2%
I would not pay for this system	139
	22.7%
Total (n)	611

Source: IHS © 2013 IHS

- Nearly 25% of respondents selected that they would prefer a complete upfront cost of $700 with no monthly subscription.
- Nearly 23% of respondents selected that they would not pay for this system at all, regardless of the split between monthly and upfront cost structure. As these respondents were limited to those with an interest in at least one type of connected device (having previously indicated that they either owned a connected device or would like the functionality enabled through a connected device), this could have a number of implications. For example, it may suggest that there could be a role for standalone connected devices outside of wider connected home systems. Alternatively, it may point to the need for new business models outside of the upfront cost or recurring subscription options seen today. For more information on potential monetization models, please refer to Chapter Three.
- The most common 'subscription-based' combination was $20 per month/$500 upfront, with just under 10% of respondents selecting this option. Interestingly, despite a decline in response frequency at the $55-$65 per month subscription fee, there is a small spike in respondents opting for systems with $70 monthly fees and no up-front costs.

Due to the wide number of options provided to respondents when cross-analyzed against demographic data the number of respondents in each category becomes very low. For this reason, for certain demographics, the categories have been combined as follows:

- Low Monthly Fee, High Upfront Cost ($0-$20 per month/$700-$500 upfront)
- Mid Monthly Fee, Mid Upfront Cost ($25-$45 per month/$450-$250 upfront)
- High Monthly Fee, Low Upfront Cost ($50-$70 per month/$200-$0 upfront)
- Would not pay for this system

There are significant variations by some demographics, as highlighted below.

Table 4.72 presents this information by location.

Table 4.72: Question 5.1 - Upfront and Monthly Service Fees
By Location; Number of Respondents

	Canada	U.S - East Coast	U.S. - Midwest	U.S - South	U.S - West Coast
Low monthly fee, high upfront cost	138	39	34	38	39
	50%	42%	43%	42%	55%
Mid monthly fee and upfront cost	48	16	16	20	15
	17%	17%	20%	22%	21%
High monthly fee, low upfront cost	25	10	14	13	7
	9%	11%	18%	14%	10%
Would not pay for this system	66	27	16	20	10
	24%	29%	20%	22%	14%
Total (n)	277	92	80	91	71

Source: IHS © 2013 IHS

Key points to note from this data include:

- A higher proportion of respondents on the East Coast U.S. would not pay for this type of system.
- On average, a higher proportion of West Coast respondents chose higher upfront costs and lower monthly subscription costs, compared with the Midwest, South, and East Coast.
- A higher proportion of Canadian respondents than U.S. respondents indicated that they preferred low monthly fees with high upfront costs. Conversely, a higher proportion of U.S. respondent indicated that they preferred mid-high monthly fees. A similar proportion from both regions selected that they would not pay for the system (20-25%).

Table 4.73 presents this information by gender.

Table 4.73: Question 5.1 - Upfront and Monthly Service Fees
By Gender; Number of Respondents

	Female	Male
Low monthly fee, high upfront cost	151	137
	45%	50%
Mid monthly fee and upfront cost	56	59
	17%	22%
High monthly fee, low upfront cost	54	15
	16%	5%

	Female	Male
Would not pay for this system	76	63
	23%	23%
Total (n)	337	274

Source: IHS © 2013 IHS

Key points to note from this data include:

- Generally, women were more likely than men to select that they would prefer paying higher monthly subscription fees with lower upfront costs; whereas men were more skewed towards the mid- and high-upfront costs with relatively lower ongoing fees.

Table 4.74 presents this information by housing tenure.

Table 4.74: Question 5.1 - Upfront and Monthly Service Fees
By Housing Tenure; Number of Respondents

	Living with relatives	Tenancy	Homeowner
Low monthly fee, high upfront cost	20	93	175
	45%	48%	47%
Mid monthly fee and upfront cost	4	32	79
	9%	16%	21%
High monthly fee, low upfront cost	6	27	36
	14%	14%	10%
Would not pay for this system	14	43	82
	32%	22%	22%
Total (n)	44	195	372

Source: IHS © 2013 IHS

Key points to note from this data include:

- While responses were fairly similar across renters and home owners, those renting homes were slightly more likely to be willing to pay a higher monthly fee with a lower system cost than home owners, although the variation was minimal.

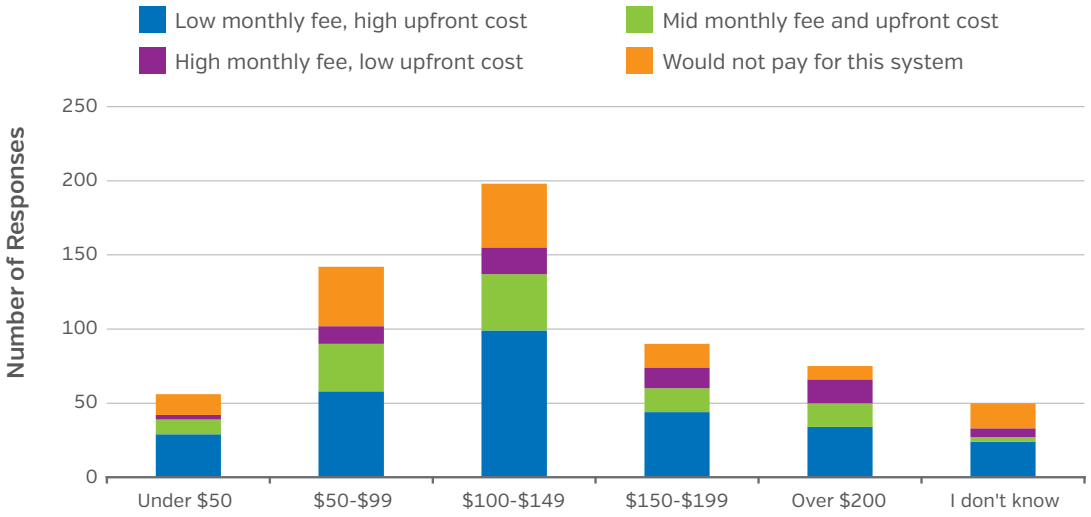
Table 4.75 presents this information by monthly electricity expenditure.

Table 4.75: Question 5.1 - Upfront and Monthly Service Fees
By Monthly Electricity Expenditure; Number of Respondents

	Under $50	$50-$99	$100-$149	$150-$199	Over $200	I don't know
Low monthly fee, high upfront cost	29	58	99	44	34	24
	52%	41%	50%	49%	45%	48%
Mid monthly fee and upfront cost	10	32	38	16	16	3
	18%	23%	19%	18%	21%	6%
High monthly fee, low upfront cost	3	12	18	14	16	6
	5%	8%	9%	16%	21%	12%
Would not pay for this system	14	40	43	16	9	17
	25%	28%	22%	18%	12%	34%
Total (n)	**56**	**142**	**198**	**90**	**75**	**50**

Source: IHS © 2013 IHS

Chart 4.20: Question 5.1 – Upfront and Monthly Service Fees



Source: IHS © 2013 IHS

Key points to note from this data include:

- Respondents with higher household electricity expenditure were more willing to pay for systems with low upfront costs and high monthly fees than other respondents. Twenty-one percent of respondents with household electricity expenditure over $200/month selected one of the options in this category, compared with only 5% of respondents with electricity expenditure under $50/month.

Table 4.76 presents this information by household income level.

Table 4.76: Question 5.1 - Upfront and Monthly Service Fees
By Annual Household Income; Number of Respondents

	Under $25,000	$25,000 - $49,999	$50,000 - $74,999	$75,000 - $99,999	Over $100,000
Low monthly fee, high upfront cost	47	78	66	51	46
	41%	47%	50%	53%	45%
Mid monthly fee and upfront cost	13	26	32	22	22
	11%	16%	24%	23%	21%
High monthly fee, low upfront cost	18	19	13	8	11
	16%	11%	10%	8%	11%
Would not pay for this system	36	43	21	15	24
	32%	26%	16%	16%	23%
Total (n)	114	166	132	96	103

Source: IHS © 2013 IHS

Of respondents that would pay for a connected home system, respondents with lower household incomes are more likely than other respondents to select high monthly fees with low upfront costs. Respondents with a higher household income were more likely than others to select the mid-level monthly fee and upfront cost combination. This was selected by 28% of respondents with a household income of $100,000 or over, compared with only 17% of respondents with a household income under $25,000.

Table 4.77 presents this information by decision-making role.

Table 4.77: Question 5.1 - Upfront and Monthly Service Fees
By Decision Making Role; Number of Respondents

	Major Decision Making Role	Minor Decision Making Role	No Decision Making Role
Low monthly fee, high upfront cost	135	113	40
	48%	45%	52%
Mid monthly fee and upfront cost	65	44	6
	23%	17%	8%
High monthly fee, low upfront cost	25	33	11
	9%	13%	14%
Would not pay for this system	57	62	20
	20%	25%	26%
Total (n)	282	252	77

Source: IHS © 2013 IHS

Key points to note from this data include:

- Those indicating themselves in a major decision making role were most likely to also prefer low monthly fees and high upfront costs (48%).

Table 4.78 presents this information by technology adoption.

Table 4.78: Question 5.1 - Upfront and Monthly Service Fees
By Technology Adoption; Number of Respondents

	Positive	Neutral	Negative
Low monthly fee, high upfront cost	155	98	35
	52%	44%	39%
Mid monthly fee and upfront cost	70	35	10
	23%	16%	11%
High monthly fee, low upfront cost	33	30	6
	11%	14%	7%
Would not pay for this system	42	58	39
	14%	26%	43%
Total (n)	300	221	91

Source: IHS © 2013 IHS

Key points to note from this data include:

- Respondents with a positive technology adoption score were more likely to be willing to pay for this type of system than those with neutral or negative adoption scores.

SERVICE PROVIDER PREFERENCE

OVERVIEW

Respondents were asked “If you were going to pay a monthly subscription fee to monitor and control in-home devices from outside the home, which companies would you feel most comfortable with providing this service?”

Respondents could select a single company type only. Previous consumer surveys conducted by IHS have indicated that respondents would feel comfortable with home management services from multiple company types. As more companies enter the market, and services become available from a wider range of companies, the purpose of this question was to determine if respondents today had a clear preference.

Six hundred and eleven (611) respondents took part in this question, limited to those that had previously indicated an interest in connected devices in previous questions (either by owning a connected device today, or wanting to be able to perform a function which would be enabled through a connected device). However, 22.7% of respondents who selected that they either already owned a device or would want to perform a function indicated in Question 2.2 that they would not pay one of the upfront/monthly combinations for a connected home system.

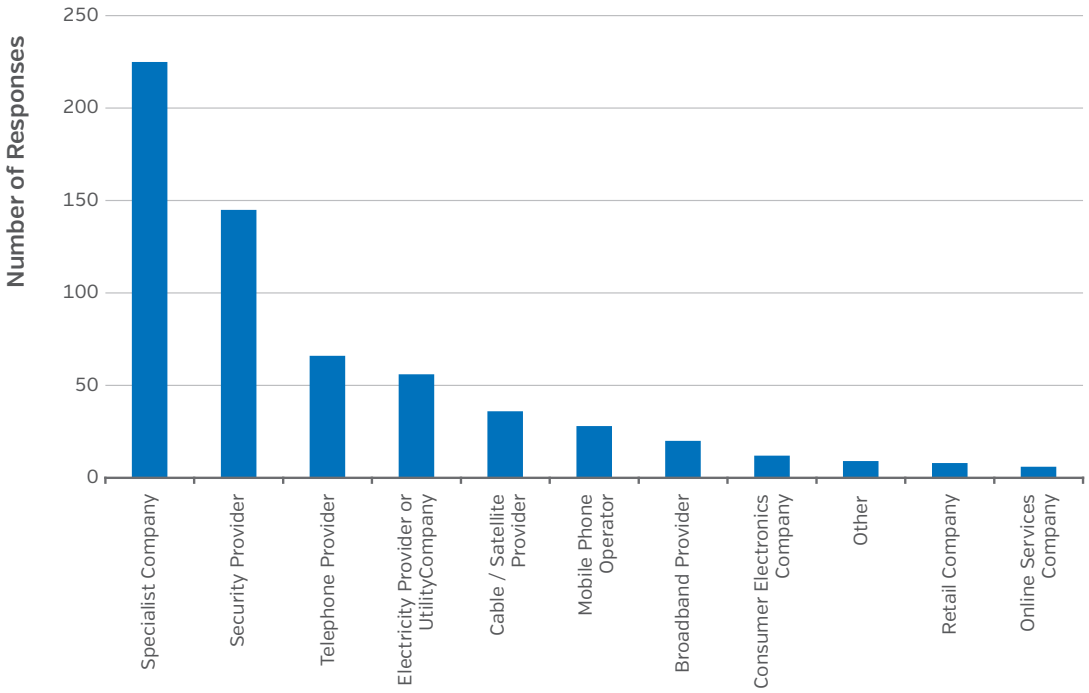
Table 4.79 provides an overview of the results.

Table 4.79: Question 5.2 - Managed Service Provider Preference
Overview; Number of Respondents

	Number of Respondents
Broadband Provider	20
	3.3%
Cable / Satellite Provider	36
	5.9%
Consumer Electronics Company	12
	2.0%
Electricity Provider or Utility Company	56
	9.2%
Mobile Phone Operator	28
	4.6%
Online Services Company	6
	1.0%
Retail Company	8
	1.3%
Security Provider	145
	23.7%
Specialist Company	225
	36.8%
Telephone Provider	66
	10.8%
Other	9
	1.5%
Total (n)	611

Source: IHS © 2013 IHS

Chart 4.21: Question 5.2 – Managed Service Provider Preference



Source: IHS © 2013 IHS

Key points to note include:

- Nearly 37% of respondents would prefer to pay a monthly subscription to a specialist provider for a connected home system & service.
- Over 57% of respondents selected a company that already charges an ongoing fee, such as telecommunications companies, security providers or utility companies.
- Over 23% of respondents would prefer to pay a monthly subscription to a security provider for a connected home system & service.
- Combining the different telecommunications companies (broadband providers, mobile phone operators, telephone providers), almost 19% of respondents selected these companies. Recognizing the emerging quad-play in this industry, adding in cable or satellite providers increases this to over 24% of respondents, very similar to security providers.

Table 4.80 presents this information by location.

Table 4.80: Question 5.2 - Managed Service Provider Preference
By Location; Number of Respondents

	Canada	U.S. - East Coast	U.S - Midwest	U.S - South	U.S. - West Coast
Broadband Provider	13	0	1	3	3
	5%	0%	1%	3%	4%
Cable / Satellite Provider	12	5	7	7	5
	4%	5%	9%	8%	7%
Consumer Electronics Company	5	1	1	4	1
	2%	1%	1%	4%	1%
Electricity Provider or Utility Company	26	11	6	4	9
	9%	12%	8%	4%	13%
Mobile Phone Operator	7	8	5	4	4
	3%	9%	6%	4%	6%
Online Services Company	6	0	0	0	0
	2%	0%	0%	0%	0%
Retail Company	4	0	2	1	1
	1%	0%	3%	1%	1%
Security Provider	58	25	20	26	16
	21%	27%	25%	29%	23%
Specialist Company	111	30	28	33	23
	40%	33%	35%	36%	32%
Telephone Provider	29	11	9	9	8
	10%	12%	11%	10%	11%
Other	6	1	1	0	1
	2%	1%	1%	0%	1%
Total (n)	277	92	80	91	71

Source: IHS © 2013 IHS

Key points to note include:

- While there were minor variations between the U.S. regions and between the U.S. and Canada, there were no significant differences in choice of company type and where a respondent lived.

Table 4.81 presents this information by age category.

Table 4.81: Question 5.2 - Managed Service Provider Preference
By Age; Number of Respondents

	18-23	24-29	30-35	36-40	41 -45	46-50	51-64	65 or over
Broadband Provider	0	2	6	6	3	1	0	2
	0%	3%	7%	8%	3%	1%	0%	3%
Cable / Satellite Provider	2	5	7	5	5	6	5	1
	3%	7%	9%	7%	6%	7%	6%	2%
Consumer Electronics Company	0	1	4	2	2	2	0	1
	0%	1%	5%	3%	2%	2%	0%	2%
Electricity Provider or Utility Company	5	4	8	7	5	8	7	12
	7%	6%	10%	9%	6%	10%	9%	18%
Mobile Phone Operator	7	5	2	3	6	4	1	0
	10%	7%	2%	4%	7%	5%	1%	0%
Online Services Company	1	1	0	1	3	0	0	0
	1%	1%	0%	1%	3%	0%	0%	0%
Retail Company	1	1	1	1	1	1	2	0
	1%	1%	1%	1%	1%	1%	3%	0%
Security Provider	15	18	16	14	23	25	17	17
	22%	26%	20%	18%	26%	30%	22%	26%
Specialist Company	30	25	30	23	30	29	31	27
	44%	36%	37%	30%	34%	35%	40%	41%
Telephone Provider	5	8	7	13	10	6	12	5
	7%	11%	9%	17%	11%	7%	15%	8%
Other	2	0	0	1	1	1	3	1
	3%	0%	0%	1%	1%	1%	4%	2%
Total (n)	**68**	**70**	**81**	**76**	**89**	**83**	**78**	**66**

Source: IHS © 2013 IHS

Key points to note include:

- More respondents in the younger generations (notable 18-23) would prefer to pay their mobile phone operator monthly for a connected home system than in the older age categories.
- The preference for specialist connected home providers remained relatively steady, between 30% and 40% of all respondents across all age bands.
- More respondents in the highest age category (65 or over) stated that they would prefer to pay utility or electricity companies monthly for connected home systems than in younger age categories.

- Combining the telecommunications companies and cable operators as a single category, these were the most popular responses for those in the 36-40 age category at 36% of responses, compared with 30% for specialist companies and 18% for security providers. The second most likely age group to select telecommunications or cable providers was 24-29 year olds, at 29%, compared with a low of 12% from those aged 65 or over.

Table 4.82 presents this information by housing tenure.

Table 4.82: Question 5.2 - Managed Service Provider Preference
By Housing Tenure; Number of Respondents

	No - I live with relatives who rent or own	No - I'm renting	Yes
Broadband Provider	1	6	13
	2%	3%	3%
Cable / Satellite Provider	4	13	19
	9%	7%	5%
Consumer Electronics Company	1	6	5
	2%	3%	1%
Electricity Provider or Utility Company	5	19	32
	11%	10%	9%
Mobile Phone Operator	3	10	15
	7%	5%	4%
Online Services Company	0	5	1
	0%	3%	0%
Retail Company	0	1	7
	0%	1%	2%
Security Provider	10	31	104
	23%	16%	28%
Specialist Company	15	83	127
	34%	43%	34%
Telephone Provider	4	17	45
	9%	9%	12%
Other	1	4	4
	2%	2%	1%
Total (n)	**44**	**195**	**372**

Source: IHS © 2013 IHS

- Those in rented accommodation were more likely to select a specialist company to provide connected home services, at 43% of respondents, compared with 34% of each of the other home ownership categories.
- Those living in rented accommodation were less likely to select security providers, at 16% of respondents compared with 28% of home owners.

Table 4.83 presents this information by monthly electricity expenditure.

Table 4.83: Question 5.2 - Managed Service Provider Preference
By Monthly Electricity Expenditure; Number of Respondents

	Under $50	$50- $99	$100-$149	$150-$199	$200-$299	$300-$399	Over $400	I don't know
Broadband Provider	4	3	6	3	1	1	0	2
	7%	2%	3%	3%	2%	5%	0%	4%
Cable / Satellite Provider	4	7	12	2	8	2	0	1
	7%	5%	6%	2%	15%	10%	0%	2%
Consumer Electronics Company	2	1	4	2	2	0	0	1
	4%	1%	2%	2%	4%	0%	0%	2%
Electricity Provider or Utility Company	4	12	19	7	5	2	0	7
	7%	8%	10%	8%	9%	10%	0%	14%
Mobile Phone Operator	0	5	14	4	2	2	0	1
	0%	4%	7%	4%	4%	10%	0%	2%
Online Services Company	4	1	0	0	0	0	0	1
	7%	1%	0%	0%	0%	0%	0%	2%
Retail Company	1	3	2	2	0	0	0	0
	2%	2%	1%	2%	0%	0%	0%	0%
Security Provider	11	32	42	26	19	7	0	8
	20%	23%	21%	29%	36%	35%	0%	16%
Specialist Company	21	64	73	26	12	4	1	24
	38%	45%	37%	29%	23%	20%	50%	48%
Telephone Provider	4	11	24	17	4	1	1	4
	7%	8%	12%	19%	8%	5%	50%	8%
Other	1	3	2	1	0	1	0	1
	2%	2%	1%	1%	0%	5%	0%	2%
Total (n)	56	142	198	90	53	20	2	50

Source: IHS © 2013 IHS

Key points to note include:

- Combining the responses from the highest electricity expenditure tiers to form a larger sample frame with monthly expenditure of $200 or above, these respondents were more likely to select cable operators than other electricity expenditure tiers (with 13% of respondents) or security providers (selected by 35% of respondents). They were less likely than other electricity expenditure tiers to select specialist connected home suppliers.

Table 4.84 presents this information by household income level.

Table 4.84: Question 5.2 - Managed Service Provider Preference
By Annual Household Income; Number of Respondents

	Under $25,000	$25,000 - $49,999	$50,000 - $74,999	$75,000 - $99,999	$100,000 - $124,999	$125,000 - $149,999	$150,000 - $199,999	$200,000 - $249,999	$250,000 or over
Broadband Provider	4	4	3	3	3	1	1	0	1
	4%	2%	2%	3%	8%	3%	6%	0%	20%
Cable / Satellite Provider	10	11	5	5	1	2	0	2	0
	9%	7%	4%	5%	3%	6%	0%	22%	0%
Consumer Electronics Company	3	3	3	1	0	2	0	0	0
	3%	2%	2%	1%	0%	6%	0%	0%	0%
Electricity Provider or Utility Company	8	17	12	10	4	3	2	0	0
	7%	10%	9%	10%	10%	9%	12%	0%	0%
Mobile Phone Operator	7	6	7	4	2	1	1	0	0
	6%	4%	5%	4%	5%	3%	6%	0%	0%
Online Services Company	2	0	4	0	0	0	0	0	0
	2%	0%	3%	0%	0%	0%	0%	0%	0%
Retail Company	1	2	1	1	2	1	0	0	0
	1%	1%	1%	1%	5%	3%	0%	0%	0%
Security Provider	23	31	31	36	10	9	1	4	0
	20%	19%	23%	38%	26%	27%	6%	44%	0%
Specialist Company	40	74	48	26	13	10	8	2	4

	Under $25,000	$25,000 - $49,999	$50,000 - $74,999	$75,000 - $99,999	$100,000 - $124,999	$125,000 - $149,999	$150,000 - $199,999	$200,000 - $249,999	$250,000 or over
	35%	45%	36%	27%	33%	30%	47%	22%	80%
Telephone Provider	12	15	17	9	4	4	4	1	0
	11%	9%	13%	9%	10%	12%	24%	11%	0%
Other	4	3	1	1	0	0	0	0	0
	4%	2%	1%	1%	0%	0%	0%	0%	0%
Total (n)	114	166	132	96	39	33	17	9	5

Source: IHS © 2013 IHS

Key points to note include:

- There was insufficient variation to suggest a significant relationship with this demographic index.

Table 4.85 presents this information by technology adoption.

Table 4.85: Question 5.2 - Managed Service Provider Preference
By Technology Adoption; Number of Respondents

	Strong Positive	Weak Positive	Neutral	Weak Negative	Strong Negative
Broadband Provider	8	7	5	0	0
	7%	4%	2%	0%	0%
Cable / Satellite Provider	11	7	15	3	0
	10%	4%	7%	4%	0%
Consumer Electronics Company	4	5	2	1	0
	4%	3%	1%	1%	0%
Electricity Provider or Utility Company	7	18	22	7	2
	6%	9%	10%	9%	14%
Mobile Phone Operator	5	15	5	3	0
	5%	8%	2%	4%	0%
Online Services Company	2	4	0	0	0
	2%	2%	0%	0%	0%
Retail Company	2	2	4	0	0
	2%	1%	2%	0%	0%
Security Provider	26	50	49	17	3
	24%	26%	22%	22%	21%

	Strong Positive	Weak Positive	Neutral	Weak Negative	Strong Negative
Specialist Company	29	58	94	37	7
	27%	30%	43%	49%	50%
Telephone Provider	14	23	22	5	2
	13%	12%	10%	7%	14%
Other	1	2	3	3	0
	1%	1%	1%	4%	0%
Total (n)	109	191	221	76	14

Source: IHS © 2013 IHS

Key points to note include:

- Due to the size of the 'strong negative' sample frame, results are insufficient to analyze in this context. For analysis purposes, the two negative categories have been combined to result in a general 'negative' category to increase the sample frame.
- As may be expected, broadband providers, telephone providers and online service companies were more likely to be selected by individuals with higher technology adoption ratings.
- Interestingly, the proportion of respondents selecting specialist connected home providers increased consistently as their technology adoption rating declined, suggesting that such companies are felt to be safer options for those that are less confident with technology than companies such as telecommunications companies.

Table 4.86 presents this information by energy efficiency attitude.

Table 4.86: Question 5.2 - Managed Service Provider Preference
By Energy Efficiency Attitude; Number of Respondents

	Strong Positive	Weak Positive	Neutral	Weak Negative	Strong Negative
Broadband Provider	12	5	3	0	0
	8%	2%	2%	0%	0%
Cable / Satellite Provider	13	13	9	1	0
	8%	5%	5%	7%	0%
Consumer Electronics Company	3	6	2	0	1
	2%	2%	1%	0%	33%
Electricity Provider or Utility Company	15	23	17	1	0
	9%	9%	9%	7%	0%
Mobile Phone Operator	8	15	5	0	0
	5%	6%	3%	0%	0%

	Strong Positive	Weak Positive	Neutral	Weak Negative	Strong Negative
Online Services Company	2	3	1	0	0
	1%	1%	1%	0%	0%
Retail Company	2	3	3	0	0
	1%	1%	2%	0%	0%
Security Provider	36	53	52	3	1
	23%	21%	28%	20%	33%
Specialist Company	45	101	70	9	0
	28%	40%	38%	60%	0%
Telephone Provider	19	27	18	1	1
	12%	11%	10%	7%	33%
Other	3	3	3	0	0
	2%	1%	2%	0%	0%
Total (n)	158	252	183	15	3

Source: IHS © 2013 IHS

Key points to note include:

- The size of the strong negative tier is insufficient to analyze. Focusing analysis on the strong positive, weak positive and neutral tiers, there are no major differences of note, aside from a slightly higher than average tendency of those in the strong positive category towards broadband providers or cable or satellite providers, with a lower than average selection of specialist connected home providers.

Table 4.87 and Figure 4.22 present this information by their motivation for choice of service provider.

After selecting which company type they would select to provide ongoing connected home services, respondents were asked why they had selected that type of company from a list of options to assess the motivation behind the choice of service provider. Options were:

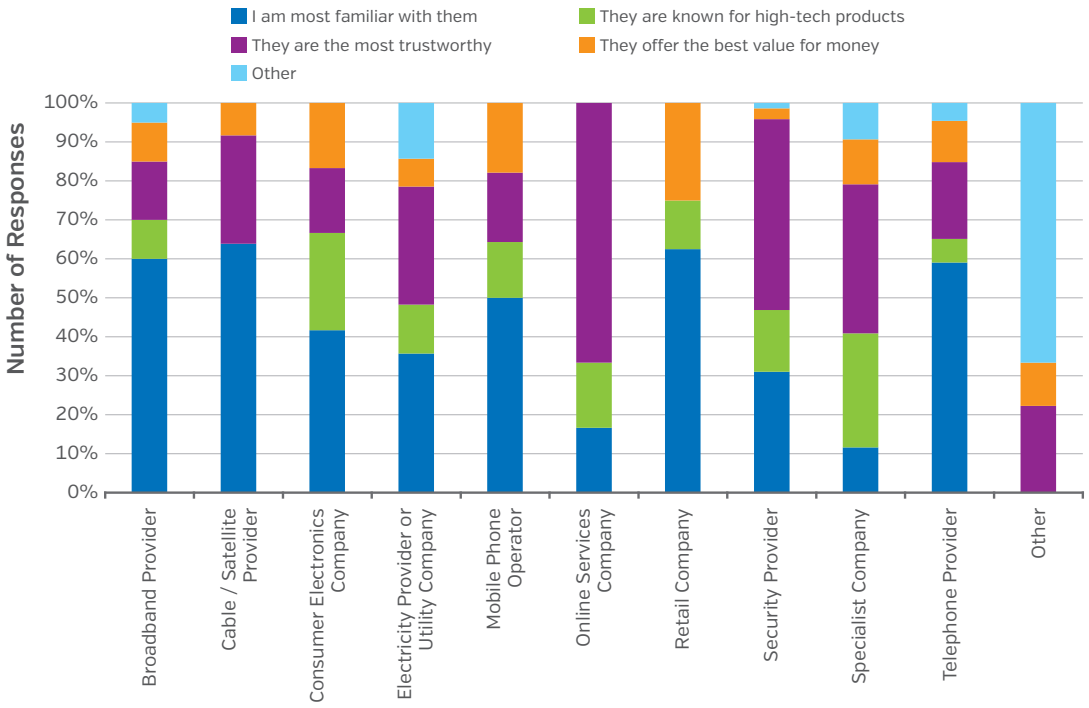
- I am most familiar with them
- They are the most trustworthy
- They offer the best value for money
- They are known for high-tech products
- Other (please state)

Table 4.87: Question 5.2 - Managed Service Provider Preference
By Motivation; Number of Respondents

	I am most familiar with them	They are known for high-tech products	They are the most trustworthy	They offer the best value for money	Other
Broadband Provider	12	2	3	2	1
	6%	2%	1%	4%	2%
Cable / Satellite Provider	23	0	10	3	0
	12%	0%	5%	5%	0%
Consumer Electronics Company	5	3	2	2	0
	3%	3%	1%	4%	0%
Electricity Provider or Utility Company	20	7	17	4	8
	11%	6%	8%	7%	20%
Mobile Phone Operator	14	4	5	5	0
	7%	4%	2%	9%	0%
Online Services Company	1	1	4	0	0
	1%	1%	2%	0%	0%
Retail Company	5	1	0	2	0
	3%	1%	0%	4%	0%
Security Provider	45	23	71	4	2
	24%	21%	33%	7%	5%
Specialist Company	26	66	86	26	21
	14%	59%	40%	46%	51%
Telephone Provider	39	4	13	7	3
	21%	4%	6%	13%	7%
Other	0	0	2	1	6
	0%	0%	1%	2%	15%
Total (n)	**190**	**111**	**213**	**56**	**41**

Source: IHS © 2013 IHS

Chart 4.22: Question 5.2 – Managed Serice Provider Preference



Source: IHS © 2013 IHS

Key points to note include:

- Overall, the most common response was 'they are most trustworthy', followed by 'I am most familiar with them'.
- Familiarity was the most common reason for respondents to select broadband providers, cable/satellite providers, retail companies, consumer electronics providers, telephone providers, mobile phone or utility companies.
- Trustworthiness was the most common reason for respondents to select online services companies, security providers, specialist companies and electricity providers
- Interesting 'other' responses include: "seems like the logical choice", "it just seems to make the most sense", "I think they specialize in this", and "they are the most knowledgeable"

Table 4.88 presents this information by the respondent's monthly fee preference.

This section cross-analyzes the different pricing options selected by respondents and the type of company they selected that they would be most willing to pay monthly connected home service fees to.

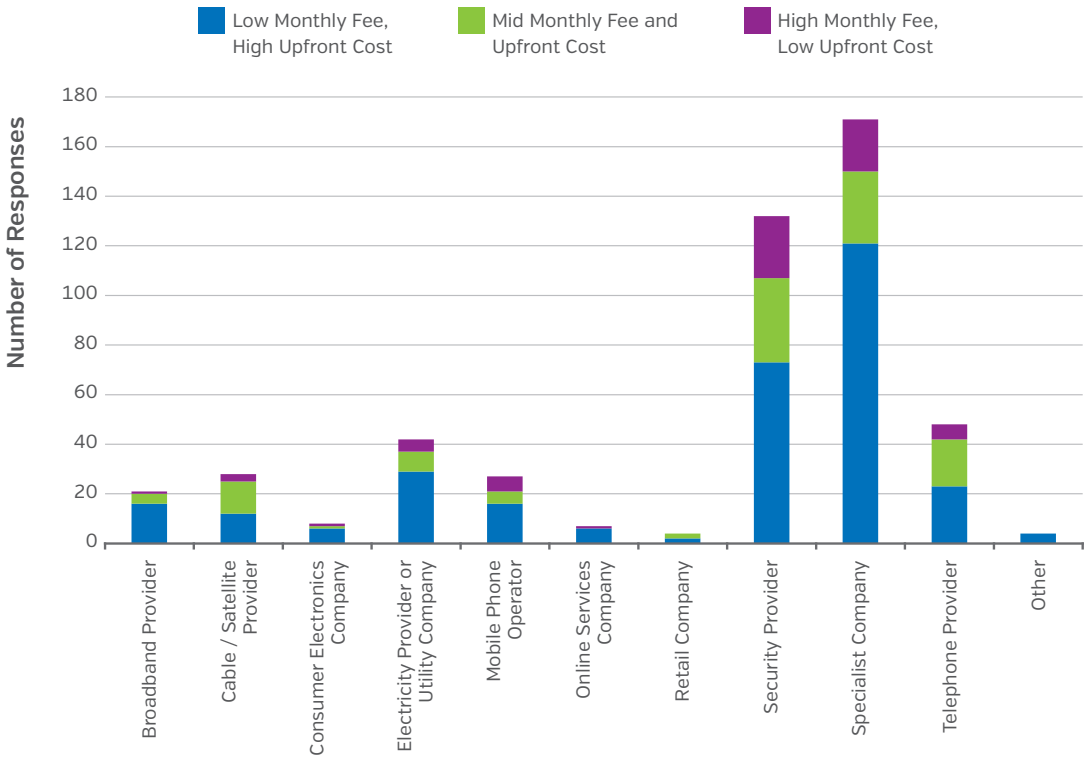
This sample frame does not include respondents who selected that they would not purchase a connected home system. As such, the sample frame includes 457 respondents.

Table 4.88: Question 5.2 - Managed Service Provider Preference
By Monthly Fee Preference; Number of Respondents

	Low Monthly Fee, High Upfront Cost	Mid Monthly Fee and Upfront Cost	High Monthly Fee, Low Upfront Cost	Total (n)
Broadband Provider	16	4	1	21
	76%	19%	5%	
Cable / Satellite Provider	12	13	3	28
	43%	46%	11%	
Consumer Electronics Company	6	1	1	8
	75%	13%	13%	
Electricity Provider or Utility Company	29	8	5	42
	69%	19%	12%	
Mobile Phone Operator	16	5	6	27
	59%	19%	22%	
Online Services Company	6	0	1	7
	86%	0%	14%	
Retail Company	2	2	0	4
	50%	50%	0%	
Security Provider	73	34	25	132
	55%	26%	19%	
Specialist Company	121	29	21	171
	71%	17%	12%	
Telephone Provider	23	19	6	48
	48%	40%	13%	
Other	4	0	0	4
	100%	0%	0%	

Source: IHS © 2013 IHS

Chart 4.23: Question 5.2 – Managed Service Provider Preferences



Source: IHS © 2013 IHS

There are some variations by company type, as highlighted below. However, it is important to note that due to the relatively small sample frames involved for some company types, firm conclusions cannot necessarily be drawn from this data.

- An above average proportion of respondents selecting broadband providers, consumer electronics companies, utility companies, and specialist companies selected pricing options with low monthly fees and higher up-front costs.
- An above average proportion of respondents selecting cable or satellite providers, retail companies security providers or telephone providers selected pricing options with mid-level monthly fees and mid-level up-front costs.
- An above average proportion of respondents selecting mobile phone operators or security providers selected pricing options with high monthly fees and low up-front costs.
- Broadband providers were strongly skewed towards low monthly fees and higher up-front costs, as were consumer electronics companies, utility companies, specialist companies, telephone providers and online service companies.
- Cable or satellite providers were relatively evenly spread across the low-mid monthly fee with high-mid upfront fee options, as were retailers
- Security providers showed the widest spread across the different pricing categories.

INSTALLATION PROCESSES AND MOTIVATIONS

INSTALLATION PREFERENCE

Respondents were asked: "Some connected home systems are designed so that they are easy for consumers to install themselves. If you were to purchase a connected home system, would you purchase one that is professionally installed or would you install It yourself?"

Table 4.89 summarize the responses to this question.

Table 4.89: Question 5.5 - Installation Preference
Overview; Number of Respondents

	Number of Respondents
Self-Install	182
	29.8%
Professionally Installed	429
	70.2%
Total (n)	611

Source: IHS © 2013 IHS

Table 4.90 presents this information by location.

Table 4.90: Question 5.5 - Installation Preference
By Location; Number of Respondents

	Canada	U.S - East Coast	U.S. - Midwest	U.S - South	U.S - West Coast
Self-Install	92	24	21	27	18
	33%	26%	26%	30%	25%
Professionally Installed	185	68	59	64	53
	67%	74%	74%	70%	75%
Total (n)	277	92	80	91	71

Source: IHS © 2013 IHS

- West Coast respondents are slightly less likely than average to want to install a system themselves, whereas Canadian respondents were the most willing to install their own systems.

Table 4.91 presents this information by age.

Table 4.91: Question 5.5 - Installation Preference
By Age; Number of Respondents

	18-23	24-29	30-35	36-40	41-45	46-50	51-64	65 or Over
Self-Install	22	21	22	22	23	27	26	19
	32%	30%	27%	29%	26%	33%	33%	29%
Professionally Installed	46	49	59	54	66	56	52	47
	68%	70%	73%	71%	74%	67%	67%	71%
Total (n)	68	70	81	76	89	83	78	66

Source: IHS © 2013 IHS

- Although there are minor variations, there are no notable trends in attitude towards installation when analyzed by respondent age.

Table 4.92 presents this information by technology adoption.

Table 4.92: Question 5.5 - Installation Preference
By Technology Adoption; Number of Respondents

	Positive	Neutral	Negative
Self-Install	75	73	34
	25%	33%	38%
Professionally Installed	225	148	56
	75%	67%	62%
Total (n)	300	221	90

Source: IHS © 2013 IHS

Key points to note include:

- Rather unexpectedly, those with higher technology adoption ratings were consistently more likely to opt for professionally installed systems rather than self-installed systems; the inverse was true for those with low technology adoption ratings.

SELF-INSTALL SYSTEMS

Respondents that indicated they would prefer to self-install their connected home system (n=182) were asked to indicate their main motivation behind this response. Only one option could be selected. Options were:

- I want to understand how it is connected
- It would be more convenient that having a professional install it
- It would be cheaper that having a professional install it
- Other (please state)

Table 4.93 presents an overview of responses.

Table 4.93: Question 5.7 - Self-install Motivation
Overview; Number of Respondents

	Number of Respondents
I want to understand how it is connected.	47
	25.8%
It would be cheaper than having a professional install it.	107
	58.8%
It would be more convenient than having a professional install it.	20
	11.0%
Other (Please State)	8
	4.4%
Total (n)	182

Source: IHS © 2013 IHS

- As may be expected, the cost of system installation was the major reason why these respondents are more attracted to systems they can install themselves.

Table 4.94 presents this information by location.

Table 4.94: Question 5.7 - Self-install Motivation
By Location; Number of Respondents

	Canada	U.S - East Coast	U.S. - Midwest	U.S - South	U.S - West Coast	U.S. - ALL regions
I want to understand how it is connected	25	6	3	8	5	22
	27%	25%	14%	30%	28%	24%
It would be cheaper than having a professional install	55	12	16	15	9	52
	60%	50%	76%	56%	50%	58%
More convenient than professional install	9	3	0	4	4	11
	10%	13%	0%	15%	22%	12%
Other	3	3	2	0	0	5
	3%	13%	10%	0%	0%	6%
Total (n)	92	24	21	27	18	90

Source: IHS © 2013 IHS

Key points to note include:

- As the sample sizes for each U.S. region were too small, these were combined to create 'All U.S. Regions'. However, there were no significant variances in the data when looking by location.

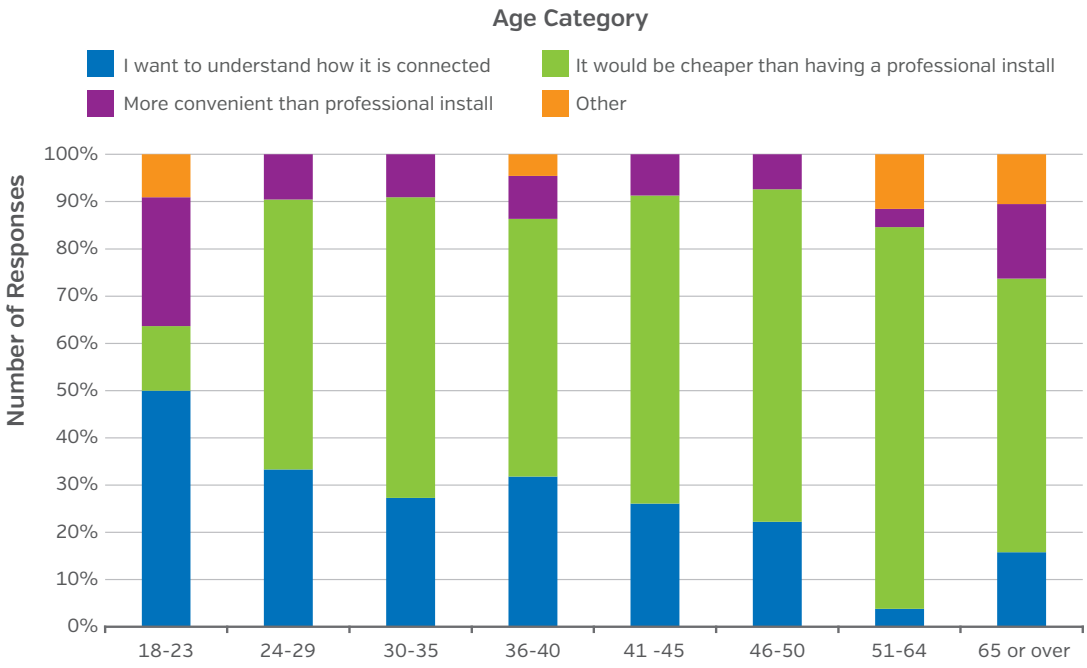
Table 4.95 presents this information by age.

Table 4.95: Question 5.7 - Self-install Motivation
By Age; Number of Respondents

	18-23	24-29	30-35	36-40	41-45	46-50	51-64	65 or Over
I want to understand how it is connected	11	7	6	7	6	6	1	3
	50%	33%	27%	32%	26%	24%	5%	21%
It would be cheaper than having a professional install	3	12	14	12	15	19	21	11
	14%	57%	64%	55%	65%	76%	95%	79%
More convenient than professional install	6	2	2	2	2	2	1	3
	27%	10%	9%	9%	9%	8%	5%	21%
Other	2	0	0	1	0	0	3	2
	9%	0%	0%	5%	0%	0%	14%	14%
Total (n)	22	21	22	22	23	25	22	14

Source: IHS © 2013 IHS

Chart 4.24: Question 5.7 – Self-install Motivation



Source: IHS © 2013 IHS

Key points to note include:

- The overall sample sizes in each age group make it difficult to draw firm conclusions. However, general trends seen in this data suggest that younger respondents are more likely to install their own connected home system because they want to know how it works, whereas older respondents are more likely to select self-installation as they feel it will be less expensive than professionally installed systems.

Table 4.96 presents this information by technology adoption.

Table 4.96: Question 5.7 - Self-install Motivation
By Technology Adoption; Number of Respondents

	Strong Positive	Weak Positive	Positive	Neutral	Weak Negative	Negative
I want to understand how it is connected	13	13	26	16	5	5
	52%	26%	35%	22%	17%	15%
It would be cheaper than having a professional install	9	29	38	49	16	20
	36%	58%	51%	67%	53%	59%

	Strong Positive	Weak Positive	Positive	Neutral	Weak Negative	Negative
More convenient than professional install	2	8	10	6	4	4
	8%	16%	13%	8%	13%	12%
Other	1	0	1	2	5	5
	4%	0%	1%	3%	17%	15%
Total (n)	25	50	75	73	30	34

Source: IHS © 2013 IHS

Key points to note include:

- Respondents with higher technology adoption scores that selected self-installation were more likely to indicate that this was because they would like to understand how the system worked than those with lower technology adoption scores.

PROFESSIONALLY INSTALLED SYSTEMS

Respondents that previously indicated that they would prefer to have a professionally installed connected home system (n=429) were asked to select their main motivation behind this response. Only one option could be selected. Options included:

- I am worried about not setting the system up correctly
- I don't understand how to install home systems
- I would be worried about voiding the warranty if installed incorrectly
- It would be too time-consuming to do it myself
- Other (please state)

Table 4.97 summarizes the responses.

Table 4.97: Question 5.6 - Professional Install Motivation
Overview; Number of Respondents

	Number of Respondents
I am worried about not setting the system up correctly.	181
	42.2%
I don't understand how to install home systems.	120
	28.0%
I would be worried about voiding the warranty if installed incorrectly.	47
	11.0%
It would be too time-consuming to do it myself.	70
	16.3%

	Number of Respondents
Other [Please State]	11
	2.6%
Total (n)	429

Source: IHS © 2013 IHS

- The most common response was that respondents were worried that they would not be able to set the system up correctly, followed by those that don't understand how to install home systems. It could be that enhanced consumer education or marketing to highlight the ease of some self-installation systems could be a valuable exercise to alleviate some of these concerns.

Table 4.98 presents this information by location.

Table 4.98: Question 5.6 - Professional Install Motivation
By Location; Number of Respondents

	Canada	U.S - East Coast	U.S. - Midwest	U.S - South	U.S - West Coast
I am worried about not setting the system up correctly.	73	31	25	31	21
	39%	46%	42%	48%	40%
I don't understand how to install home systems.	56	17	10	20	17
	30%	25%	17%	31%	32%
I would be worried about voiding the warranty if installed incorrectly.	21	7	10	5	4
	11%	10%	17%	8%	8%
It would be too time-consuming to do it myself.	29	11	12	8	10
	16%	16%	20%	13%	19%
Other [Please State]	6	2	2	0	1
	3%	3%	3%	0%	2%
Total (n)	185	68	59	64	53

Source: IHS © 2013 IHS

- While there are some variations, there is no distinct correlation between the motivation for professionally installed systems and the respondent's location.

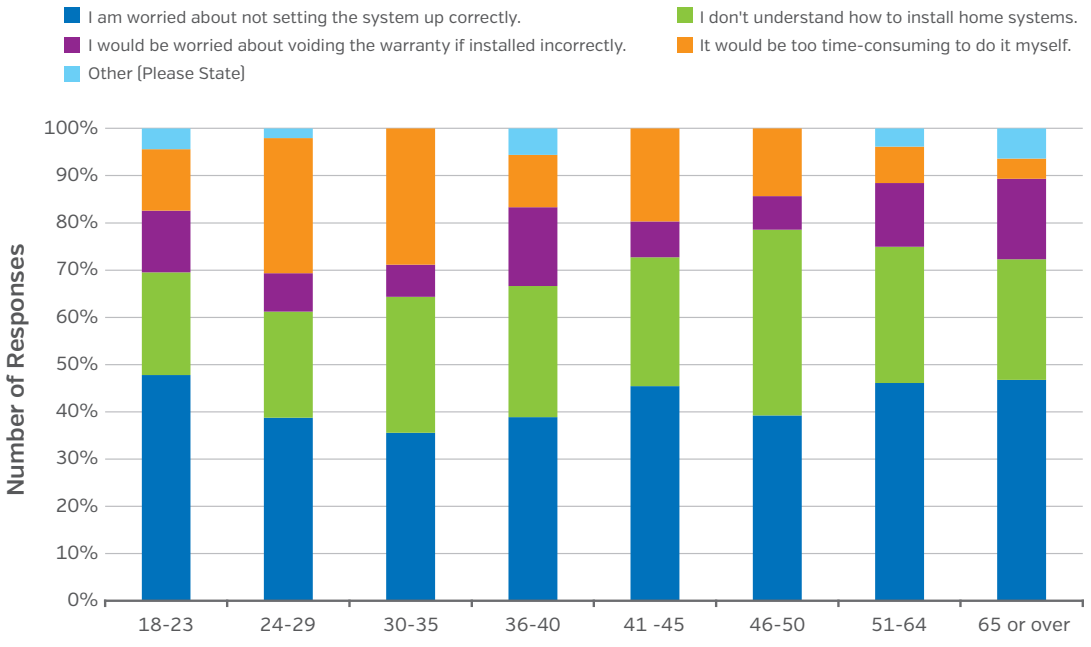
Table 4.99 presents this information by age.

Table 4.99: Question 5.6 - Professional Install Motivation
By Age; Number of Respondents

	18-23	24-29	30-35	36-40	41-45	46-50	51-64	65 or Over
I am worried about not setting the system up correctly.	22	19	21	21	30	22	24	22
	48%	39%	36%	39%	45%	50%	62%	65%
I don't understand how to install home systems.	10	11	17	15	18	22	15	12
	22%	22%	29%	28%	27%	50%	38%	35%
I would be worried about voiding the warranty if installed incorrectly.	6	4	4	9	5	4	7	8
	13%	8%	7%	17%	8%	9%	18%	24%
It would be too time-consuming to do it myself.	6	14	17	6	13	8	4	2
	13%	29%	29%	11%	20%	18%	10%	6%
Other (Please State)	2	1	0	3	0	0	2	3
	4%	2%	0%	6%	0%	0%	5%	9%
Total (n)	46	49	59	54	66	44	39	34

Source: IHS © 2013 IHS

Chart 4.25: Question 5.6 – Professional Install Motivation



Source: IHS © 2013 IHS

Key points to note include:

- Those in younger age bands (notable 24-29 and 30-35) were more attracted to professionally installed systems in order to save time in setting the system up compared with older age bands.
- Those in older age bands (notable 46-50) were more likely to be attracted to professionally installed systems because they don't understand how to do it themselves, compared with younger age bands.

Table 4.100 presents this information by technology adoption.

Table 4.100: Question 5.6 - Professional Install Motivation
By Technology Adoption; Number of Respondents

	Positive	Neutral	Negative
I am worried about not setting the system up correctly.	123	55	3
	41%	45%	27%
I don't understand how to install home systems.	77	38	5
	26%	31%	45%
I would be worried about voiding the warranty if installed incorrectly.	34	11	2
	11%	9%	18%
It would be too time-consuming to do it myself.	55	14	1
	19%	12%	9%
Other (Please State)	8	3	0
	3%	2%	0%
Total (n)	**297**	**121**	**11**

Source: IHS © 2013 IHS

Key points to note include:

- The sample size for those with the lowest technology adoption scores that selected professional installation is insufficient to allow for detailed analysis.
- Perhaps surprisingly, a relatively high proportion of respondents that had selected that they would prefer professional installation because they did not feel that they would set up a self-install system correctly had a strong positive technology adoption score.
- However, 26% of those with a strong positive technology adoption score were motivated by time-saving rather than a concern about their ability to set the system up. This declined alongside technology adoption scores.

ON-BOARDING AND NETWORK SET-UP

Six hundred and eleven (611) respondents were asked: "How comfortable would you feel about adding new connected home devices to your home network? E.g., adding a Wi-Fi thermostat to your existing

Wi-Fi network, or adding a new connected home device to your existing connected home system". Respondents could select only one option. Options were:

- I am comfortable that I could do this
- I would only feel comfortable if the device was specifically designed for self-installation
- I am not sure if I could add a new device to my home network
- I would avoid having to do this myself

Table 4.101 presents an overview of the responses.

Table 4.101: Question 5.8 - Network On-Boarding
Overview; Number of Respondents

	Number of Respondents
I am comfortable that I could do this.	204
	33.4%
I am not sure if I could add a new device to my home network	97
	15.9%
I would avoid having to do this myself	96
	15.7%
I would only feel comfortable if the device was specifically designed for self-installation	214
	35.0%
Total (n)	611

Source: IHS © 2013 IHS

- More than a third of respondents responded that they would feel comfortable adding new devices to a connected home network, with an additional 35% of respondents selecting that they would feel comfortable doing this, but only if the device was specifically designed for self-installation.

Table 4.102 presents this information by location.

Table 4.102: Question 5.8 - Network On-Boarding
By Location; Number of Respondents

	Canada	U.S. – East Coast	U.S. – Midwest	U.S. – South	U.S. – West Coast
I am comfortable that I could do this.	95	30	26	28	25
	34%	33%	33%	31%	35%

	Canada	U.S. – East Coast	U.S. – Midwest	U.S. – South	U.S. – West Coast
I am not sure if I could add a new device to my home network	47	15	9	16	10
	17%	16%	11%	18%	14%
I would avoid having to do this myself	49	16	10	11	10
	18%	17%	13%	12%	14%
Only if device was designed for self-installation	86	31	35	36	26
	31%	34%	44%	40%	37%
Total (n)	**277**	**92**	**80**	**91**	**71**

Source: IHS © 2013 IHS

- Overall, respondents from the U.S. were slightly more comfortable with the idea of adding devices to their home system provided those devices were specifically designed for self-installation, with 38% of respondents selecting this option, compared with 31% of Canadian respondents.
- Specifically, respondents from the Midwest were most likely to be comfortable with adding self-install devices to their home systems, following by those from the South of the U.S.

Table 4.103 presents this information by age.

Table 4.103: Question 5.8 - Network On-Boarding
By Age; Number of Respondents

	18-23	24-29	30-35	36-40	41 -45	46-50	51-64	65 or over
I am comfortable that I could do this.	27	23	40	20	33	26	18	17
	40%	33%	49%	26%	37%	31%	23%	26%
I am not sure if I could...	6	10	8	13	15	18	16	11
	9%	14%	10%	17%	17%	22%	21%	17%
I would avoid having to do this myself	9	9	6	12	8	15	22	15
	13%	13%	7%	16%	9%	18%	28%	23%
Only if device was designed for self-installation	26	28	27	31	33	24	22	23
	38%	40%	33%	41%	37%	29%	28%	35%
Total (n)	**68**	**70**	**81**	**76**	**89**	**83**	**78**	**66**

Source: IHS © 2013 IHS

- There was no significant variance when analyzing the attitude to on-boarding by the decision making role of the respondent. However, in general, younger age groups were slightly more likely to feel comfortable adding devices to an existing network than older respondents.

Table 4.104 presents this information by gender.

Table 4.104: Question 5.8 - Network On-Boarding
By Gender; Number of Respondents

	Female	Male
I am comfortable that I could do this.	92	112
	27%	41%
I am not sure if I could...	60	37
	18%	14%
I would avoid having to do this myself	67	29
	20%	11%
Only if device was designed for self-installation	118	96
	35%	35%
Total (n)	337	274

Source: IHS © 2013 IHS

- Male respondents were more comfortable with the idea of connecting devices to their home systems, with 41% of male respondents selecting this option companies with only 27% of female respondents. An equal percentage of male and female respondents (35%) stated that they would be happy to do this for devices which were specifically designed to be self-installed.

Table 4.105 presents this information by housing tenure.

Table 4.105: Question 5.8 - Network On-Boarding
By Housing Tenure; Number of Respondents

	I live with relatives who own/rent	No - I'm renting	Yes
I am comfortable that I could do this.	9	74	121
	20%	38%	33%
I am not sure if I could...	7	21	69
	16%	11%	19%
I would avoid having to do this myself	11	30	55
	25%	15%	15%
Only if device was designed for self-installation	17	70	127
	39%	36%	34%
Total (n)	44	195	372

Source: IHS © 2013 IHS

- There was no significant variance when analyzing the attitude to on-boarding by the home ownership status of the respondent, although renters seems slightly more comfortable with adding new devices to their systems than home owners.

Table 4.106 presents this information by household income.

Table 4.106: Question 5.8 - Network On-Boarding
By Household Income; Number of Respondents

	Under $25,000	$25,000 - $49,999	$50,000 - $74,999	$75,000 - $99,999	$100,000 or Over
I am comfortable that I could do this.	26	63	45	28	42
	23%	38%	34%	29%	41%
I am not sure if I could...	20	23	23	19	12
	18%	14%	17%	20%	12%
I would avoid having to do this myself	27	28	17	14	10
	24%	17%	13%	15%	10%
Only if device was designed for self-installation	41	52	47	35	39
	36%	31%	36%	36%	38%
Total (n)	114	166	132	96	103

Source: IHS © 2013 IHS

- Although there are variances, there is no clear trend between the attitude to on-boarding and the respondent's household income.

Table 4.107 presents this information by decision-making role.

Table 4.107: Question 5.8 - Network On-Boarding
By Decision Making Role; Number of Respondents

	Major Decision Making Role	Minor Decision Making Role	No Decision Making Role
I am comfortable that I could do this.	108	75	21
	38%	30%	27%
I am not sure if I could...	46	39	12
	16%	15%	16%
I would avoid having to do this myself	32	47	17
	11%	19%	22%
Only if device was designed for self-installation	96	91	27
	34%	36%	35%
Total (n)	282	252	77

Source: IHS © 2013 IHS

- Generally, those with a major decision making role in the household were more likely to be comfortable at adding devices to their home systems. It is important to note that gender was a significant influence in the decision making score. For more information, please see the demographics section in Appendix 1.

Table 4.108 presents this information by technology adoption.

Table 4.108: Question 5.8 - Network On-Boarding
By Technology Adoption; Number of Respondents

	Positive	Neutral	Negative
I am comfortable that I could do this.	127	66	11
	42%	30%	12%
I am not sure if I could...	33	44	20
	11%	20%	22%
I would avoid having to do this myself	25	42	29
	8%	19%	32%
Only if device was designed for self-installation	115	69	30
	38%	31%	33%
Total (n)	300	221	90

Source: IHS © 2013 IHS

- As expected, a higher proportion of respondents with a positive technology adoption score chose that they would be comfortable adding devices onto an existing network, whereas those with a lower technology adoption score were more likely to select that they weren't sure if they could do this, or that they would avoid doing it themselves.

RETURN ON INVESTMENT VIA ENERGY SAVINGS

Respondents were provided with the following information and associated question: "Some devices can lead to energy savings. For example, a connected thermostat which could automatically detect could save you money on your electricity bill. If you were to purchase a connected device to enable energy savings, how long would you expect it to take before you have saved more in energy costs than the original cost of the device?"

Unless otherwise indicated, the sample frame for this question was limited to the 557 respondents which had earlier indicated an interest in wanting to be able to perform an applicable function connected home function.

Table 4.109 provides an overview of the results to this question.

Table 4.109: Return on Investment via Energy Saving
Overview; Number of Respondents

	Number of Respondents
Under 1 year	134
	24.1%
1-2 years	178
	32.0%
2-5 years	140
	25.1%
5-10 years	23
	4.1%
Over 10 years	11
	2.0%
I am not concerned with the pay-back period on my devices	71
	12.7%
Total (n)	557

Source: IHS © 2013 IHS

- The most common response was between 1 and 2 years, selected by 32% of respondents.
- Cumulatively, over 80% of consumers selected responses less than five years.
- Only 13% of consumers were not concerned about the payback period of devices. When the sample frame is expanded to include all respondents, this figure increases to 30%, suggesting that those interested in connected applications are more likely to consider device payback period than the wider population.
- Female respondents were slightly more likely to expect a shorter payback period for their devices than male respondents.
- Younger respondents were slightly more likely to expect a shorter payback period for their devices than older respondents.
- Respondents living with relatives were more likely to prefer a longer payback time than other respondents, consistent with the lower rate of electricity expenditure awareness from these respondents. Those living in their own properties, rather than tenants, were most likely to want a payback period of less than 10 years.
- Of those in the most popular monthly electricity expenditure category [$100-$149], a high proportion expected a payback period of less than five years. A relatively equal proportion of respondents across each electricity expenditure category, however, expected a payback period of under 1 year.
- Respondents with higher annual incomes were more likely to expect a payback period of over two years, compared with those on lower incomes who were more likely to expect a payback period of less than two years.

4.4 SCENARIO CREATION

SUMMARY & KEY IMPLICATIONS

This section presents the key implications from the analysis contained within Section 4.4.

- The majority of respondents interested in connected home systems indicated that "scenario creation" (i.e., the communication of connected devices to automate functions based on pre-defined triggers) would be valuable, either very or moderately so. This highlights the potential for system providers to create effective 'bundled' solution, and enable further devices to be added to the system as new applications are enabled by a wider range of parties. This highlights the need for interoperability and standards-based communications between systems running on a common platform to provide additional value to consumers.
- Respondents with negative technology adoption scores were more likely to consider scenarios not to be of value. However, the data would suggest that negative technology adopters were significantly more likely to find scenarios two and four, focused on home security and climate control, more valuable than the other scenarios presented. This may suggest that systems with the ability to enhance energy saving or improve convenience or home security may hold more appeal to this demographic of consumers. This is consistent with the types of connected home functions negative technology adopters indicated an interest in performing.

OVERVIEW

Respondents were provided with the following information and associated question: "Some systems allow you to create a 'scenario' at certain times of the day, or when certain devices are activated. You can pre-set how different devices automatically interact with each other according to your lifestyle. Please consider the following scenarios and select whether these would be valuable to you".

Unless otherwise indicated, the sample frame for this question was limited to the 557 respondents which had earlier indicated an interest in wanting to be able to perform an applicable function connected home function. This is the also the case for all the more detailed scenario creation analysis in this section, unless otherwise stated.

Table 4.110 provides an overview of the results. The full scenarios presented to respondents are outlined in the sections below.

Table 4.110: Consumer Attitudes to Scenario Creation
Overview; Number of Respondents

	Very Valuable	Moderately Valuable	Neutral	Not of Value
Using GPS in Car or Smartphone	159	206	121	71
	29%	37%	22%	13%
Home Occupancy as Trigger	247	201	85	24
	44%	36%	15%	4%
TV/Entertainment System as Trigger	97	183	163	114
	17%	33%	29%	20%

	Very Valuable	Moderately Valuable	Neutral	Not of Value
Heating/Cooling System as Energy Savings Trigger	186	223	109	39
	33%	40%	20%	7%
Use of Online Information as Trigger	184	230	102	41
	33%	41%	18%	7%
Today's Manual Processes Automated	123	211	144	79
	22%	38%	26%	14%
Total (n)	**996**	**1,254**	**724**	**368**
Percentages are derived from the value / 557				

Source: IHS © 2013 IHS

Key points to note include:

- At least 60% of respondents found scenario 2 (home occupancy as trigger point), scenario 4 (heating/cooling system as energy savings trigger point), and scenario 5 (using online information as a trigger point) and scenario 6 (automating today's manual processes) to be moderately or very valuable.
- Scenario 3 (TV/Entertainment system as a trigger) was found to be of the least value overall to respondents, with 50% selecting either 'not of value' or 'neutral'.
- Both scenarios associated with energy savings (scenarios 4 and 5) scored relatively well with respondents; however, scenario 2 (using a security system as a trigger point for home automation) received the highest proportion of positive responses.
- Scenarios 1, 3 and 6 were considered to be of least value to respondents, a higher number of respondents indicating these scenarios to be not of value.
- Widening the sample frame to include all respondents highlights similar trends in terms of the most and least popular scenarios, i.e., with scenario two proving the most popular and scenario three the least popular. As expected, the wider sample frame (which includes people with no interest in connected home systems) produced a lower proportion of respondents selecting the scenarios to be very or moderately valuable.

SCENARIO ONE

Scenario one was described as follows: "Your home automation system can ascertain your distance from your home using GPS in your car or smartphone and perform pre-set functions. For example, the porch lights come on and garage door opens when you are 10 yards from your home."

Table 4.111 shows respondent attitudes to scenario one by age.

Table 4.111: Scenario One - Use of GPS in Car or Smartphone
By Age; Number of Respondents

	18-23	24-29	30-35	36-40	41 -45	46-50	51-64	65 or over
Very Valuable	16	18	30	26	30	12	20	7
	25%	29%	40%	37%	35%	16%	28%	13%
Moderately Valuable	27	22	27	21	29	39	21	20
	43%	35%	36%	30%	34%	51%	30%	38%
Neutral	14	14	12	17	15	15	18	16
	22%	22%	16%	24%	18%	20%	25%	30%
Not of Value	6	9	6	7	11	10	12	10
	10%	14%	8%	10%	13%	13%	17%	19%
Total (n)	63	63	75	71	85	76	71	53

Source: IHS © 2013 IHS

- Generally, older respondents were least likely to consider this function valuable. It was most popular amongst respondents in the 30-35 age group category, rated as valuable by 76% of respondents, compared with only 51% of respondents aged 65 or over.

Table 4.112 shows attitude to scenario one by housing tenure.

Table 4.112: Scenario One - Use of GPS in Car or Smartphone
By Housing Tenure; Number of Respondents

	Living with Relatives	Renting a Property	Living in Own Property
Very Valuable	6	51	102
	16%	29%	30%
Moderately Valuable	17	64	125
	45%	36%	36%
Neutral	8	35	78
	21%	20%	23%
Not of Value	7	26	38
	18%	15%	11%
Total (n)	38	176	343

Source: IHS © 2013 IHS

- Typically, respondents living in their own property were more likely to consider scenario one to be of value, compared with those living in rented property.

Table 4.113 shows attitude to scenario one by technology adoption index.

Table 4.113: Scenario One - Use of GPS in Car or Smartphone
By Technology Adoption; Number of Respondents

	Positive	Neutral	Negative
Very Valuable	110	37	12
	40%	18%	15%
Moderately Valuable	118	70	18
	42%	35%	23%
Neutral	41	57	23
	15%	28%	29%
Not of Value	9	37	25
	3%	18%	32%
Total (n)	278	201	78

Source: IHS © 2013 IHS

- As expected, a higher proportion of those with negative technology adoption index scores found the scenario not of value, or were indifferent towards this scenario. Conversely, those with a positive technology adoption index score were more likely to select the scenario as very or moderately valuable.

Additional information includes:

- There was no significant variance by location.
- The proportion of respondents considering this scenario either very or moderately valuable increased significantly amongst respondents that do not currently have a form of security system. Seventy-four percent of respondents that do not currently own a security system considered this scenario valuable, compared with only 61% of respondents with a security system. Interestingly, this trend is reversed when the sample frame is widened to the entire population.

SCENARIO TWO

Scenario two was described as follows: “When you leave the house, the system can automatically detect there is no-one home and locks all windows and doors and switches all lights and heating/cooling systems to a pre-set level”.

Eighty percent of respondents selected this scenario as valuable, the highest compared with all other scenarios presented. Specifically, 44% of respondents selected this scenario as very valuable, higher than any other scenario.

Table 4.114 shows attitude to scenario two by location.

Table 4.114: Scenario Two - Home Occupancy as Trigger for Lights and Heating/Cooling
By Location; Number of Respondents

	Canada	U.S. – East Coast	U.S. – Midwest	U.S. – South	U.S. – West Coast
Very Valuable	113	34	29	44	27
	45%	41%	40%	51%	42%
Moderately Valuable	88	29	28	32	24
	35%	35%	38%	37%	37%
Neutral	36	15	13	9	12
	14%	18%	18%	10%	18%
Not of Value	13	5	3	1	2
	5%	6%	4%	1%	3%
Total [n]	250	83	73	86	65

Source: IHS © 2013 IHS

There was some variation by location, with this scenario being more popular amongst respondents from the South of the U.S., with 88% of respondents in these locations considering this scenario to be valuable, compared with 76-80% of respondents from other locations.

Table 4.115 shows attitude to scenario two by age.

Table 4.115: Scenario Two - Home Occupancy as Trigger for Lights and Heating/Cooling
By Age; Number of Respondents

	18-23	24-29	30-35	36-40	41 -45	46-50	51-64	65 or over
Very Valuable	42	24	31	36	42	27	32	13
	67%	38%	41%	51%	49%	36%	45%	25%
Moderately Valuable	16	30	26	28	24	29	23	25
	25%	48%	35%	39%	28%	38%	32%	47%
Neutral	4	7	15	6	14	16	12	11
	6%	11%	20%	8%	16%	21%	17%	21%
Not of Value	1	2	3	1	5	4	4	4
	2%	3%	4%	1%	6%	5%	6%	8%
Total [n]	63	63	75	71	85	76	71	53

Source: IHS © 2013 IHS

- In general, those in lower age groups were considered more likely to find this scenario very or moderately valuable than older respondents. For example, 92% of those aged 18-23 selected this as very valuable, compared with just 72% of those aged 65 or over. Widening the sample

frame to all respondents makes this relationship more evident, with 77% of respondents aged 18-23 finding this scenario attractive, compared with only 40% of respondents aged 65 or over.

Table 4.116 shows attitude to scenario two by technology adoption index.

Table 4.116: Scenario Two - Home Occupancy as Trigger for Lights and Heating/Cooling
By Technology Adoption; Number of Respondents

	Positive	Neutral	Negative
Very Valuable	150	71	26
	54%	35%	33%
Moderately Valuable	96	78	27
	35%	39%	35%
Neutral	29	41	15
	10%	20%	19%
Not of Value	3	11	10
	1%	5%	13%
Total (n)	278	201	78

Source: IHS © 2013 IHS

- As expected, those with a positive technology adoption index score were more likely to select the scenario as very or moderately valuable.

Additional information includes:

- There was little variation between the value of this scenario and the respondent's housing tenure.
- The proportion of respondents considering this scenario either very or moderately valuable increased significantly amongst respondents that currently do not have a form of security system. Eighty-six percent of respondents who did not currently own a security system considered this scenario valuable, compared with 78% that did. Again, this is the reverse of the trend indicated when the sample frame is widened to include all respondents. Using the wider sample frame, 74% of those with a security system considered this scenario valuable, compared with only 52% that did not have a security system.

SCENARIO THREE

Scenario three was described as follows: "When you switch on your TV or Blu-Ray player, lights dim or turn off, other media (such as a sound system) deactivates, and shutters or blinds automatically close".

This scenario was least likely to be rated as valuable by respondents compared with the other scenarios, with just 50% selecting as very or moderately valuable. Comparing this to results for other scenarios, such as using online information to interact with systems (74%) or using the security system as a trigger for HVAC activity (80%), the results for this scenario is relatively low.

Table 4.117 shows attitudes to scenario three by age

Table 4.117: Scenario Three - Media as Trigger for Device Automation
By Age; Number of Respondents

	18-23	24-29	30-35	36-40	41 -45	46-50	51-64	65 or over
Very Valuable	17	11	25	14	15	10	5	0
	27%	17%	33%	20%	18%	13%	7%	0%
Moderately Valuable	21	24	27	20	24	26	28	13
	33%	38%	36%	28%	28%	34%	39%	25%
Neutral	14	17	19	24	28	22	17	22
	22%	27%	25%	34%	33%	29%	24%	42%
Not of Value	11	11	4	13	18	18	21	18
	17%	17%	5%	18%	21%	24%	30%	34%
Total [n]	63	63	75	71	85	76	71	53

Source: IHS © 2013 IHS

- As expected, a higher proportion of younger respondents rated this scenario as useful, with just 25% of those aged 65 or over selecting either very or moderately valuable, compared with 60% of those aged 18-23. This scenario was most likely to be considered valuable by respondents in the 30-35 age range.

Table 4.118 shows attitudes to scenario three by technology adoption.

Table 4.118: Scenario Three - Media as Trigger for Device Automation
By Technology Adoption; Number of Respondents

	Positive	Neutral	Negative
Very Valuable	77	14	6
	28%	7%	8%
Moderately Valuable	115	57	11
	41%	28%	14%
Neutral	67	68	28
	24%	34%	36%
Not of Value	19	62	33
	7%	31%	42%
Total [n]	278	201	78

Source: IHS © 2013 IHS

- As expected, a higher proportion of those with negative technology adoption index scores found the scenario not of value (42%). Conversely, those with a positive technology adoption index score were more likely to select the scenario as very or moderately valuable (69%, compared with just 22% of those with negative technology adoption index scores).
- However, out of respondents with a positive score in the technology adoption index, just 69% identified this scenario as moderately or very valuable, compared with over 77% for all other scenarios considered, suggesting this is still the least popular scenario amongst technology-aware respondents.

Additional information includes:

- There was some regional variation, with 40% of respondents from Canada and the West Coast considering this solution to be valuable (either moderately or very), compared with between 29% and 36% of respondents from other locations.

SCENARIO FOUR

Scenario four was described as follows: "In order to conserve energy, window dressings (such as blinds, shutters and curtains) automatically react to the climate. For example, when you activate your cooling system, shades are lowered over windows that are currently in direct sunlight".

Overall, 73% of respondents in this sample frame considered this to be very or moderately valuable.

Table 4.119 and show attitudes to scenario four by age.

Table 4.119: Scenario Four - Automatic Reaction of Devices to Climate
By Age; Number of Respondents

	18-23	24-29	30-35	36-40	41 -45	46-50	51-64	65 or over
Very Valuable	24	22	28	29	36	21	18	8
	38%	35%	37%	41%	42%	28%	25%	15%
Moderately Valuable	28	22	33	26	28	30	28	28
	44%	35%	44%	37%	33%	39%	39%	53%
Neutral	9	15	11	12	15	17	18	12
	14%	24%	15%	17%	18%	22%	25%	23%
Not of Value	2	4	3	4	6	8	7	5
	3%	6%	4%	6%	7%	11%	10%	9%
Total (n)	63	63	75	71	85	76	71	53

Source: IHS © 2013 IHS

- A higher proportion of younger respondents considered this scenario to be valuable compared with older respondents, but there was less variation by age than for some of the other scenarios. For example, just 25% of respondents over the age of 65 selected the automation of shades and lighting in conjunction with their media systems (Scenario 3) to be valuable, compared with 60% of 18-23 year olds; whereas for this scenario, 68% of those aged 65 or over

felt that this scenario would be valuable compared with 83% of 18-23 year olds. This suggests that this scenario has appeal across a wider age demographic.

Table 4.120 shows attitudes to scenario four by technology adoption.

Table 4.120: Scenario Four - Automatic Reaction of Devices to Climate
By Technology Adoption; Number of Respondents

	Positive	Neutral	Negative
Very Valuable	122	40	24
	44%	20%	31%
Moderately Valuable	117	83	23
	42%	41%	29%
Neutral	34	57	18
	12%	28%	23%
Not of Value	5	21	13
	2%	10%	17%
Total (n)	278	201	78

Source: IHS © 2013 IHS

Although a higher proportion of those with negative technology adoption index scores found the scenario not of value, there was less of a clear trend by technology adoption than some other scenarios. While 86% of respondents with a positive technology score selected that this scenario was valuable, an almost event amount of respondents in the neutral and negative categories found considered this to be valuable.

Table 4.121 and show attitudes to scenario four by energy efficiency.

Table 4.121: Scenario Four - Automatic Reaction of Devices to Climate
By Energy Efficiency Index; Number of Respondents

	Positive	Neutral	Negative
Very Valuable	145	40	1
	39%	24%	7%
Moderately Valuable	152	68	3
	41%	40%	20%
Neutral	57	45	7
	15%	27%	47%
Not of Value	19	16	4
	5%	9%	27%
Total (n)	373	169	15

Source: IHS © 2013 IHS

There is a significant relationship between the response to this scenario and attitude to energy efficiency. Eighty percent of respondents with a positive energy efficiency score considered this scenario valuable, compared with only 64% of respondents with a neutral energy efficiency score.

Additional information includes:

- Canadian respondents were slightly more likely to find this scenario valuable, with 61% of respondents considering it to be very or moderately valuable, compared with 46%-55% of respondents from other locations.

SCENARIO FIVE

Scenario five was described as follows: "Your home control system can react to information it finds online and automatically adjusts its operation. For example, your thermostat could take into account daily weather forecasts to conserve energy".

Overall, 60% of respondents in this sample frame considered scenario five to be valuable. Table 4.122 shows attitudes to scenario five by age.

Table 4.122: Scenario Five - Automatic Reaction of Devices to Online Information
By Age; Number of Respondents

	18-23	24-29	30-35	36-40	41 -45	46-50	51-64	65 or over
Very Valuable	32	18	33	22	36	19	21	3
	51%	29%	44%	31%	42%	25%	30%	6%
Moderately Valuable	20	31	28	32	31	32	30	26
	32%	49%	37%	45%	36%	42%	42%	49%
Neutral	8	11	11	12	12	17	15	16
	13%	17%	15%	17%	14%	22%	21%	30%
Not of Value	3	3	3	5	6	8	5	8
	5%	5%	4%	7%	7%	11%	7%	15%
Total (n)	63	63	75	71	85	76	71	53

Source: IHS © 2013 IHS

- Overall, there was an inverse relationship between the value placed on the scenario and the age of the respondent.

Table 4.123 shows attitudes to scenario five by housing tenure.

Table 4.123: Scenario Five - Automatic Reaction of Devices to Online Information
By Housing Tenure; Number of Respondents

	Living with Relatives	Renting a Property	Living in Own Property
Very Valuable	11	63	112
	29%	36%	33%
Moderately Valuable	13	74	136
	34%	42%	40%
Neutral	10	30	69
	26%	17%	20%
Not of Value	4	9	26
	11%	5%	8%
Total (n)	38	176	343

Source: IHS © 2013 IHS

- Interestingly, a higher proportion of those renting a property compared with those owning their property found this valuable, with 78% of those renting indicating this scenario was of value, compared with 72% of those who owned their property.

Table 4.124 shows attitudes to scenario five by technology adoption.

Table 4.124: Scenario Five - Automatic Reaction of Devices to Online Information
By Technology Adoption; Number of Respondents

	Positive	Neutral	Negative
Very Valuable	127	45	12
	46%	22%	15%
Moderately Valuable	117	82	31
	42%	41%	40%
Neutral	29	51	22
	10%	25%	28%
Not of Value	5	23	13
	2%	11%	17%
Total (n)	278	201	78

Source: IHS © 2013 IHS

As expected, there was a positive relationship between the technology adoption index score and the respondent valuation of scenario 5. 88% of those with a positive technology adoption score rated the scenario as valuable, compared with just 55% of those with a negative technology adoption score.

SCENARIO SIX

Scenario six was described as follows: "Today's manual processes can be automated. For example, your window shades automatically close at dusk and open at a pre-set time, such as when your alarm clock goes off".

Overall, 60% of respondents in this sample frame found this scenario to be valuable. Table 4.125 shows attitudes to scenario six by age.

Table 4.125: Scenario Six - Automation of Today's Manual Processes
By Age; Number of Respondents

	18-23	24-29	30-35	36-40	41 -45	46-50	51-64	65 or over
Very Valuable	20	12	19	19	21	15	13	4
	24%	15%	17%	22%	21%	16%	16%	7%
Moderately Valuable	26	24	39	26	29	27	25	15
	31%	30%	36%	30%	29%	30%	31%	26%
Neutral	12	20	12	16	21	22	18	23
	14%	25%	11%	18%	21%	24%	22%	40%
Not of Value	26	24	39	26	29	27	25	15
	31%	30%	36%	30%	29%	30%	31%	26%
Total (n)	84	80	109	87	100	91	81	57

Source: IHS © 2013 IHS

- Overall, there was an inverse relationship between the value placed on the scenario and the age of the respondent. However, the variation in responses between respondents aged between 18-64 was relatively minimal compared with some of the other scenarios.

Table 4.126 shows attitudes to scenario six by housing tenure.

Table 4.126: Scenario Six - Automation of Today's Manual Processes
By Housing Tenure; Number of Respondents

	Living with Relatives	Renting a Property	Living in Own Property
Very Valuable	9	73	102
	24%	41%	30%
Moderately Valuable	17	66	147
	45%	38%	43%
Neutral	8	26	68
	21%	15%	20%
Not of Value	4	11	26
	11%	6%	8%
Total (n)	38	176	343

Source: IHS © 2013 IHS

- Interestingly, a higher proportion of those renting a property compared with those owning their property found this valuable, with 79% of those renting indicating this scenario was of value, compared with 73% of those who owned their property.

Table 4.127 shows attitudes to scenario six by technology adoption.

Table 4.127: Scenario Six - Automation of Today's Manual Processes
By Technology Adoption; Number of Respondents

	Positive	Neutral	Negative
Very Valuable	95	22	6
	34%	11%	8%
Moderately Valuable	119	71	21
	43%	35%	27%
Neutral	49	64	31
	18%	32%	40%
Not of Value	15	44	20
	5%	22%	26%
Total (n)	278	201	78

Source: IHS © 2013 IHS

- As expected, there was a positive relationship between the technology adoption index score and the respondent valuation of scenario 6. 77% of those with a positive technology adoption score rated the scenario as valuable, compared with just 46% of those with a neutral technology adoption score.

4.5 VALUE-ADDED APPLICATIONS AND SERVICES

The sample frame for this section was limited to the 557 respondents which were deemed to have an interest in connected home devices. This excluded those who do not already own a connected device (ascertained in Q2.1) and also those that do not wish to perform any connected home functions (ascertained in Q2.2). This sample frame is applied across the remainder of this section, unless otherwise indicated.

SUMMARY & KEY IMPLICATIONS

This section presents the key implications from the analysis contained within Section 4.5.

- Less than 10% of respondents interested in connected home systems indicated they felt that voice activation would be of no value to them. More than half of respondents considered to have a neutral attitude toward technology adoption, and over a third with negative attitudes indicated this feature would be valuable. This suggests that voice activation may be a viable means of differentiating from competing systems, offering a feature considered valuable to a broader range of people outside of those that are the most technology-aware.

- Remote diagnostics appears to offer a powerful value proposition, with over 80% of respondents that want to be able to perform connected home functions suggesting that this feature would be valuable. Just 10% of respondents with negative attitudes toward technology adoption indicated this feature was not of value, highlighting that this feature may be a means of broadening the appeal of connected home systems. Remote diagnostics presents a good opportunity for connected home system suppliers or service providers to generate additional revenue. This can be directly through the maintenance of the system itself, replacing parts or devices that are close to the end of their operational life and reducing warrantee driven costs, as well as using the associated data to enhance the targeting of consumers to up-sell or cross-sell further devices or services.
- Automated peripheral product ordering was considered to be valuable by more than half of respondents that would like to be able to perform connected home functions, with this considered most valuable to respondents under the age of 46. Again, just 10% of respondents indicated this feature would not be of value, suggesting that offering a means to order peripheral products may be a viable way to generate an alternative revenue stream.
- Remote software upgrades offer a potential way to differentiate connected home systems, with less than 5% of respondents interested in the connected home indicating this feature would not be of any value. This may help to fix any bugs in the system or perhaps enhance functionality.
- Importantly, many of these value adding services (such as remote diagnostics, remote software upgrades and e-commerce platforms) were considered to be valuable by a significant proportion of respondents outside of those that had indicated they would like to be able to perform previous home automation-like connected home applications, indicating a broader appeal for these services.
- A "universal help button" (or a means of easily and seamlessly connecting with professionals to provide technical support) was considered valuable by just over half of respondents in this sample frame, with only a small proportion of those with negative attitudes to technology adoption suggesting this feature did not have any value. This may help to alleviate concerns over the complexity of the systems, with technical support easy to access, and offer a powerful proposition when combined with remote diagnostics and e-commerce platforms to replace devices or products. The indication again is that this would be a valuable differentiator and broaden the appeal of connected home systems.
- Only 4% of respondents interested in the connected home suggested they would expect no warranty whatsoever on either their connected home system or device, suggesting this may be a key feature. Further, more than 60% of these respondents wished to have the option to purchase insurance for the connected home system, indicating that further revenue streams may be obtained through the provision of insurance or extended warranties.

VOICE ACTIVATION & CONTROL

The following information and question was provided to respondents: "Some connected home devices can be controlled by voice activation, similar to the way that your smart phone can operate with voice activation. For example, this will allow you to turn lights on or off just by speaking to your home control system. How valuable would this functionality be to you when considering the purchase of a connected home device?"

557 respondents were selected for this question, limited to those who indicated an interest in a connected home use case in Q2.2.

Table 4.128 presents an overview of the results.

Table 4.128: Consumer Attitudes to Voice Activation
Overview; Number of Respondents

	Number of Respondents
Very Valuable	112
	20.1%
Moderately Valuable	253
	45.4%
Neutral	141
	25.3%
Not of Value	51
	9.2%
Total (n)	557

Source: IHS © 2013 IHS

Overall, 65.5% of respondents in this sample frame considered voice activation to be either very or moderately valuable. When the sample frame is increased to include all 1000 respondents, this drops to 48.1%. Table 4.129 shows attitudes to voice activation and control by age, reverting back to the target sample frame of respondents that had expressed an interest in connected home devices in earlier parts of the survey.

Table 4.129: Consumer Attitudes to Voice Activation
By Age; Number of Respondents

	18-23	24-29	30-35	36-40	41 -45	46-50	51-64	65 or over
Very Valuable	10	13	27	16	21	15	10	0
	16%	21%	36%	23%	25%	20%	14%	0%
Moderately Valuable	32	26	25	37	41	33	32	27
	51%	41%	33%	52%	48%	43%	45%	51%
Neutral	15	16	19	17	17	19	21	17
	24%	25%	25%	24%	20%	25%	30%	32%
Not of Value	6	8	4	1	6	9	8	9
	10%	13%	5%	1%	7%	12%	11%	17%
Total (n)	63	63	75	71	85	76	71	53

Source: IHS © 2013 IHS

- Interestingly, 75% of those aged between 36 and 40 selected that this feature would be of value, compared with 62% of 24-29 year olds and 51% of respondents aged 65 or above. Similarly, the highest proportions of those selecting voice activation as not valuable were polarized to either end of the age brackets, suggesting this feature is most appealing to those in the 30-45 age segment.

Table 4.130 shows attitudes to voice activation and control by income.

Table 4.130: Consumer Attitudes to Voice Activation
By Income; Number of Respondents

	Under $25,000	$25,000 - $49,999	$50,000 - $74,999	$75,000 - $99,999	$100,000 or over
Very Valuable	23	27	26	18	18
	23%	18%	21%	21%	13%
Moderately Valuable	45	66	53	40	49
	44%	45%	42%	47%	34%
Neutral	23	40	34	22	22
	23%	27%	27%	26%	15%
Not of Value	11	13	12	6	9
	11%	9%	10%	7%	6%
Total (n)	102	146	125	86	144

Source: IHS © 2013 IHS

A lower proportion (47%) of those earning over $100,000 selected that voice activation would be valuable, compared with the other age bands which were broadly similar in the 63-67% range.

Table 4.131 shows attitudes to voice activation and control by decision making score.

Table 4.131: Consumer Attitudes to Voice Activation
By Decision Making Role; Number of Respondents

	Major Decision Making Role	Minor Decision Making Role	No Decision Making Role
Very Valuable	62	44	6
	24%	19%	8%
Moderately Valuable	126	97	30
	50%	42%	41%
Neutral	46	69	26
	18%	30%	36%

	Major Decision Making Role	Minor Decision Making Role	No Decision Making Role
Not of Value	20	20	11
	8%	9%	15%
Total (n)	254	230	73

Source: IHS © 2013 IHS

- A higher proportion (74%) of primary decision makers selected that voice activation would be of value, compared with minor decision makers (61%) and those with no decision making role (49%). It is expected that this is due to a strong link between age and decision-making: a higher proportion of mid-aged respondents (i.e., those between the aged of 36 and 50) are major decision makers.

Table 4.132 shows attitudes to voice activation and control by technology adoption index.

Table 4.132: Consumer Attitudes to Voice Activation
By Technology Adoption; Number of Respondents

	Positive	Neutral	Negative
Very Valuable	89	17	6
	32%	8%	8%
Moderately Valuable	136	96	21
	49%	48%	27%
Neutral	43	63	35
	15%	31%	45%
Not of Value	10	25	16
	4%	12%	21%
Total (n)	278	201	78

Source: IHS © 2013 IHS

- As expected a higher proportion of those who had positive technology adoption scores selected voice activation as moderately or very valuable. Eighty-one percent of respondents with a positive technology adoption score selected this feature to be either very or moderately valuable, compared with 56% of 'technology-neutral' respondents and 35% of those with negative technology adoption scores.

CROSS-QUESTION ANALYSIS: CONNECTED HOME USE CASE PREFERENCE AND VOICE ACTIVATION

This analysis presents segmentation of respondents who selected voice activation as valuable compared with which use cases they originally selected that they would like to be able to do. This is intended to give an indication of which use-cases would be most valuable with voice activation to consumers.

Table 4.133 shows attitudes to voice activation and control by connected home use case.

Table 4.133: Consumer Attitudes to Voice Activation - by End Use Case
Overview; Number of Respondents

	Very Valuable	Moderately Valuable	Neutral	Not of Value
Intruder Notification	71	160	87	30
	20%	46%	25%	9%
Hazard Detector Monitoring	70	152	87	27
	21%	45%	26%	8%
Climate Control	69	140	71	27
	22%	46%	23%	9%
Windows/Doors Lock Status	66	138	69	20
	23%	47%	24%	7%
Lighting Control	68	127	56	17
	25%	47%	21%	6%
View Energy Consumption	56	122	62	21
	21%	47%	24%	8%
View Camera Feed	61	115	53	12
	25%	48%	22%	5%
Remote Front Door Lock	63	111	49	15
	26%	47%	21%	6%
Home Appliance Control	58	89	28	12
	31%	48%	15%	6%
Home Entertainment Monitoring	56	84	30	8
	31%	47%	17%	4%
Relative Notification	52	73	32	9
	31%	44%	19%	5%
Window Dressing Control	48	67	24	5
	33%	47%	17%	3%
Personal Health Monitoring	46	61	26	5
	33%	44%	19%	4%
Elderly Relative Monitoring	40	51	30	8
	31%	40%	23%	6%
Pool Pump Monitoring	20	26	5	2
	38%	49%	9%	4%
None of the above	16	10	25	26
	21%	13%	32%	34%
Total (n)	860	1,526	734	244

Source: IHS © 2013 IHS

- Overall a high percentage of respondents who selected that they were interested in a connected home use case also selected that voice activation would be very or moderately valuable to a connected home system; this varied between 66% and 88% of respondents for each use case.
- Of applications with a sample size over 100, respondents that selected window dressing control as an application they would like were most likely to also consider voice control to be valuable. For these applications, the proportion of respondents' also selecting voice control to be of value varied between 66%-80%. It is important to note that the sample size of respondents indicating that connected pool pump monitoring was desirable was relatively low.

REMOTE DIAGNOSTICS

Respondents were provided with the following information and question: "With some connected home devices, the device manufacturers can pre-empt expensive repair or maintenance issues, and recommend when a device needs to be serviced or repaired in order to ensure the device continues to run effectively. How valuable would this be to you?"

Table 4.134 provide an overview of the results.

Table 4.134: Consumer Attitudes to Pre-Emption of Device Repairs
Overview; Number of Respondents

	Number of Respondents
Very Valuable	178
	32.0%
Moderately Valuable	268
	48.1%
Neutral	97
	17.4%
Not of Value	14
	2.5%
Total (n)	557

Source: IHS © 2013 IHS

Over 80.1% of respondents who had previously indicated an interest in connected home systems considered this feature to be moderately or very valuable. Interestingly, when the sample frame is widened to all respondents, 593 indicated that this feature was either very or moderately valuable; compared with 446 of respondents in the limited sample frame. This indicates that there is a significant proportion of respondents that were not interested in the previous connected home applications presented who would find this feature valuable.

Table 4.135 shows attitudes to remote diagnostics by age based on the sample frame of respondents with an interest in connected home applications.

Table 4.135: Consumer Attitudes to Pre-Emption of Device Repairs
By Age; Number of Respondents

	18-23	24-29	30-35	36-40	41 -45	46-50	51-64	65 or over
Very Valuable	19	21	29	20	33	19	23	14
	30%	33%	39%	28%	39%	25%	32%	26%
Moderately Valuable	31	30	33	40	39	41	27	27
	49%	48%	44%	56%	46%	54%	38%	51%
Neutral	13	11	13	11	9	15	17	8
	21%	17%	17%	15%	11%	20%	24%	15%
Not of Value	0	1	0	0	4	1	4	4
	0%	2%	0%	0%	5%	1%	6%	8%
Total (n)	63	63	75	71	85	76	71	53

Source: IHS © 2013 IHS

- As with attitudes to voice activation, respondents in the middle age groups included in this survey (between 30 and 45) were most likely to find remote diagnostics valuable. This may have been impacted by the sample sizes, but gender may also have been a factor with more females in the mid-age ranges. However, it is important to note that there is not major variance by age compared with some of the other questions.
- When the sample frame is widened to all respondents, those in the younger bands are more likely to be interested in this feature; this is consistent with more respondents in younger age bands being interested in connected home applications in general.

Table 4.136 shows attitudes to remote diagnostics by income.

Table 4.136: Consumer Attitudes to Pre-Emption of Device Repairs – by Income
By Income; Number of Respondents

	Under $25,000	$25,000 - $49,999	$50,000 - $74,999	$75,000 - $99,999	$100,000 or over
Very Valuable	30	53	36	29	30
	29%	36%	29%	34%	21%
Moderately Valuable	48	64	67	41	48
	47%	44%	54%	48%	33%
Neutral	20	26	21	15	15
	20%	18%	17%	17%	10%
Not of Value	4	3	1	1	5
	4%	2%	1%	1%	3%
Total (n)	102	146	125	86	144

Source: IHS © 2013 IHS

- Interestingly, the proportion of respondents in the highest income bracket were significantly less likely to consider this feature valuable, at 54% compared with 76%-82% of respondents in other income brackets.

Table 4.137 shows attitudes to remote diagnostics by decision making role.

Table 4.137: Consumer Attitudes to Pre-Emption of Device Repairs – by Decision Making Role
By Decision Making Role; Number of Respondents

	Major Decision Making Role	Minor Decision Making Role	No Decision Making Role
Very Valuable	91	70	17
	36%	30%	23%
Moderately Valuable	130	109	29
	51%	47%	40%
Neutral	30	43	24
	12%	19%	33%
Not of Value	3	8	3
	1%	3%	4%
Total (n)	254	230	73

Source: IHS © 2013 IHS

- Eighty-seven percent of respondents with a major decision-making role considered this feature valuable (either very or moderately so), compared with 78% of respondents with a minor role in the decision-making process and only 63% of respondents with no role in the decision-making process.

Table 4.138 shows attitudes to remote diagnostics by technology adoption index.

Table 4.138: Consumer Attitudes to Pre-Emption of Device Repairs – by Technology Adoption Index
By Technology Adoption; Number of Respondents

	Positive	Neutral	Negative
Very Valuable	117	46	15
	42%	23%	19%
Moderately Valuable	132	103	33
	47%	51%	42%
Neutral	29	46	22
	10%	23%	28%

	Positive	Neutral	Negative
Not of Value	0	6	8
	0%	3%	10%
Total (n)	278	201	78

Source: IHS © 2013 IHS

- As expected a higher proportion of those who had positive technology adoption scores selected voice activation as moderately or very valuable. Ninety percent of respondents with a positive technology adoption score selected this feature to be either very or moderately valuable, compared with 74% of 'technology-neutral' respondents and 62% of those with negative technology adoption scores.

REMOTE SOFTWARE UPGRADES

Respondents were provided with the following information and question: "Some connected devices can enable remote software upgrades. This can offer a number of benefits, including additional functionality of the device, customized user experiences and allow the device to run more effectively. How valuable would this be to you?"

Table 4.139 provides an overview of the results.

Table 4.139: Consumer Attitudes to Remote Software Upgrades – Overview
Overview; Number of Respondents

	Number of Respondents
Very Valuable	165
	29.6%
Moderately Valuable	269
	48.3%
Neutral	97
	17.4%
Not of Value	26
	4.7%
Total (n)	557

Source: IHS © 2013 IHS

Overall, 78% of respondents in the limited sample frame (respondents with an interest in connected home applications) considered this feature to be very or moderately valuable. A further 140 respondents from the wider sample frame also considered this to be very or moderately valuable, indicating market potential outside those with an interest in other connected home applications.

Key points include:

- Generally, there was little trend in attitudes to remote software upgrades by age, however there was some variety. Those aged 65 or over were more likely to find remote software upgrades not of value, and also were least likely to select the feature as moderately valuable. However, over 70% of both younger and older respondents found remote software upgrades to be valuable.
- As expected a higher proportion of those who had positive technology adoption scores were more likely to select this feature as moderately or very valuable. Respondents with a positive technology score are more likely to be familiar with installing remote software upgrades in other devices, such as smartphones or tablets, and understand the process and associated benefits.
- Females were far more likely to be indifferent towards consumer remote software upgrades (66%) or find them not valuable (65%).
- Broadly, respondents with higher household incomes were more likely to find this feature valuable. However, this proportion dips significantly when considering respondent earning over $100,000 per year.
- Eighty-two percent of respondents with a major decision-making role considered this feature valuable (either very or moderately so), compared with 75% of respondents with a minor role in the decision-making process and 74% of respondents with no role in the decision-making process.
- As was typical in the survey, a high proportion of those who had a positive technology adoption score were more likely to assign a higher value to remote software upgrades.

PERIPHERAL PRODUCT REPLACEMENT AND E-COMMERCE

Respondents were provided with the following information and question: “Some connected devices can detect when you might need to replace peripheral products (such as air conditioner filters or pool pump filters) and even automatically order these for you so that you have the replacement delivered just before it’s needed. Would this be valuable to you?”

Table 4.140 provides an overview of the results using the limited sample frame (i.e., respondents with an interest in connected home applications).

Table 4.140: Consumer Attitudes to Peripheral Product Replacement and E-Commerce – Overview
Overview; Number of Respondents

	Number of Respondents
Very Valuable	149
	26.8%
Moderately Valuable	215
	38.6%
Neutral	136
	24.4%

	Number of Respondents
Not of Value	57
	10.2%
Total (n)	557

Source: IHS © 2013 IHS

Of this limited sample frame, 65.4% of respondents indicated that this feature would be very or moderately valuable. Analyzing the wider sample frame (all 1,000 respondents), a further 123 respondents indicated that this feature would be valuable, indicating a potential target market for this feature outside of those with an interest in other connected home applications covered in Section 4.2 of this report.

Table 4.141 show attitudes to peripheral product replacement and e-commerce by location.

Table 4.141: Consumer Attitudes to Peripheral Product Replacement and E-Commerce – by Location
By Location; Number of Respondents

	Canada	U.S. – East Coast	U.S. – Midwest	U.S. – South	U.S. – West Coast
Very Valuable	60	19	17	27	26
	24%	23%	23%	31%	40%
Moderately Valuable	88	37	35	34	21
	35%	45%	48%	40%	32%
Neutral	70	19	14	19	14
	28%	23%	19%	22%	22%
Not of Value	32	8	7	6	4
	13%	10%	10%	7%	6%
Total (n)	250	83	73	86	65

Source: IHS © 2013 IHS

- Overall, respondents in Canada were least likely to consider this feature valuable, with respondents on the West Coast most likely to consider this feature very valuable.

Table 4.142 shows attitudes to peripheral product replacement and e-commerce by age.

Table 4.142: Consumer Attitudes to Peripheral Product Replacement and E-Commerce – by Age
By Age; Number of Respondents

	18-23	24-29	30-35	36-40	41 -45	46-50	51-64	65 or over
Very Valuable	18	17	22	20	24	22	15	11
	29%	27%	29%	28%	28%	29%	21%	21%
Moderately Valuable	27	27	30	30	35	25	26	15
	43%	43%	40%	42%	41%	33%	37%	28%
Neutral	14	16	15	13	16	24	20	18
	22%	25%	20%	18%	19%	32%	28%	34%
Not of Value	4	3	8	8	10	5	10	9
	6%	5%	11%	11%	12%	7%	14%	17%
Total (n)	63	63	75	71	85	76	71	53

Source: IHS © 2013 IHS

- In general, younger respondents (aged 45 or under) were most likely to find this feature valuable, with between 69% and 71% of respondents selecting either very or moderately valuable in these age categories. However, for older respondents, this declined significantly to 49% of those aged 65 or over.

Table 4.143 shows attitudes to peripheral product replacement and e-commerce by technology adoption index.

Table 4.143: Consumer Attitudes to Peripheral Product Replacement and E-Commerce – by Technology Adoption Index
By Technology Adoption; Number of Respondents

	Positive	Neutral	Negative
Very Valuable	101	38	10
	36%	19%	13%
Moderately Valuable	109	80	26
	39%	40%	33%
Neutral	59	55	22
	21%	27%	28%
Not of Value	9	28	20
	3%	14%	26%
Total (n)	278	201	78

Source: IHS © 2013 IHS

- As expected a higher proportion of those who had positive technology adoption scores were more likely to select this feature as moderately or very valuable. This was selected by 76% of respondents with a positive technology adoption rating, compared with only 59% of 'technology neutral' respondents and 46% of 'technology negative' respondents.

Additional points include:

- Female respondents were slightly more likely to find this feature very or moderately valuable than their male counterparts, at 68% compared with 62%.
- Respondents who are living with relatives were least likely to find this feature valuable, compared with those who rent or own their own home. These respondents may be less likely to be responsible for day-to-day home management.
- Seventy-four percent of respondents with a major decision-making role considered this feature valuable (either very or moderately so), compared with 60% of respondents with a minor role in the decision-making process and only 55% of respondents with no role in the decision-making process.

UNIVERSAL HELP BUTTONS

Respondents were provided with the following information and question: Would you find it valuable to have a system which has a universal help button that connects you automatically to the relevant help centers or maintenance hot-lines relating to an individual device without you needing to find out the contact information yourself?"

Table 4.144 provides an overview of the results using the sample frame limited to respondents which had previously indicated an interest in connected home applications.

Table 4.144: Consumer Attitudes to Universal Help Buttons – Overview
Overview; Number of Respondents

	Number of Respondents
Very Valuable	165
	29.6%
Moderately Valuable	215
	38.6%
Neutral	140
	25.1%
Not of Value	37
	6.6%
Total (n)	557

Source: IHS © 2013 IHS

Within this sample frame, a universal help button was considered moderately or very valuable by 78% of respondents. Comparing this to the full sample frame of 1,000 respondents, just over half (51%) of all respondents considered this to be a valuable feature.

Table 4.145 shows attitudes to universal help buttons by technology adoption index.

Table 4.145: Consumer Attitudes to Universal Help Buttons – by Technology Adoption Index
By Technology Adoption; Number of Respondents

	Positive	Neutral	Negative
Very Valuable	100	48	17
	36%	24%	22%
Moderately Valuable	116	71	28
	42%	35%	36%
Neutral	55	66	19
	20%	33%	24%
Not of Value	7	16	14
	3%	8%	18%
Total (n)	278	201	78

Source: IHS © 2013 IHS

- A higher proportion of those who had positive technology adoption scores selected a universal help button as moderately or very valuable. These options were selected by 78% of respondents with a positive technology adoption rating, compared with only 59% of 'technology neutral' respondents and 58% of 'technology negative' respondents.

Additional points include:

- As with many previous questions, respondents who are living with relatives were least likely to find this feature valuable, compared with those who rent or own their own home. These respondents may be less likely to be responsible for day-to-day home management.
- Broadly speaking, younger respondents were more likely to find this feature to be either moderately or very valuable. This was selected by only 66% and 55% of the older two respondent age brackets (including respondents aged 51 and over), whereas between 67% and 79% of respondents in the two youngest age brackets found this to be valuable. However, there is not a clear linear trend.
- There is some variation by respondent household income, but no clear trend.
- Seventy-three percent of respondents with a major decision-making role considered this feature valuable (either very or moderately so), compared with 64% of respondents with a minor role in the decision-making process and only 63% of respondents with no role in the decision-making process.

4.6 DATA PRIVACY AND WILLINGNESS TO PROVIDE DATA

SUMMARY & KEY IMPLICATIONS

This section presents the key implications from the analysis contained within Section 4.6.

- Over 60% of respondents interested in connected home systems suggested they would be prepared to allow the sharing of their personal data collected through these systems provided there was an incentive to do so. The data generated by connected home systems is increasingly being considered as a viable alternative means of monetizing the connected home, as it can be used to enhance the targeting of marketing information to consumers or be sold to third-parties (where allowed by the consumer).

WILLINGNESS TO PROVIDE DATA FOR INCENTIVE

Respondents were provided with the following information and question: "Some connected home devices could be offered at the same price as non-connected alternatives and/or with no monthly subscription fees in return for you giving consent for the device supplier or other associated company to use and securely distribute your device-related data (such as how long it runs for, at what times of day the device runs, or whether it requires maintenance or replacement) to its partner companies. Would you be willing to provide this data to a company in exchange for either a lower device cost or in place of a monthly subscription fee? This data would be stored safely and securely and only shared with selected partner companies."

Table 4.146 provides an overview of the results using the limited sample frame of respondents which had previously indicated an interest in connected home applications.

Table 4.146: Consumer Attitudes to Data Sharing – Overview
Overview; Number of Respondents

	Number of Respondents
Not willing to provide data	208
	37.3%
Willing to provide data in return for incentive	349
	62.7%
Total (n)	557

Source: IHS © 2013 IHS

The intention of this question was to ascertain consumer attitude to data sharing in return for some form of incentive. Notably, 63% of respondents indicated that they would be willing to provide data in return for an incentive.

Table 4.147 shows attitudes to data privacy and incentive by technology adoption.

Table 4.147: Consumer Attitudes to Data Sharing – by Technology Adoption Index
By Technology Adoption; Number of Respondents

	Positive	Neutral	Negative
Not willing to provide data	90	85	33
	32%	42%	42%
Willing to provide data in return for incentive	188	116	45
	68%	58%	58%
Total [n]	278	201	78

Source: IHS © 2013 IHS

Respondents with a positive technology adoption score were more likely to be willing to provide their data in return for an incentive, with this option selected by 68% of respondents compared with 58% of respondents with neutral or negative technology adoption scores.

Additional information includes:

- There is no major variation by location, although respondents on the East Coast of the U.S. or in the South of the U.S. were slightly more inclined to allow data sharing.
- Overall, those in younger age groups were more likely to allow data sharing in return for an incentive; however, the data demonstrated only minor variation across age groups.
- Respondents living in their own properties were slightly more likely to allow data sharing than other respondents, with 67% selecting this option compared with 60% of renters and 39% of respondents living with relatives.
- There is no linear trend with household income, although respondents in households with an income of $100,000 or over are less likely to allow data sharing than respondents with lower household income levels. At the two lowest household income brackets, 61% and 60% of respondents would allow data to be shared in this way.
- Respondents with a major role in the decision-making process were more willing to share data, at 70% compared with 58% and 51% of those with a minor or nom-existent role in the household decision-making process.

DATA PRIVACY AND ATTITUDES TO THIRD PARTY DATA SHARING

Respondents were provided with the following information and question: “When considering the purchase of a connected home device, which sentence describes how you feel about sharing your data, such as how much electricity you use and when, the status of the operation of the device and whether something might be working incorrectly, when and for how long your devices are activated or which devices you use most in the home, with the system or device provider? This type of data would be securely managed by the provider and not publically available.”

This question was intended as a more in-depth look at data privacy concerns. For example, were consumers concerned with the original service provider using their data, or were they mainly concerned with the service provider sharing that data with external parties?

Table 4.148 presents an overview of the results.

Table 4.148: Consumer Attitudes to Data Privacy – Overview
Overview; Number of Respondents

	Number of Respondents
Not comfortable with data being available to any company	160
	28.7%
Comfortable with sharing data, but only for incentive	188
	33.8%
Comfortable sharing with company & partner companies	76
	13.6%
Comfortable sharing ONLY with service provider	133
	23.9%
Total (n)	557

Source: IHS © 2013 IHS

A significant proportion (29%) of respondents were not comfortable providing their data to any company. However, 47% were comfortable sharing data with the original service provider and partner companies, although most (34%) will require an incentive to do so. Twenty-four percent were comfortable sharing only with the service provider.

Additional information includes:

- While there was no clear linear trend respondents aged 30-35 and 41-45 were most likely to be comfortable sharing data beyond just the original service provider. Broadly, those in older age groups were less likely to be comfortable with wider sharing of their data, even where there is an incentive involved.
- There was no major variation between the respondent attitudes towards data privacy and other demographics such as location or gender.
- Consistent with the previous question, respondents living in their own properties were slightly more likely to allow data sharing than other respondents, with 68% selecting this option compared with 59% of renters and 58% of respondents living with relatives. Also consistent with the previous questions, respondents with a major decision-making role were more likely to allow data sharing than those with minor or non-existing roles in the decision-making process.
- Respondents with a higher technology adoption score were more likely to be comfortable with data-sharing, with 50% selecting one of the options relating to the sharing of their data beyond the service provider (i.e., to partner companies), compared with 46% and 42% of respondents with neutral or negative technology adoption ratings, respectively.

4.7 WARRANTY AND INSURANCE EXPECTATION

Respondents were asked “If you were to purchase a connected home system, would you want or expect a warranty on the devices and the remote management system?” Consumers that selected

they would like a warranty (either on the system, devices, or both) were then asked how long they would like their warranty to last.
Again, this section was limited to the 557 respondents which had previously indicated an interest in connected home applications.

Table 4.149 presents an overview of the results for the expectation of warranty.

Table 4.149: Consumer Expectation of Warranties – Overview
Overview; Number of Respondents

	Number of Respondents
Would not expect a warranty on either devices or system	23
	4.1%
Would expect a warranty on both devices and system	287
	51.5%
Would expect a warranty on devices	216
	38.8%
Would expect a warranty on system	31
	5.6%
Total (n)	557

Source: IHS © 2013 IHS

Table 4.150 presents an overview of the expected length of warranty for those which selected that they would expect a warranty.

Table 4.150: Consumer Expectation of Warranty Length – Overview
Overview; Number of Respondents

	1 year	3 years	5 years	10 years	20 years	Lifetime
Would expect warranty on both devices and system	10	46	97	60	5	69
	50%	40%	48%	61%	83%	75%
Would expect warranty on devices	9	61	93	32	0	21
	45%	53%	46%	33%	0%	23%
Would expect warranty on system	1	8	13	6	1	2
	5%	7%	6%	6%	17%	2%
Total (n)	20	115	203	98	6	92

Source: IHS © 2013 IHS

Table 4.151 presents this information by location.

Table 4.151: Consumer Expectation of Warranties – by Location
By Location; Number of Respondents

	Canada	U.S. – East Coast	U.S. – Midwest	U.S. – South	U.S. – West Coast
Would not expect a warranty on either devices or system	9	4	3	4	3
	4%	5%	4%	5%	5%
Would expect a warranty on both devices and system	128	47	32	48	32
	51%	57%	44%	56%	49%
Would expect a warranty on devices	97	28	32	33	26
	39%	34%	44%	38%	40%
Would expect a warranty on system	16	4	6	1	4
	6%	5%	8%	1%	6%
Total (n)	250	83	73	86	65

Source: IHS © 2013 IHS

Key points to note include:

- Over half (52%) of all respondents expected a warranty on both the devices and the system; over a third (39%) expected a warranty on just the devices.
- Only 4% did not expect a warranty on either the devices or the system.
- The most selected warranty period was five years (37%), followed by three years (21%) and 10 years (18%).
- Seventeen percent of respondents selected that they would expect a lifetime warranty.
- Of those who expected a warranty on both the devices and the system, 75% expected a lifetime warranty.
- Of those who expected a warranty on only the devices, the highest proportion (53%) expected a three year warranty.
- There is no clear trend by location, although in most locations, respondents are considerably more likely to expect a warranty on the device and system combined rather than the devices alone. The Midwest is an exception, where an equal number of respondents (44%) selected each of these two options.
- Notably, those on the West Coast U.S. were least likely to select a longer warranty length (20 years or lifetime), but were more likely to expect a five year warranty. Conversely, nearly 30% of respondents on the East Coast of the U.S. expected a lifetime warranty.

Additional information includes:

- A higher percentage of female respondents (68%, compared to 50% of male respondents) would expect a warranty on both the devices and system, rather than one or the other. Conversely, a comparatively high proportion of males would expect a warranty on just the devices.

- Female respondents were more likely to expect a lifetime warranty than male respondents, who were more likely to select three or 10 year warranties.
- Older respondents are more likely to expect a warranty on both the devices and the system compared with younger respondents. The proportion of respondents expecting both device and system to be covered under a warranty ranges from 42% to 46% in age bands under 40, and then increases in subsequent age bands from 48% to 63%.
- Respondents with higher household incomes were less likely to expect lifetime warranties to be provided with their devices than respondents with lower incomes. Overall, they were more likely to expect 5 or 10 year alternatives.
- Respondents with higher technology adoption scores were more likely to expect one or three year warranties than respondents with lower technology adoption scores, and less likely to expect lifetime warranties. This may be because these consumers are more familiar with the warranty programs for other electronics items, where a lifetime warranty would be considered rare, with typical warranties covering shorter, defined periods.
- While there are some variations by other demographics such as age, there are no significant clear trends to highlight.

INSURANCE OPTIONS

Respondents were asked whether they would like the option to purchase insurance on a connected home device or system. This was a standard “yes”/”no” question, with the sample frame limited to the 557 respondents that had previously indicated an interest in connected home applications.

Table 4.152 provides an overview of the results of this question:

Table 4.152: Consumer Expectation of Insurance Provision – Overview
Overview; Number of Respondents

	Number of Respondents
Would like option to purchase insurance	353
	63.4%
Would not like option to purchase insurance	204
	36.6%
Total (n)	557

Source: IHS © 2013 IHS

63.4% of respondents who indicated an interest in the connected home would like the option to purchase insurance for their connected home devices or system. This is interesting for the potential monetization of the connected home: by either partnering with insurance companies or building internal insurance provision offerings, additional insurance options could be one way of adding value to the connected home service.

Table 4.153 shows consumer attitude to insurance provision for connected home systems by age.

Table 4.153: Consumer Expectation of Insurance Provision – by Age
By Age; Number of Respondents

	18-23	24-29	30-35	36-40	41 -45	46-50	51-64	65 or over
Would like option to purchase insurance	44	41	46	47	56	45	39	35
	70%	65%	61%	66%	66%	59%	55%	66%
Would not like option to purchase insurance	19	22	29	24	29	31	32	18
	30%	35%	39%	34%	34%	41%	45%	34%
Total (n)	63	63	75	71	85	76	71	53

Source: IHS © 2013 IHS

- Overall, respondents aged 45 or younger were most likely to select that they wanted the option to purchase insurance; however, there is no clear linear trend.

Table 4.154 presents respondent attitude to insurance provision for connected home systems by income.

Table 4.154: Consumer Expectation of Insurance Provision – by income
By Income; Number of Respondents

	Under $25,000	$25,000 - $49,999	$50,000 - $74,999	$75,000 - $99,999	$100,000 or over
Would like option to purchase insurance	65	106	78	56	48
	64%	73%	62%	65%	49%
Would not like option to purchase insurance	37	40	47	30	50
	36%	27%	38%	35%	51%
Total (n)	102	146	125	86	98

Source: IHS © 2013 IHS

- Respondents in the highest income brackets were less likely than those in lower brackets to want the option of purchasing insurance. This might be because these households are more likely to have more comprehensive contents insurance which may include the purchase of such systems.

Table 4.155 shows consumer attitudes to insurance provision for connected home systems by technology adoption.

Table 4.155: Consumer Expectation of Insurance Provision – by Technology Adoption Index
By Technology Adoption; Number of Respondents

	Positive	Neutral	Negative
Would like option to purchase insurance	198	114	41
	71%	57%	53%
Would not like option to purchase insurance	80	87	37
	29%	43%	47%
Total (n)	278	201	78

Source: IHS © 2013 IHS

- Seventy-one percent of those who scored positively on the technology adoption index wanted the option to purchase insurance on these systems, compared with only 57% and 53% of those with neutral or negative scores, respectively. This may be because these respondents are more familiar with purchasing insurance for other electronics devices, such as smartphones.

COMPARISON BETWEEN INSURANCE AND WARRANTY EXPECTATIONS

The question of insurance options preference has also been cross-examined with whether the respondent selected that they would want a warranty with the system.

Table 4.156 provides insight into these results.

Table 4.156: Comparison of Consumer Expectation of Warranty and Expecation of Insurance Provision
Overview; Number of Respondents

	Would like option to purchase insurance	Would not like option to purchase insurance
Would not expect warranty on either devices or system	13	10
	57%	43%
Would expect warranty on both devices and system	172	115
	60%	40%
Would expect warranty on devices	150	66
	69%	31%
Would expect warranty on system	18	13
	58%	42%
Total (n)	353	204

Source: IHS © 2013 IHS

- There is a stronger relationship between respondents which expected a warranty on connected home devices and those who would like the option to purchase insurance compared with respondents which had other warranty expectations.

4.8 ADVERTISING AND EDUCATION

SUMMARY & KEY IMPLICATIONS

This section presents the key implications from the analysis contained within Section 4.7.

- Almost one-third of respondents that had indicated they would like to be able to perform one or more connected home functions were only made aware of connected home systems via the examples given in the end-user survey. This implies there is a significant potential customer base that lacks the required education and awareness in order to make an informed decision to purchase a connected home system. This supports the previously discussed findings that a significant proportion of respondents indicated that they would be willing to pay for connected home systems, but were unsure when they would purchase these. This emphasizes the need for the industry, and those active within it, to take a leading role in educating consumers to the benefit of connected home systems if they are to become more broadly adopted.

OVERVIEW AND DEMOGRAPHIC ANALYSIS

Many key industry players have identified consumer advertising and education as the cornerstone of mass market penetration of connected home systems and devices. As the topic is so vast, a separate survey would be required to fully explore. This section intends to provide the reader with a summary of responses to the question “Where did you first hear and learn about connected home devices?”

This is a key question, and may help to target marketing and advertising schemes across different demographics and media channels.

Table 4.157 provides a summary of the results using the limited sample frame (i.e., those respondents that had previously indicated an interest in the connected home applications outlined in earlier parts of the survey).

Table 4.157: Advertising and Education Channels – Overview
Overview; Number of Respondents

	Number of Respondents
Internet	177
	30.1%
Television	113
	19.2%
Retail store	12
	2.0%

	Number of Respondents
Utility mailing	10
	1.7%
Word of mouth	86
	14.6%
In this survey	177
	30.1%
Other	14
	2.4%
Total (n)	589

Source: IHS © 2013 IHS

- Thirty percent of respondents first learned about connected home devices in the recent survey by IHS. Using the wider sample frame, 40% of all respondents had only heard about connected home devices in the IHS survey. This demonstrates the potential opportunities which could stem from increasing consumer awareness relating to connected home systems and functions.
- A high proportion learned about connected devices on the Internet, with this option selected by 30% of respondents. Television was the next most selected advertising medium.

Table 4.158 shows consumer awareness of connected home systems by location.

Table 4.158: Advertising and Education Channels – by Location
By Location; Number of Respondents

	Canada	U.S. – East Coast	U.S. – Midwest	U.S. – South	U.S. – West Coast
Internet	57	20	20	23	25
	23%	24%	27%	27%	38%
Television	56	13	10	16	18
	22%	16%	14%	19%	28%
Retail store	3	4	1	1	3
	1%	5%	1%	1%	5%
Utility mailing	5	2	0	1	2
	2%	2%	0%	1%	3%
Word of mouth	34	17	11	15	9
	14%	20%	15%	17%	14%
In this survey	89	23	29	28	8
	36%	28%	40%	33%	12%

	Canada	U.S. – East Coast	U.S. – Midwest	U.S. – South	U.S. – West Coast
Other	6	4	2	2	0
	2%	5%	3%	2%	0%
Total (n)	250	83	73	86	65

Source: IHS © 2013 IHS

- As expected, a higher proportion of respondents on the West Coast U.S. had already heard about connected home devices via the Internet and television. It is IHS's belief that there is a relatively forward-facing attitude to connected or 'smart' devices on the West Coast, with significant awareness of, or interest in, related aspects such as technology, electric cars, and smart grid, and so there is a greater awareness from related marketing, advertising and education schemes within this region. The lowest pre-existing awareness of connected home systems was amongst respondents in the Midwest of the U.S.

Table 4.159 shows consumer awareness of connected home systems by age.

Table 4.159: Advertising and Education Channels - by Age
By Age; Number of Respondents

	18-23	24-29	30-35	36-40	41 -45	46-50	51-64	65 or over
Internet	8	21	35	18	21	16	13	13
	13%	33%	47%	25%	25%	21%	18%	25%
Television	13	10	11	15	28	20	10	6
	21%	16%	15%	21%	33%	26%	14%	11%
Retail store	0	2	2	2	4	0	2	0
	0%	3%	3%	3%	5%	0%	3%	0%
Utility mailing	0	0	0	1	3	2	1	3
	0%	0%	0%	1%	4%	3%	1%	6%
Word of mouth	12	10	12	10	12	11	10	9
	19%	16%	16%	14%	14%	14%	14%	17%
In this survey	27	20	15	23	14	25	32	21
	43%	32%	20%	32%	16%	33%	45%	40%
Other	3	0	0	2	3	2	3	1
	5%	0%	0%	3%	4%	3%	4%	2%
Total (n)	63	63	75	71	85	76	71	53

Source: IHS © 2013 IHS

- Respondents aged 41-45 showed the highest awareness of the connected home prior to the recent survey from IHS. Notably, this lack of prior awareness was highest amongst respondents at either side of the age scale, i.e., those aged 18-23 and those aged 51 or over.

- Of respondents that had prior awareness of the connected home (i.e., before the survey from IHS), respondents in the 24-35 and over 65 age brackets were more than twice as likely to have heart about the connected home through the Internet than television (which was the second most common channel).

Additional information includes:

- Female respondents were more likely to have only heard about connected home devices through the survey conducted by IHS, at 38% compared with only 24% of male respondents. Male respondents were more likely to have heard about connected home devices via the Internet (at 32%, compared with 21% of female respondents).
- In general, respondents with higher household incomes were more likely to have heard about connected home devices through the Internet than respondents with lower household income. The reverse is true of television, which was a more common channel for households with lower income levels. Respondents with lower household income levels were generally more likely to have only learned about connected home devices though the recent survey from IHS.
- Respondents with major decision-making roles were more likely than those with minor or non-existing roles in the decision-making process to have heard of connected devices before the recent survey from IHS.
- As expected, respondents with positive technology adoption scores were more likely to be aware of connected home devices prior to the IHS survey, with 35% of these respondents learning about these systems through the Internet, 24% through television, and 13% through word-of-mouth. Conversely, 50% of those with a negative technology adoption score only learned about connected homes via the IHS survey.

APPENDIX 1
COMPANY PROFILES

AP1.0 INTRODUCTION

This appendix presents figures containing company profiles, as referenced throughout the report.

AP1.1 ADT

Managed Service Provider Profile 1.1: ADT (Pulse)

Smart Home Overview
ADT Pulse provides smart home security systems; a connected version of its traditional ADT professional monitoring and security services. The ADT Pulse system combines both self-monitoring and professional monitoring services, by offering 24/7 monitoring as well as smartphone/tablet availability for self-managing. While security is the focus, some energy management, lighting and other services are available. ADT also offers a traditional home healthcare system (unconnected), seperately to the Pulse service.

Standard Packages and Devices		Monthly Cost	Installation Cost
"Select"	2x window/door contacts; motion sensor; fire/smoking monitors; (CO detector and flood detector optional extras)	$47.99	$399.00
"Choice"	2x window/door contacts; motion sensor; fire/smoking monitors; (CO detector, flood detector, thermostats, light switch, small appliance control optional extras)	$49.99	$349.00
"Advantage"	2 x window/door contatcs; motion detector; fire/smoke monitors; thermostat; small appliance controller	$49.99	$749.00
Premier	2 x window/door contatcs; motion detector; thermostat; small appliance controller; 2 x indoor video cameras;light controller; touchscreen	$57.99	$999.00

Additional Information
ADT Pulse is a professionally monitored system; therefore all pricing is reflective of a 24/7 professional monitoring service as well as the hardware and software. Because of this, all packages are professional install only; ADT installer and associated costs are mandatory. An addition to the Pulse solution, ADT also offers a PERS system (ADT Home Health).

Source: IHS - Information Retrieved from ADT Website, August 2013

AP1.2 VERIZON

Managed Service Provider Profile 1.2: Verizon

Smart Home Overview
Verizon has implemented its connected home services in 2012; it includes energy management, with real time energy consumption data display for the consumer, as well as dedicated monitoring services (mostly based on safety & security applications). The focus of this service is on the consumer-managed remote control aspects of the connected home. To purchase any of these packages, the consumer must already be a Verizon subscriber.

Standard Packages and Devices	Monthly Cost	Installation & Hardware Cost
Standard Starter Kit Gateway; Camera; Indoor Light Module	$9.99	$129.99

A La Carte Device Pricing	Additional Monthly Cost for Device	Additional Device Cost (Upfront)	Total upfront cost
Outdoor Camera	$0	$149.99	$149.99
Indoor Camera	$0	$99.99	$99.99
Door Lock	$0	$159.99	$159.99
Indoor Light Module	$0	$39.99	$39.99
Outdoor Light Module	$0	$44.99	$44.99
Smart Plug	$0	$44.99	$44.99
Light Switch (on/off)	$0	$44.99	$44.99
Light Switch (dimmer)	$0	$49.99	$49.99
Door.Window Sensor	$0	$39.99	$39.99
Appliance Switch	$0	$39.99	$39.99
Thermostat	$0	$129.99	$129.99
Energy Reader	$0	$99.99	$99.99
Remote Control	$0	$29.99	$29.99

Bundles	Bundles: Price Breakdown and Discount	
	Per Month	Package Discount
"Energy Accessory Offer" • Standard Package (required) • Door Package • Camera Package	$9.99 (no additional per month charge for devices)	$84.99 off device cost
"Entry Accessory Offer" • Standard Package (required) • Door Package • Camera Package • Energy Package	$9.99 (no additional per month charge for devices)	$58.49 off device cost

"Entry and Energy Accessory Offer" • Standard Package (required) • Door Package • Camera Package • Energy Package	$9.99 (no additional per month charge for devices)	$71.99 off device cost

Additional Information

There is a pre-owned accessories outlet on the Verizon Web site, plus there is a free pre-owned starter-kit option to go with these devices. In addition, all of these devices are self-install: all add-ons are one off fees with no additional monthly subscription charge.

Source: IHS - Information Retrieved from Verizon Website, August 2013

AP1.3 COMCAST

STANDARD DEVICES AND PACKAGES

Managed Service Provider Profile 1.3: Comcast

Smart Home Overview

Comcast launched its Xfinity Home system to the mass market in May 2012, as an extension of the triple-play Xfinity service. Xfinity home focuses on the home monitoring application, using ZigBee technology; Comcast has expanded this system to 65% of its markets since the 2010 pilot. Subscription to Xfinity Home also requires a subscription to Xfinity Internet service.

Standard Packages and Devices		Monthly Cost	Device Cost
Home Automation System			**Home Automation Packages have the option of self-install ($0) or professional install (starting at $99.99)**
"Control 100"	Light Control; Appliance Switch; Thermostat	$14.95	$99.95 (in addition to any install costs)
"Control 150"	Same devices as "Control 100" but with 'added functionality'	$19.95	$99.95 (in addition to any install costs)
Professional Monitoring System			**Professional Monitoring Packages must be professionally installed**
"Secure 300"	• 1 x touchscreen • 3 x window/door contacts • 1 x motion sensor • 1 x wireless keypad	$39.95	$99 (Start Price) For devices and installation
"Secure 350"	• 1 x touchscreen controller; • 3 x window/door contacts; • 1 x motion sensor • 1 x wireless keypad • 2 x indoor/outdoor cameras • 2 x light controllers • 1 x thermostat OR 1 x additional camera	$49.95	$399 (Start Price) For devices and installation

Source: IHS - Information Retrieved from Comcast Website, August 2013

COMCAST - A LA CARTE DEVICE AND BUNDLE PRICING

A La Carte Device Pricing	Monthly Cost	Total	Device Cost	Total
Available as Add-Ons for All Packages				
Window/door contact	–	$9.99	$49.95	–
Motion sensor	–	$9.99	$69.95	–
Thermostat	–	$9.99	$129.95	–
Indoor camera	–	$9.99	$89.95	–
Indoor/outdoor camera	–	$9.99	$129.95	–
Water detector	–	$9.99	$49.95	–
Smart plug	–	$9.99	$69.95	–
CO detector	–	$9.99	$89.95	–
Light switch	–	$9.99	$89.95	–
Targeted motion sensor	–	$9.99	$49.95	–
Powerline device	–	$9.99	$59.95	–
Available as Add-Ons ONLY for Home Secure Packages				
Wireless keypad	–	$9.99	$89.95	–
Keychain remote	–	$9.99	$69.95	–
Glass break sensor	–	$9.99	$129.95	–
Smoke detector	–	$9.99	$89.95	–
Wi-Fi repeater	–	$9.99	$49.95	–
Remote siren	–	$9.99	$99.95	–

Bundles		Bundles: Price Breakdown and Discount		
		Per Month	Upfront (excluding installation)	Discount on devices (excluding monthly fee & installation)
"Eco Add-On Pack"	• Standard Package (required) • Thermostat; window/door contact; lighting controller	no additional per month charge for devices	$229.95	39.90 saving
"View Add-On Pack"	• Standard Package (required) • Indoor/outdoor camera; window/door contact; lighting controller	no additional per month charge for devices	$229.95	39.90 saving

"Sensor Add-On Pack"	• Standard Package (required) • 4 x window/door contacts • 1 x motion sensor	no additional per month charge for devices	$199.95	$69.80 saving
"View Eco Add-On Pack"	• Standard Package (required) • Indoor/outdoor camera • thermostat	no additional per month charge for devices	$229.95	$29.95 saving
"Total Add-On Pack"	• Standard Package (required) • Indoor/outdoor camera • thermostat • window/door contact • lighting controller	no additional per month charge for devices	$349.95	$49.85 saving

Source: IHS - Information Retrieved from Comcast Website, August 2013

AP1.4 AT&T

Managed Service Provider Profile 1.4: AT&T

Smart Home Overview
AT&T has gradually rolled out its Digital Life platform across a number of U.S. states. AT&T Digital Life Package is compatible with any high speed Internet connection, and is marketed as a professionally installed system. Suppliers to AT&T include Digital Security Controls, Alarm.com, Honeywell, and Coulomb, among others. AT&T's platform is run in-house, through the acquisition of software supplier Xanboo in 2010.

Standard Packages and Device		Monthly Cost	Installation & Hardware Cost
Simple Security	• 1 x Siren • 1 x Key Fob • 1 x Widnow/Door Sensor • 1 x Keypad	$29.99	$149.99
Smart Security	• 1 x Siren • 1 x Key Fob • 1 x Widnow/Door Sensor • 1 x Keypad • 1 x Smoke Detector • 1 x CO Detector • 1 x Glass Break Sensor • 1 x Motion Detector	$39.99	$249.99

Add-On Packages		Monthly Cost (add-on)	Total monthly cost (including standard package)	Installation & Hardware Cost	Total upfront cost
To enable add-on bundles, the consumer must be subscribed to "Smart Security" package					
Camera Package	• 2 x cameras - indoor and outdoor	$9.99	$49.98	$199.99	$449.98

Door Package	• 1 x garage door sensor • 1 x door lock • 1 x push button door lock	$4.99	$44.98	$99.99	$349.98
Energy Package	• 1 x thermostat • 1 x light control • 2 x smart plug (indoor and outdoor)	$4.99	$44.98	$199.99	$449.98
Water Detection	• 1 x temperature & water sensor	$4.99	$44.98	$49.99	$299.98
Water Control	• 1 x temperature & water sensor • 1 x water shutoff	$9.99	$49.98	$249.99	$499.98
Bundles		**Bundles: Price Breakdown and Discount**			
		Per Month (including standard package)	**Installation & Hardware Cost (including standard package)**	**Bundle discount**	
"Protect the Family"	• Smart Security (required) • Door Package • Camera Package	$54.97	$549.97	No discount by choosing bundle	
"Pet Care"	• Smart Security (required) • Door Package • Camera Package • Energy Package	$59.96	$749.96	No discount by choosing bundle	
"Gadget Guru"	• Smart Security (required) • Door Package • Camera Package • Energy Package	$59.96	$749.96	No discount by choosing bundle	
"On the Go"	• Smart Security (required) • Water Control • Camera Package • Energy Package	$64.96	$899.96	No discount by choosing bundle	
Additional Information					
All AT&T packages are provided with mandatory professional installation. For first time customers, everything is installed professionally. However, if a consumer purchases add-on devices, the consumer can choose whether to self-install or personally hire a professional.					

Source: IHS - Information Retrieved from Comcast Website, August 2013

APPENDIX 2
RESPONDENT DEMOGRAPHICS

AP2.0 INTRODUCTION

This appendix presents the demography of respondents to the consumer survey designed as part of the research project conducted by IHS for the Continental Automated Building Association (CABA).

AP2.1 RESPONDENT LOCATION

This section references responses to the question "Q1.1 – Where do you live?"

Table AP2.1 below presents the responses to this question.

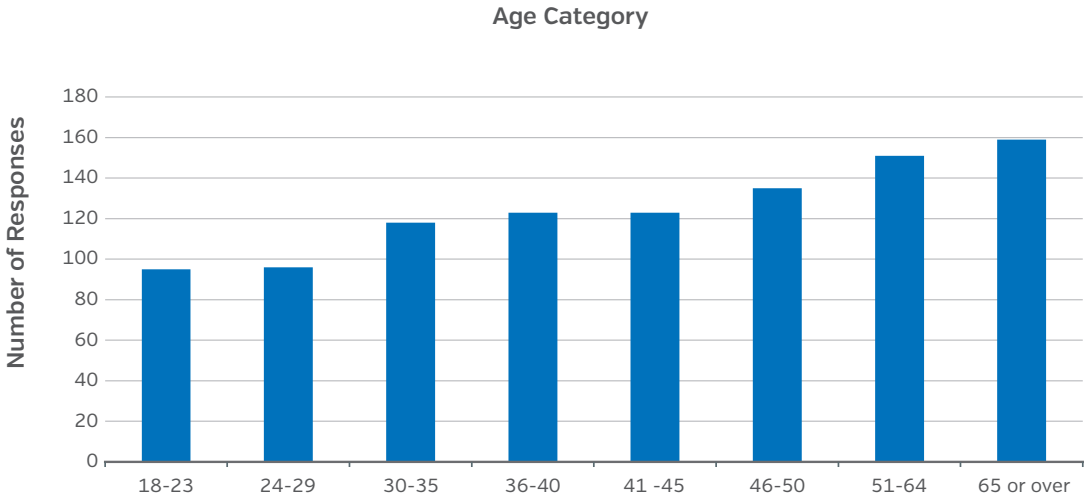
Table AP2.1: Question 1.1 – Respondent Location
Overview; Number of Respondents

	Number of Respondents
Canada	400
	40.0%
U.S. - East Coast	171
	17.1%
U.S. - Midwest	150
	15.0%
U.S. - South	160
	16.0%
U.S. - West Coast	119
	11.9%
Total (n)	1,000

Note: Quota used to ensure 40% in Canada

Source: IHS © 2013 IHS

Chart AP2.1: Question 1.2 – Respondent Age



Source: IHS © 2013 IHS

- It should be noted that a quota was used to ensure 40% of respondents lived in Canada and that over 100 respondents were included from each of the four area of the U.S.

AP2.2 RESPONDENT AGE CATEGORY

This section references responses to the question "Q1.2 – How old are you?"

Table AP2.2 and Chart AP2.1, below, present the responses to this question.

Table AP2.2: Question 1.2 – Respondent Age
Overview; Number of Respondents

	Number of Respondents
18-23	95
	9.5%
24-29	96
	9.6%
30-35	118
	11.8%
36-40	123
	12.3%
41 -45	123
	12.3%

	Number of Respondents
46-50	135
	13.5%
51-64	151
	15.1%
65 or over	159
	15.9%
Total (n)	1,000

Source: IHS © 2013 IHS

- It should be noted that quotas were used to ensure there were over 40 respondents in each age category for the U.S. and Canada to allow for analysis.
- Respondents in the United States were slightly more skewed towards the older age bands than Canadian respondents.

AP2.3 RESPONDENT GENDER

This section references responses to the question "Q1.3 – Are you male or female?"

Table AP2.3 presents the responses to this question.

Table AP2.3: Question 1.3 – Respondent Gender
Overview; Number of Respondents

	Number of Respondents
Female	544
	54.4%
Male	456
	45.6%
Total (n)	1,000

Source: IHS © 2013 IHS

- It should be noted that a degree of quota balancing was used to ensure there was no large skew in favor of one gender or the other, requiring over 450 respondents of each gender.

Table AP2.4 and Chart AP2.2, below, present this data by respondent location.

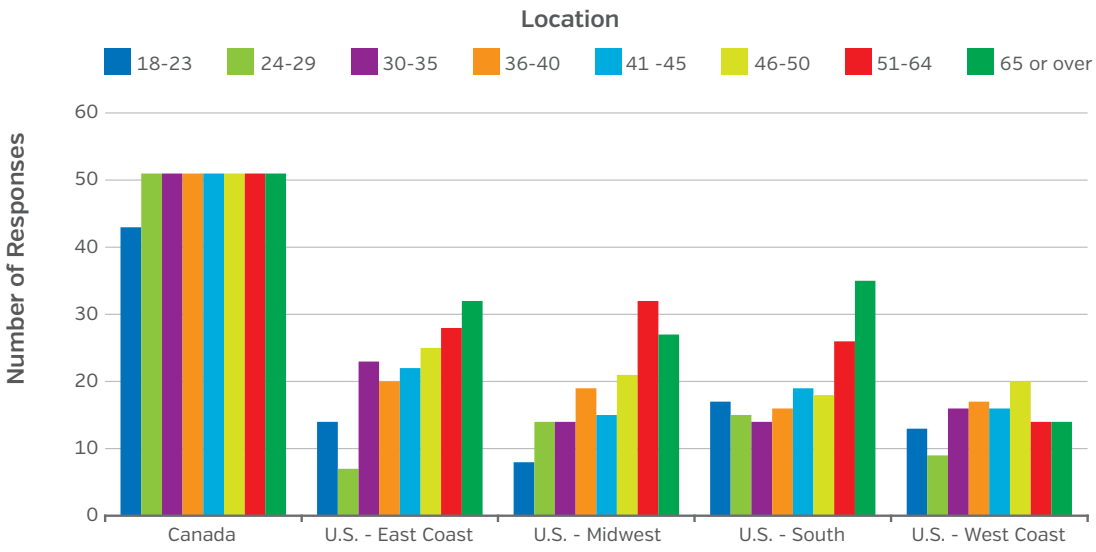
Table AP2.4: Question 1.3 – Respondent Gender
By Location; Number of Respondents

	Canada	U.S. - East Coast	U.S. - Midwest	U.S. - South	U.S. - West Coast
Female	211	85	90	94	64
	53%	50%	60%	59%	54%
Male	189	86	60	66	55
	47%	50%	40%	41%	46%
Total (n)	**400**	**171**	**150**	**160**	**119**

Source: IHS © 2013 IHS

- As shown in the table above, between 50 and 60% of respondents in each location were female.

Chart AP2.2: Question 1.2 – Respondent Age



Source: IHS © 2013 IHS

Table AP2.5 and Chart AP2.3 present this data by respondent age.

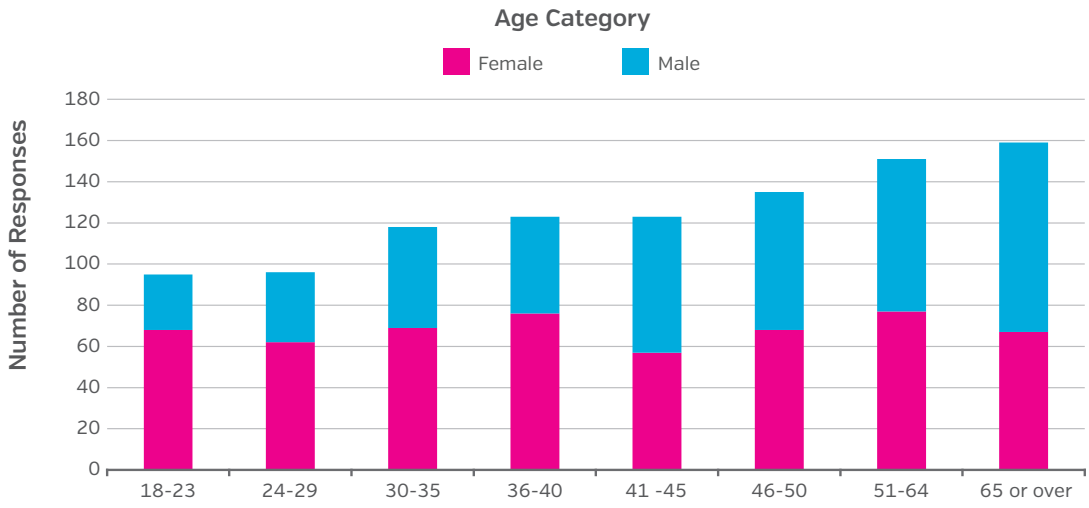
Table AP2.5: Question 1.3 – Respondent Gender
By Age; Number of Respondents

	18-23	24-29	30-35	36-40	41 -45	46-50	51-64	65 or over
Female	68	62	69	76	57	68	77	67
	72%	65%	58%	62%	46%	50%	51%	42%
Male	27	34	49	47	66	67	74	92
	28%	35%	42%	38%	54%	50%	49%	58%
Total (n)	95	96	118	123	123	135	151	159

Source: IHS © 2013 IHS

- Notably, age categories 18-23, 24-29 and 36-40 have less than 40% male respondents. This may be pertinent when considering age category analysis within the survey for questions closely correlated to gender.

Chart AP2.3: Question 1.3 – Respondent Gender



Source: IHS © 2013 IHS

AP2.4 HOUSEHOLD INFORMATION

HOUSING TENURE

This section references responses to the question "Q1.4 – Do you currently own your own home?"

Table AP2.6 presents the responses to this question.

Table AP2.6: Question 1.4 – Respondent Housing Tenure
Overview; Number of Respondents

	Number of Respondents
No - I live with relatives	77
	7.7%
No - I'm renting	338
	33.8%
Yes	585
	58.5%
Total (n)	1,000

Source: IHS © 2013 IHS

Table AP2.7 and Chart AP2.4 present this data by respondent location.

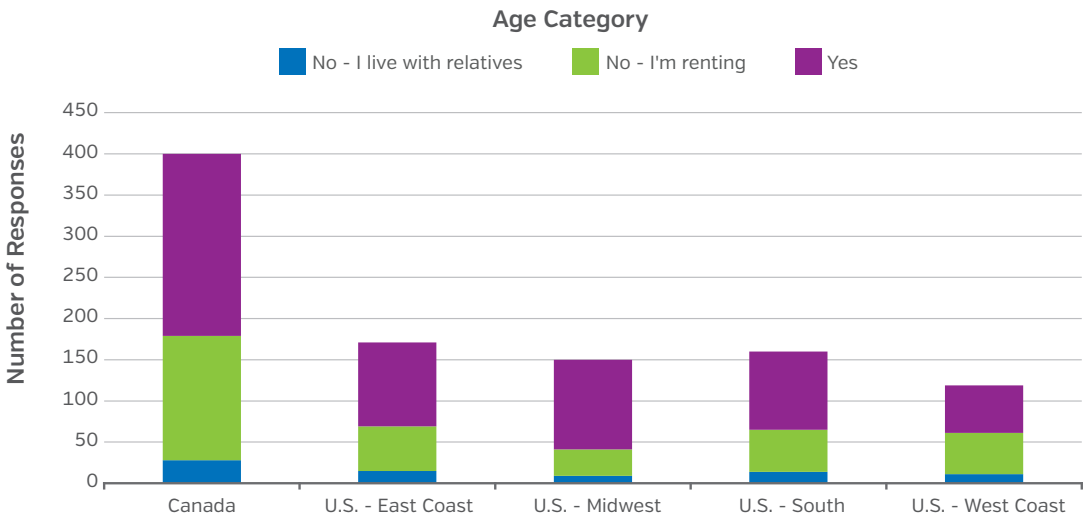
Table AP2.7: Question 1.4 – Respondent Housing Tenure
By Location; Number of Respondents

	Canada	U.S. - East Coast	U.S. - Midwest	U.S. - South	U.S. - West Coast
No - I live with relatives	28	15	9	14	11
	7%	9%	6%	9%	9%
No - I'm renting	151	54	32	51	50
	38%	32%	21%	32%	42%
Yes	221	102	109	95	58
	55%	60%	73%	59%	49%
Total (n)	400	171	150	160	119

Source: IHS © 2013 IHS

- Interestingly, a higher than average number of respondents located in the Midwest area of the United States were homeowners. This may have consequences on related analysis in subsequent survey questions.

Chart AP2.4: Question 1.4 – Respondent Housing Tenure



Source: IHS © 2013 IHS

Table AP2.8 and Chart AP2.5 present this data by age category.

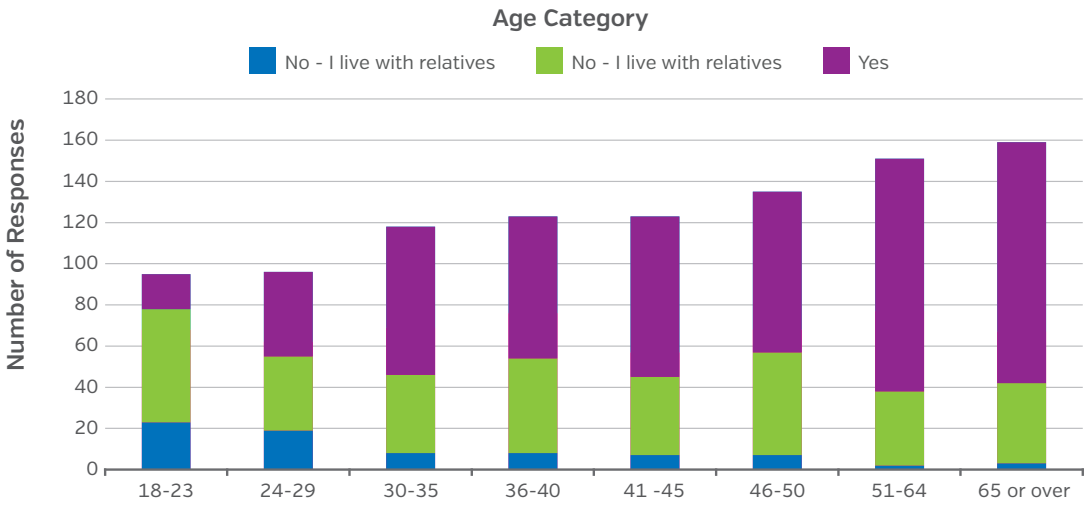
Table AP2.8: Question 1.4 – Respondent Housing Tenure
By Age; Number of Respondents

	18-23	24-29	30-35	36-40	41 -45	46-50	51-64	65 or over
No - I live with relatives	23	19	8	8	7	7	2	3
	24%	20%	7%	7%	6%	5%	1%	2%
No - I'm renting	55	36	38	46	38	50	36	39
	58%	38%	32%	37%	31%	37%	24%	25%
Yes	17	41	72	69	78	78	113	117
	18%	43%	61%	56%	63%	58%	75%	74%
Total (n)	95	96	118	123	123	135	151	159

Source: IHS © 2013 IHS

- As you may expect, the likelihood of being a homeowner increased rapidly within the lower age categories, with the likelihood that respondents lived with relatives declining.

Chart AP2.5: Question 1.4 – Respondent Housing Tenure



Source: IHS © 2013 IHS

Table AP2.9 and Chart AP2.6 present this data by respondent gender.

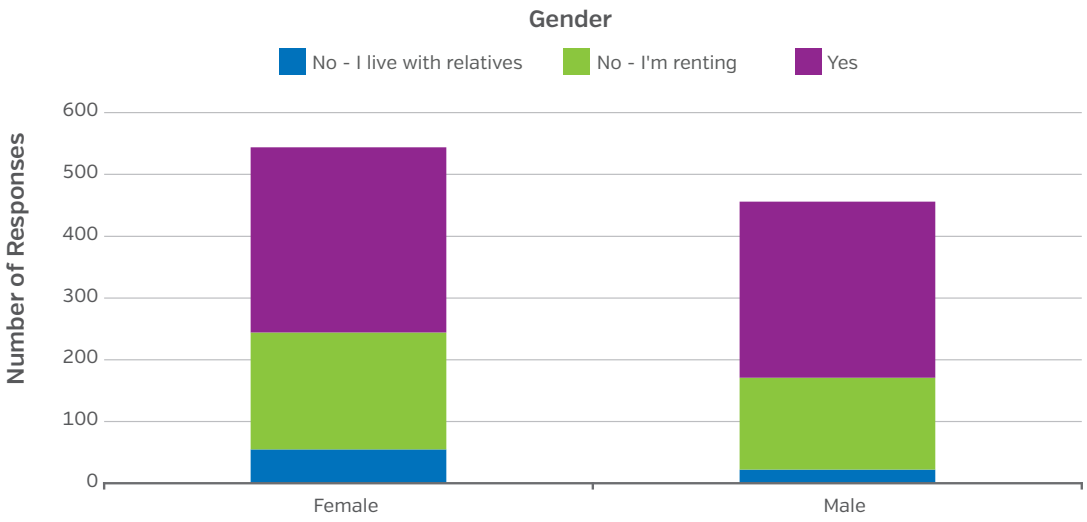
Table AP2.9: Question 1.4 – Respondent Housing Tenure
By Gender; Number of Respondents

	Female	Male
No - I live with relatives	55	22
	10%	5%
No - I'm renting	189	149
	35%	33%
Yes	300	285
	55%	63%
Total (n)	**544**	**456**

Source: IHS © 2013 IHS

- Proportionally, male respondents were half as likely as female respondents to live with relatives, but were more likely to be homeowners. This may be because the two youngest age bands are skewed towards female respondents.

Chart AP2.6: Question 1.4 – Respondent Housing Tenure



Source: IHS © 2013 IHS

DWELLING-TYPE

This section references responses to the question "Q1.5 – Which of these best describe your home?"

Table AP2.10 presents an overview of the responses.

Table AP2.10: Question 1.5 – Dwelling-type
Overview; Number of Respondents

	Number of Respondents
Apartment, flat or duplex	290
	29.0%
House or bungalow	680
	68.0%
Other	30
	3.0%
Total (n)	1,000

Source: IHS © 2013 IHS

Table AP2.11 and Chart AP2.7 present this data by respondent location.

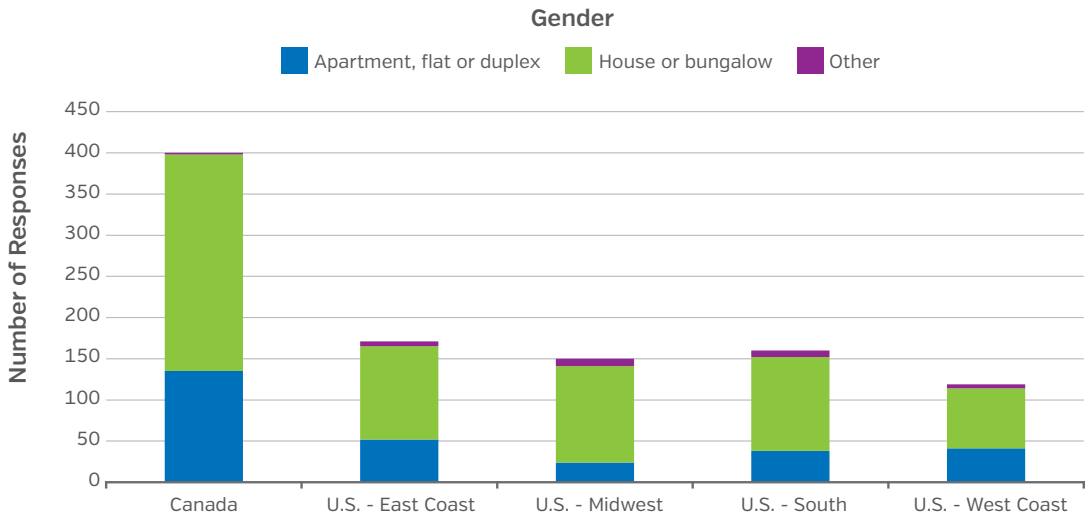
Table AP2.11: Question 1.5 – Dwelling-type
By Location; Number of Respondents

	Canada	U.S. - East Coast	U.S. - Midwest	U.S. - South	U.S. - West Coast
Apartment, flat or duplex	135	52	24	38	41
	34%	30%	16%	24%	34%
House or bungalow	263	113	117	114	73
	66%	66%	78%	71%	61%
Other	2	6	9	8	5
	1%	4%	6%	5%	4%
Total (n)	**400**	**171**	**150**	**160**	**119**

Source: IHS © 2013 IHS

- Respondents located in the Midwest of the United States were most likely to live in a house or bungalow, while those in the West Coast were least likely to, with respondents that live in apartments, flats or duplexes twice as common in the West Coast than the Midwest.

Chart AP2.7: Question 1.5 – Dwelling-type



Source: IHS © 2013 IHS

Table AP2.12 and Chart AP2.8 show this data by respondent age category.

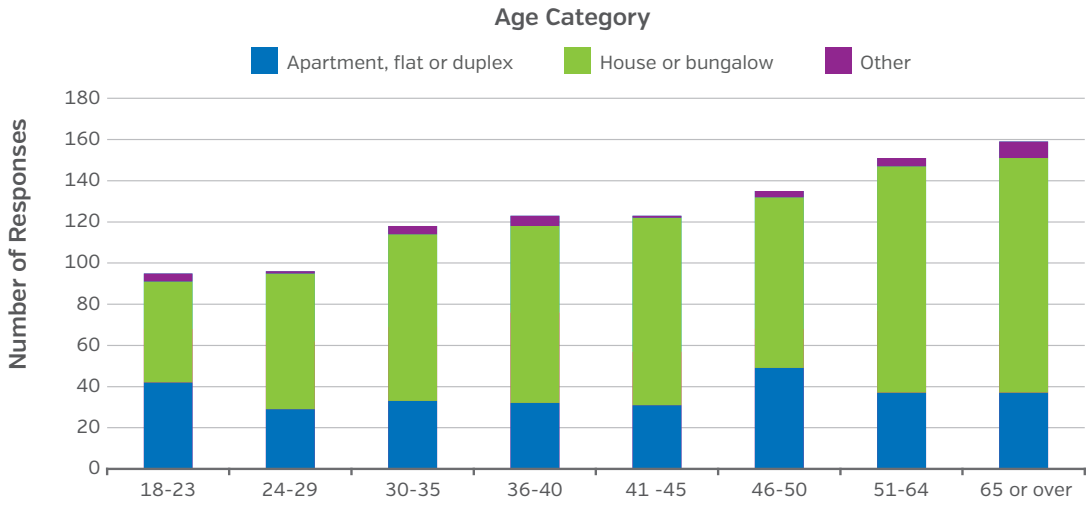
Table AP2.12: Question 1.5 – Dwelling-type
By Age; Number of Respondents

	18-23	24-29	30-35	36-40	41 -45	46-50	51-64	65 or over
Apartment, flat or duplex	42	29	33	32	31	49	37	37
	44%	30%	28%	26%	25%	36%	25%	23%
House or bungalow	49	66	81	86	91	83	110	114
	52%	69%	69%	70%	74%	61%	73%	72%
Other	4	1	4	5	1	3	4	8
	4%	1%	3%	4%	1%	2%	3%	5%
Total (n)	95	96	118	123	123	135	151	159

Source: IHS © 2013 IHS

- Generally, respondents were more likely to live in houses or bungalows as age increased. The 46-50 age category presented a surprising anomaly to this trend, perhaps due to a higher proportion of respondents in this age category indicating they rented their home, when compared with the 41 to 45 and 51 to 64 age categories.

Chart AP2.8: Question 1.5 – Dwelling-type



Source: IHS © 2013 IHS

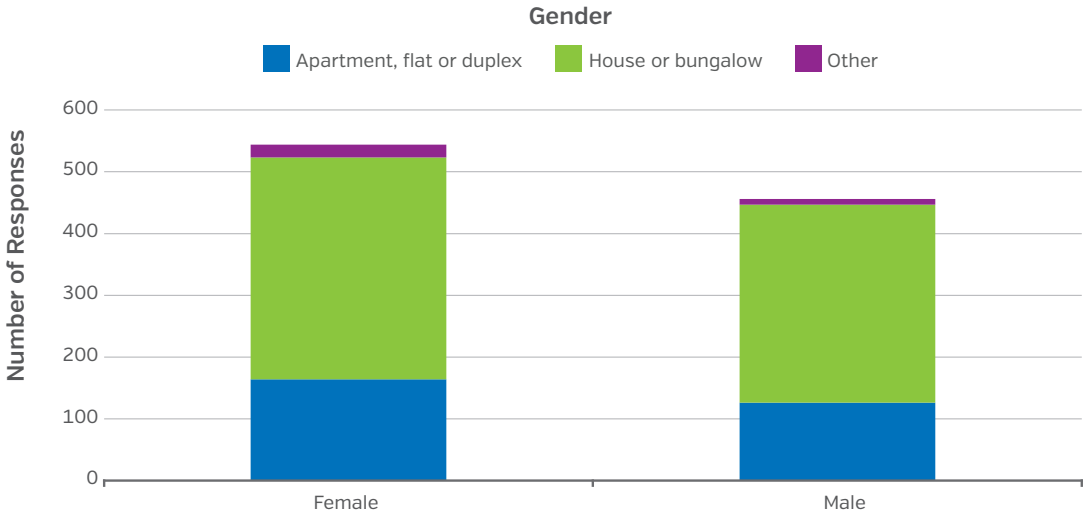
Table AP2.13 and Chart AP2.9 present this information by respondent gender.

Table AP2.13: Question 1.5 – Dwelling-type
By Gender; Number of Respondents

	Female	Male
Apartment, flat or duplex	164	126
	30%	28%
House or bungalow	359	321
	66%	70%
Other	21	9
	4%	2%
Total (n)	544	456

Source: IHS © 2013 IHS

Chart AP2.9: Question 1.5 – Dwelling-type



Source: IHS © 2013 IHS

Table AP2.14 presents the dwelling-type of respondents that indicated they owned their homes.

Table AP2.14: Question 1.5 – Dwelling-type
Table AP1.15

	Number of Respondents
Apartment, flat or duplex	47
	8.0%
House or bungalow	517
	88.4%
Other	21
	3.6%
Total (n)	585

Source: IHS © 2013 IHS

- Approximately 88% of respondents that are homeowners lived in houses or bungalows, compared to 68% of respondents overall.

INCOME

This section references responses to question "Q1.7 – Which of these best describes the annual income of your household?"

Table AP2.15 presents an overview of responses collected from respondents.

Table AP2.15: Question 1.7 – Household Income
Table AP1.15

	Number of Respondents
Under $25,000	229
	22.9%
$25,000 - $49,999	276
	27.6%
$50,000 - $74,999	211
	21.1%
$75,000 - $99,999	140
	14.0%
$100,000 - $124,999	61
	6.1%
$125,000 - $149,999	41

	Number of Respondents
	4.1%
$150,000 - $199,999	23
	2.3%
$200,000 - $249,999	11
	1.1%
$250,000 or over	8
	0.8%
Total (n)	1,000

Source: IHS © 2013 IHS

The number of respondents in households earning over $150,000 per year is relatively low. To expand the sample frame size, the higher income categories have been combined for cross-analysis with some of the questions in this survey.

Table AP2.16 and Chart AP2.10 show this information by respondent location.

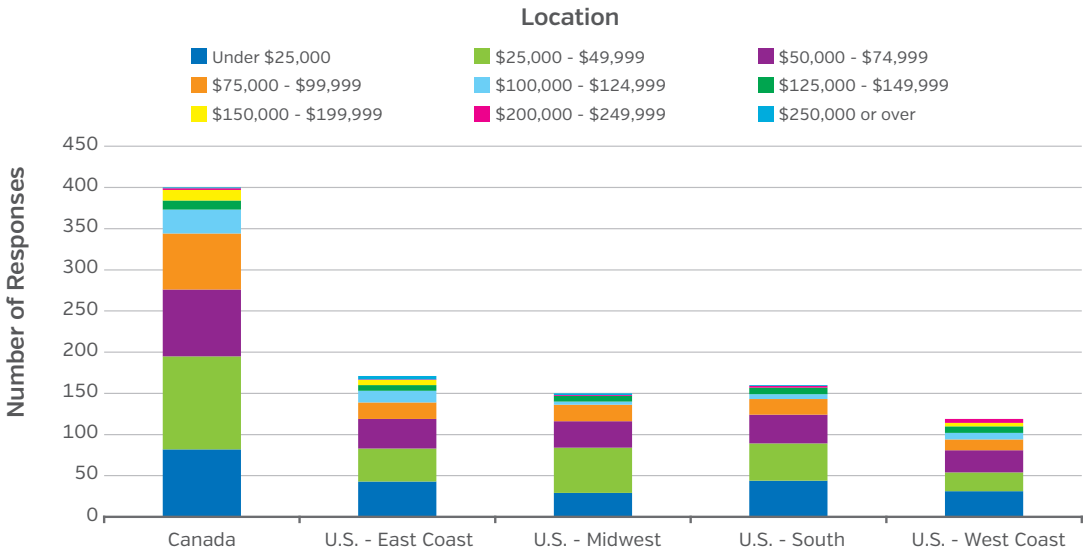
Table AP2.16: Question 1.7 – Household Income
By Location; Number of Respondents

	18-23	24-29	30-35	36-40	41 -45	46-50	51-64	65 or over
Under $25,000	31	15	23	23	24	33	44	36
	33%	16%	19%	19%	20%	24%	29%	23%
$25,000 - $49,999	29	30	32	32	26	32	38	57
	31%	31%	27%	26%	21%	24%	25%	36%
$50,000 - $74,999	22	20	19	27	29	33	28	33
	23%	21%	16%	22%	24%	24%	19%	21%
$75,000 - $99,999	9	18	18	19	25	16	20	15
	9%	19%	15%	15%	20%	12%	13%	9%
$100,000 - $124,999	1	11	10	8	6	8	7	10
	1%	11%	8%	7%	5%	6%	5%	6%
$125,000 - $149,999	0	1	11	7	7	6	5	4
	0%	1%	9%	6%	6%	4%	3%	3%

	18-23	24-29	30-35	36-40	41 -45	46-50	51-64	65 or over
$150,000 - $199,999	3	0	3	4	2	4	3	4
	3%	0%	3%	3%	2%	3%	2%	3%
$200,000 - $249,999	0	1	0	1	2	3	4	0
	0%	1%	0%	1%	2%	2%	3%	0%
$250,000 or over	0	0	2	2	2	0	2	0
	0%	0%	2%	2%	2%	0%	1%	0%
Total (n)	95	96	118	123	123	135	151	159

Source: IHS © 2013 IHS

Chart AP2.10: Question 1.7 – Household Income



Source: IHS © 2013 IHS

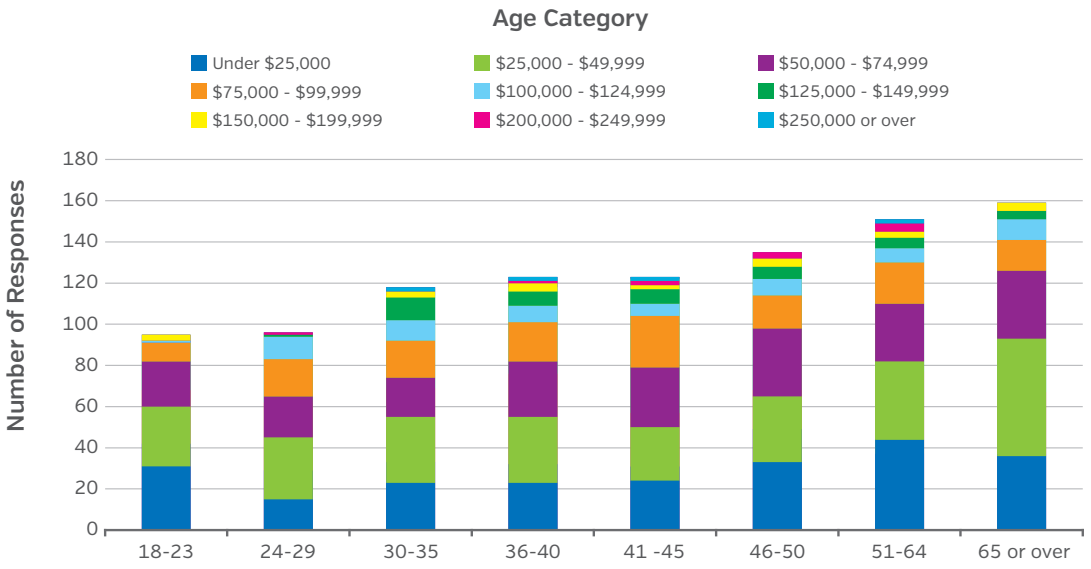
Table AP2.17 and Chart AP2.11 present this information by respondent age category.

Table AP2.17: Question 1.7 – Household Income
By Age; Number of Respondents

	18-23	24-29	30-35	36-40	41 -45	46-50	51-64	65 or over
Under $25,000	31	15	23	23	24	33	44	36
	33%	16%	19%	19%	20%	24%	29%	23%
$25,000 - $49,999	29	30	32	32	26	32	38	57
	31%	31%	27%	26%	21%	24%	25%	36%
$50,000 - $74,999	22	20	19	27	29	33	28	33
	23%	21%	16%	22%	24%	24%	19%	21%
$75,000 - $99,999	9	18	18	19	25	16	20	15
	9%	19%	15%	15%	20%	12%	13%	9%
$100,000 - $124,999	1	11	10	8	6	8	7	10
	1%	11%	8%	7%	5%	6%	5%	6%
$125,000 - $149,999	0	1	11	7	7	6	5	4
	0%	1%	9%	6%	6%	4%	3%	3%
$150,000 - $199,999	3	0	3	4	2	4	3	4
	3%	0%	3%	3%	2%	3%	2%	3%
$200,000 - $249,999	0	1	0	1	2	3	4	0
	0%	1%	0%	1%	2%	2%	3%	0%
$250,000 or over	0	0	2	2	2	0	2	0
	0%	0%	2%	2%	2%	0%	1%	0%
Total (n)	95	96	118	123	123	135	151	159

Source: IHS © 2013 IHS

Chart AP2.11: Question 1.7 – Household Income



Source: IHS © 2013 IHS

Table AP2.18 and Chart AP2.12 present this information by dwelling-type.

Table AP2.18: Question 1.7 – Household Income
By Dwelling-type; Number of Respondents

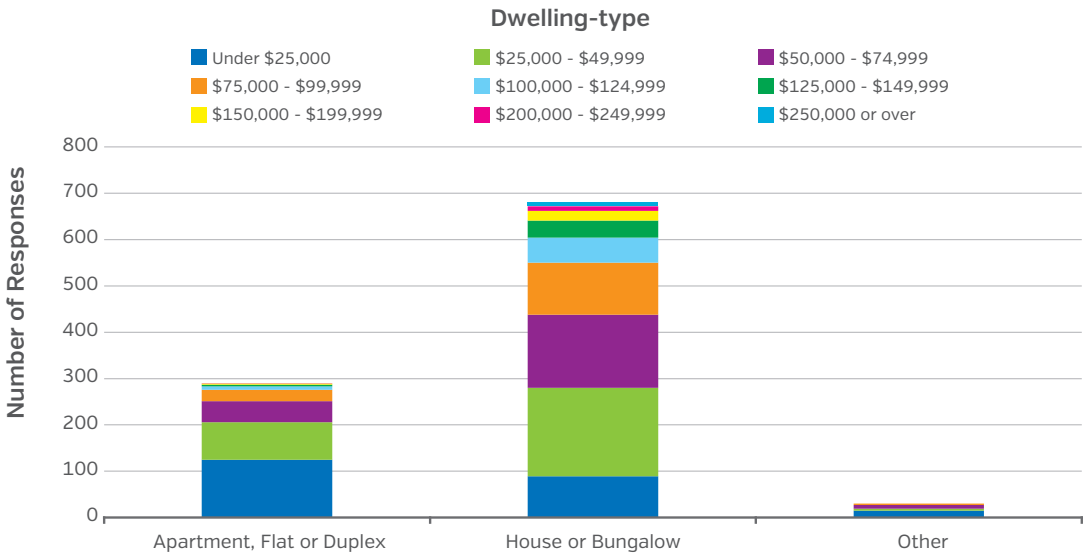
	Apartment, Flat or Duplex	House or Bungalow	Other
Under $25,000	125	89	15
	43%	13%	50%
$25,000 - $49,999	81	191	4
	28%	28%	13%
$50,000 - $74,999	45	158	8
	16%	23%	27%
$75,000 - $99,999	25	112	3
	9%	16%	10%
$100,000 - $124,999	7	54	0
	2%	8%	0%
$125,000 - $149,999	4	37	0
	1%	5%	0%
$150,000 - $199,999	2	21	0
	1%	3%	0%

	Apartment, Flat or Duplex	House or Bungalow	Other
$200,000 - $249,999	1	10	0
	0%	1%	0%
$250,000 or over	0	8	0
	0%	1%	0%
Total (n)	290	680	30

Source: IHS © 2013 IHS

- As you may expect, respondents living in an apartment, flat or duplex were more likely to have lower household incomes than those that lived in houses or bungalows.

Chart AP2.12: Question 1.7 – Household Income



Source: IHS © 2013 IHS

MONTHLY ELECTRICITY SPEND

This section references responses to question "Q1.6 - On average, how much does your household spend on electricity per month?"

Table AP2.19 presents an overview of responses collected from respondents.

Table AP2.19: Question 1.6 – Monthly Electricity Spend
Overview; Number of Respondents

	Number of Respondents
Under $50	117
	11.7%

	Number of Respondents
$50-$99	256
	25.6%
$100-$149	282
	28.2%
$150-$199	137
	13.7%
$200-$299	80
	8.0%
$300-$399	26
	2.6%
Over $400	4
	0.4%
Do not know	98
	9.8%
Total (n)	1,000

Source: IHS © 2013 IHS

- There was little variation in responses between genders.
- As you would expect, those respondents with higher household incomes were more likely to have higher monthly electricity expenditure.

Table AP2.20 and Chart AP2.13 present this information by respondent location.

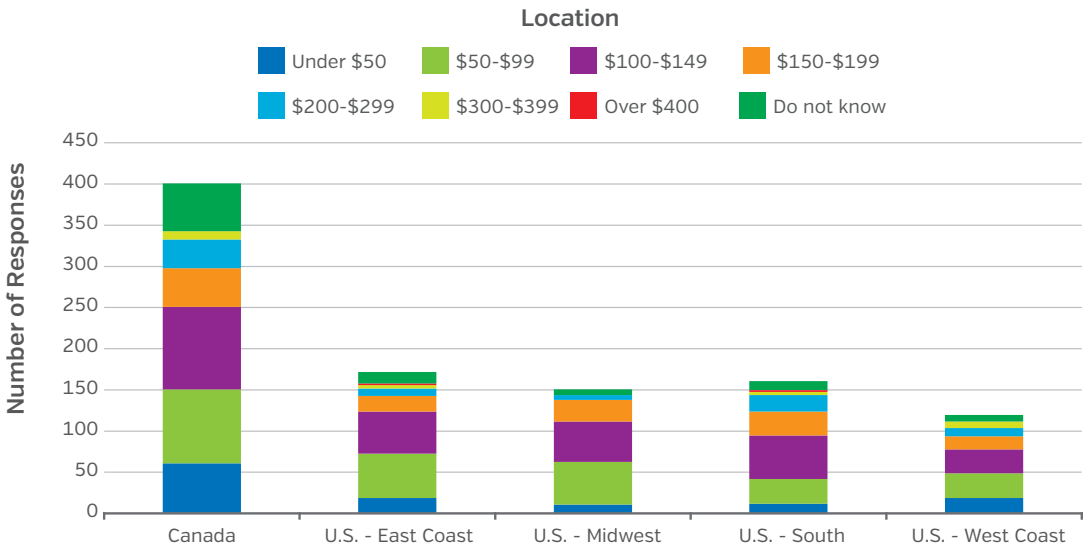
Table AP2.20: Question 1.6 – Monthly Electricity Spend
By Location; Number of Respondents

	Canada	U.S. – East Coast	U.S. – Midwest	U.S. – South	U.S. – West Coast
Under $50	60	18	10	11	18
	15%	11%	7%	7%	15%
$50-$99	90	54	52	30	30
	23%	32%	35%	19%	25%
$100-$149	100	51	49	53	29
	25%	30%	33%	33%	24%
$150-$199	47	19	26	29	16
	12%	11%	17%	18%	13%
$200-$299	35	9	6	20	10
	9%	5%	4%	13%	8%

	Canada	U.S. – East Coast	U.S. – Midwest	U.S. – South	U.S. – West Coast
$300-$399	10	4	0	4	8
	3%	2%	0%	3%	7%
Over $400	0	2	0	2	0
	0%	1%	0%	1%	0%
Do not know	58	14	7	11	8
	15%	8%	5%	7%	7%
Total [n]	400	171	150	160	119

Source: IHS © 2013 IHS

Chart AP2.13: Question 1.6 – Monthly Electricity Spend



Source: IHS © 2013 IHS

Table AP2.21 and Chart AP2.14 show this information by housing tenure.

Table AP2.21: Question 1.6 – Monthly Electricity Spend
By Housing Tenure; Number of Respondents

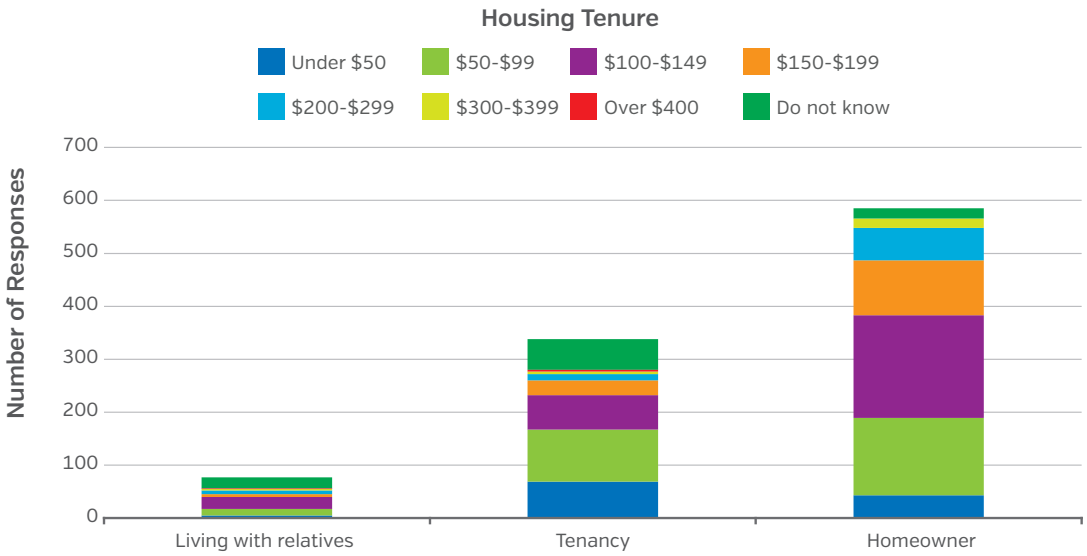
	Living with relatives	Tenancy	Homeowner
Under $50	5	69	43
	6%	20%	7%
$50-$99	12	98	146
	16%	29%	25%
$100-$149	23	65	194
	30%	19%	33%

	Living with relatives	Tenancy	Homeowner
$150-$199	5	28	104
	6%	8%	18%
$200-$299	7	12	61
	9%	4%	10%
$300-$399	3	5	18
	4%	1%	3%
Over $400	1	3	0
	1%	1%	0%
Do not know	21	58	19
	27%	17%	3%
Total (n)	**77**	**338**	**585**

Source: IHS © 2013 IHS

- Generally, homeowners were more likely to have a larger monthly electricity spend than those who were renting their homes.

Chart AP2.14: Question 1.6 – Monthly Electricity Spend



Source: IHS © 2013 IHS

Table AP2.22 and Chart AP2.15 present this information by dwelling-type.

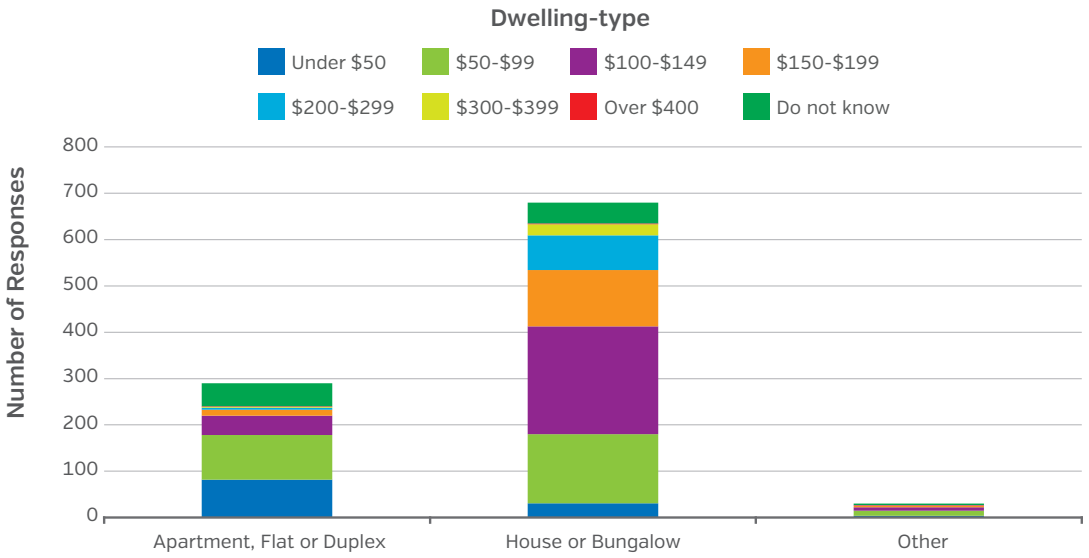
Table AP2.22: Question 1.6 – Monthly Electricity Spend
By Dwelling-type; Number of Respondents

	Apartment, Flat or Duplex	House or Bungalow	Other
Under $50	82	31	4
	28%	5%	13%
$50-$99	96	149	11
	33%	22%	37%
$100-$149	42	233	7
	14%	34%	23%
$150-$199	13	121	3
	4%	18%	10%
$200-$299	4	75	1
	1%	11%	3%
$300-$399	2	24	0
	1%	4%	0%
Over $400	1	2	1
	0%	0%	3%
Do not know	50	45	3
	17%	7%	10%
Total (n)	290	680	30

Source: IHS © 2013 IHS

- Respondents that live in a house or bungalow were more likely to have higher monthly electricity spends than those living in apartments, flats or duplexes.

Chart AP2.15: Question 1.6 – Monthly Electricity Spend



Source: IHS © 2013 IHS

AP2.5 RESPONDENT INDEXING

DECISION MAKING

This section presents an overview of the indexing of respondents based on responses to the question "Q1.8 – Are you the main decision maker, or involved in the process, in these areas?" Areas covered were: the purchase of major home appliances, home improvement, choosing utility and service providers and the selection of a security system.

Respondents selecting "primary decision maker" were scored two, with "share in the decision making" scored one and "another is solely responsible" and "does not apply" scoring zero in each decision-making scenario. Each scenario was granted an equal weighting, giving a maximum score of two and a minimum of zero. Respondents scoring over one were considered "major" decision makers, whilst those between zero and one were considered "minor" and those with zero as "none".

Table AP2.23 presents an overview of the indexing of respondents for decision making.

Table AP2.23: Question 1.8 – Decision Making
Overview; Number of Respondents

	Number of Respondents
Major	412
	41%

	Number of Respondents
Minor	415
	42%
None	173
	17%
Total (n)	1,000

Source: IHS © 2013 IHS

TECHNOLOGY ADOPTION

This section presents an overview of the indexing or respondents based on responses to Question 1.9 which asked respondents to state to what level they agree or disagree with a variety of technology statements. These were:

- "I love to try out new technology and be the first to have new devices"
- "I am comfortable setting up a home network"
- "I want my lights, doors, security system and thermostat to be controllable from a single device"
- "I use technology to improve convenience in my home (e.g., single remote control for multiple devices)"

Respondents were scored, based on their responses to each scenario, in the following way:

- Strongly agree: 2
- Agree: 1
- Neutral: 0
- Disagree: -1
- Strongly disagree: -2

Respondents scoring over one overall were considered "strong positive", while those between zero and one were considered "weak positive". Respondents scoring between zero and minus one were considered "weak negative", those scoring less than minus one were considered "strong negative", whilst those scoring zero were considered "neutral".

Table AP2.24 presents an overview of the indexing of respondents for technology adoption.

Table AP2.24: Question 1.9a – Technology Adoption
Overview; Number of Respondents

	Number of Respondents
Strong Positive	122
	12%
Weak Positive	239
	24%

	Number of Respondents
Neutral	382
	38%
Weak Negative	181
	18%
Strong Negative	76
	8%
Total (n)	1,000

Source: IHS © 2013 IHS

ENERGY EFFICIENCY

This section presents an overview of respondent indexing based on approach to energy efficiency. This is based on answers to Question 1.9, which asked respondents to state to what level they agree or disagree with a variety of energy efficiency statements. These were:

- "I make an effort to reduce my electricity, gas or water consumption"
- "I have improved my home to be more efficient, e.g., fitted better loft installation"
- "I make sure to choose the most energy efficient devices"
- "I own or intend to purchase sustainable devices such as a photovoltaic (solar) system or an electric vehicle"

Respondents were scored, based on their responses to each scenario, in the following way:

- Strongly agree: 2
- Agree: 1
- Neutral: 0
- Disagree: -1
- Strongly disagree: -2

Respondents scoring over one overall were considered "strong positive", while those between zero and one were considered "weak positive". Respondents scoring between zero and minus one were considered "weak negative", those scoring less than minus one were considered "strong negative", whilst those scoring zero were considered "neutral".

Table AP2.25 presents an overview of the indexing of respondents based on their approach to energy efficiency.

Table AP2.25: Question 1.9b – Energy Efficiency
Overview; Number of Respondents

	Number of Respondents
Strong Positive	198
	20%

	Number of Respondents
Weak Positive	370
	37%
Neutral	366
	37%
Weak Negative	50
	5%
Strong Negative	16
	2%
Total (n)	1,000

Source: IHS © 2013 IHS

Due to the sample sizes of respondents in the 'weak negative' and 'strong negative' categories being so low, these are often combined to create a single 'negative' sample to enable cross-analysis.

AP2.6 RESPONDENT DEVICE OR PRODUCT OWNERSHIP

SMART TV

This section presents responses to Question 1.10 "Do you own a Smart TV?"

Table AP2.26 presents an overview of responses to this question.

Table AP2.26: Question 1.10 – Smart TV
Overview; Number of Respondents

	Number of Respondents
Non-owners	767
	77%
Owners	233
	23%
Total (n)	1,000

Source: IHS © 2013 IHS

- The vast majority of respondents suggested they did not own a Smart TV.
- There was little variation in responses between location, age category and gender.

Table AP2.27 and Chart AP2.16 present this information by household income level.

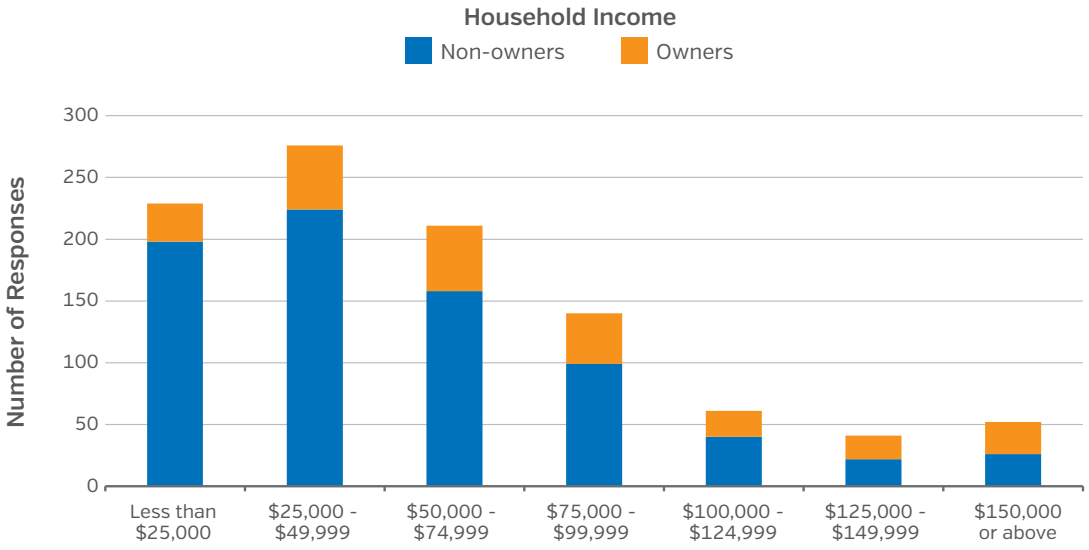
Table AP2.27: Question 1.10 – Smart TV
By Household Income Level; Number of Respondents

	Under $25,000	$25,000 - $49,999	$50,000 - $74,999	$75,000 - $99,999	$100,000 - $124,999	$125,000 - $149,999	$150,000 or over
Non-owners	198	224	158	99	40	22	26
	86%	81%	75%	71%	66%	54%	50%
Owners	31	52	53	41	21	19	26
	14%	19%	25%	29%	34%	46%	50%
Total (n)	**229**	**276**	**211**	**140**	**61**	**41**	**52**

Source: IHS © 2013 IHS

- As you might expect, the proportion of respondents owning a Smart TV generally increased with higher household income.

Chart AP2.16: Question 1.10 – Smart TV



Source: IHS © 2013 IHS

VEHICLE-TYPE

This section presents responses to Question 1.11 "Do you currently own an electric or hybrid electric vehicle?"

Table AP2.28

Table AP2.28: Question 1.11 – Vehicle-type
Overview; Number of Respondents

	Number of Respondents
Electric	21
	2%
Hybrid	52
	5%
Neither	920
	92%
Both Electric and Hybrid	7
	1%
Total (n)	1,000

Source: IHS © 2013 IHS

- With hybrid or electric vehicles often costlier than traditional vehicles, and with a much less established second-hand market, it would be expected that the majority of respondents owned neither hybrid nor an electric vehicle. Indeed, analyzing responses by household income level confirm that respondents with lower household income levels were less inclined to have purchased an electric or hybrid vehicle.
- There was little variation in responses by gender.

Table AP2.29 and Chart AP2.17 present this information by respondent location.

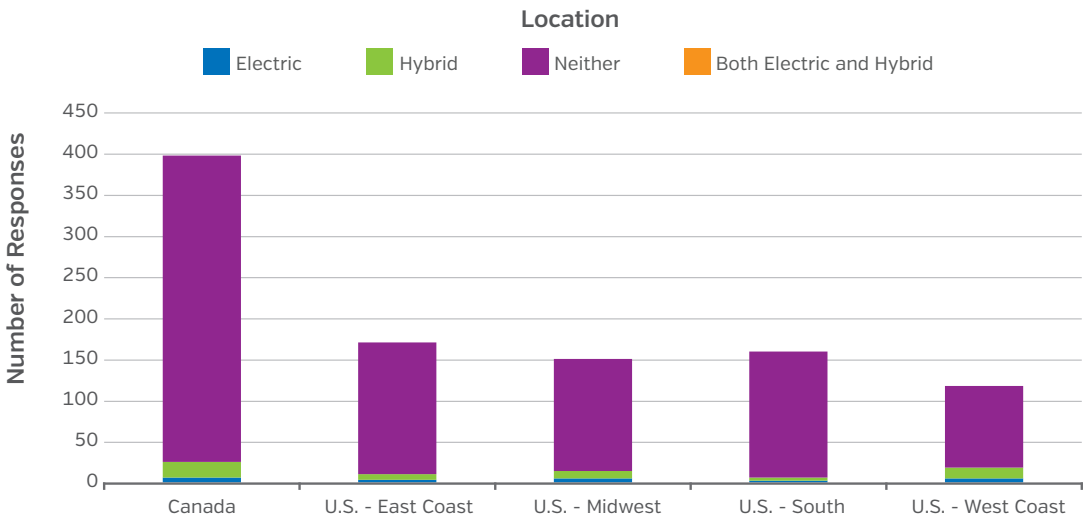
Table AP2.29: Question 1.11 – Vehicle-type
By Location; Number of Respondents

	Canada	U.S. – East Coast	U.S. – Midwest	U.S. – South	U.S. – West Coast
Electric	6	3	5	2	5
	2%	2%	3%	1%	4%
Hybrid	19	7	9	4	13
	5%	4%	6%	3%	11%
Neither	372	160	136	153	99
	93%	94%	91%	96%	83%
Both Electric and Hybrid	3	1	0	1	2
	1%	1%	0%	1%	2%
Total (n)	400	171	150	160	119

Source: IHS © 2013 IHS

- Respondents in the West Coast region of the United States were more likely to own a hybrid or electric vehicle. This may suggest a greater focus on sustainability in this region, which may have implications on the type of connected home services desired (i.e., perhaps a focus on energy efficiency). When looking at respondents' attitude to energy efficiency, the West Coast region had the second largest proportion of respondents with a positive attitude.

Chart AP2.17: Question 1.11 – Vehicle-type



Source: IHS © 2013 IHS

Table AP2.30 and Chart AP2.18 present this information by age category.

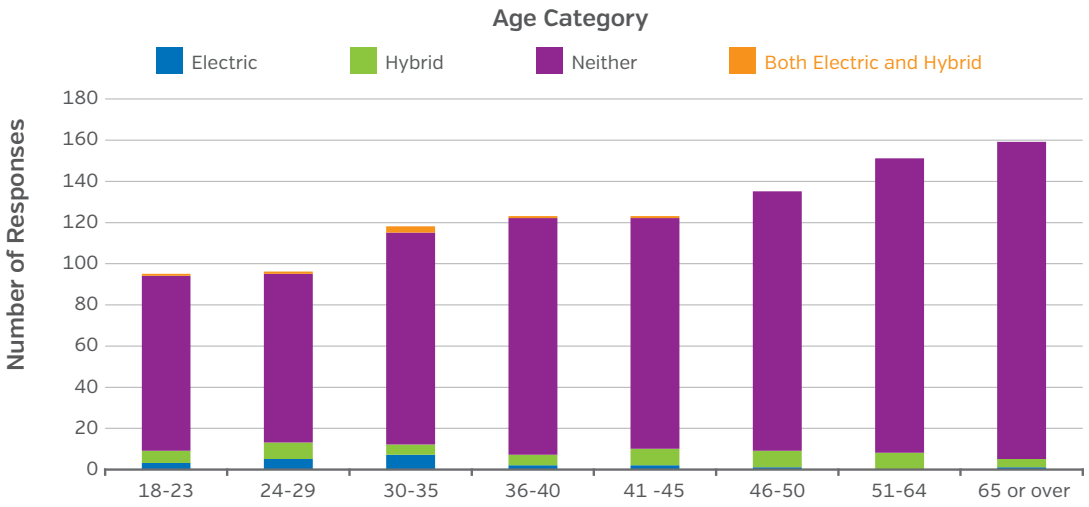
Table AP2.30: Question 1.11 – Vehicle-type
By Age; Number of Respondents

	18-23	24-29	30-35	36-40	41 -45	46-50	51-64	65 or over
Electric	3	5	7	2	2	1	0	1
	3%	5%	6%	2%	2%	1%	0%	1%
Hybrid	6	8	5	5	8	8	8	4
	6%	8%	4%	4%	7%	6%	5%	3%
Neither	85	82	103	115	112	126	143	154
	89%	85%	87%	93%	91%	93%	95%	97%
Both Electric and Hybrid	1	1	3	1	1	0	0	0
	1%	1%	3%	1%	1%	0%	0%	0%
Total (n)	**95**	**96**	**118**	**123**	**123**	**135**	**151**	**159**

Source: IHS © 2013 IHS

- Younger age categories were slightly more likely to have purchased an electric or hybrid vehicle.

Chart AP2.18: Question 1.11 – Vehicle-type



Source: IHS © 2013 IHS

Table AP2.31 and Chart AP1.19 present this information by housing tenure.

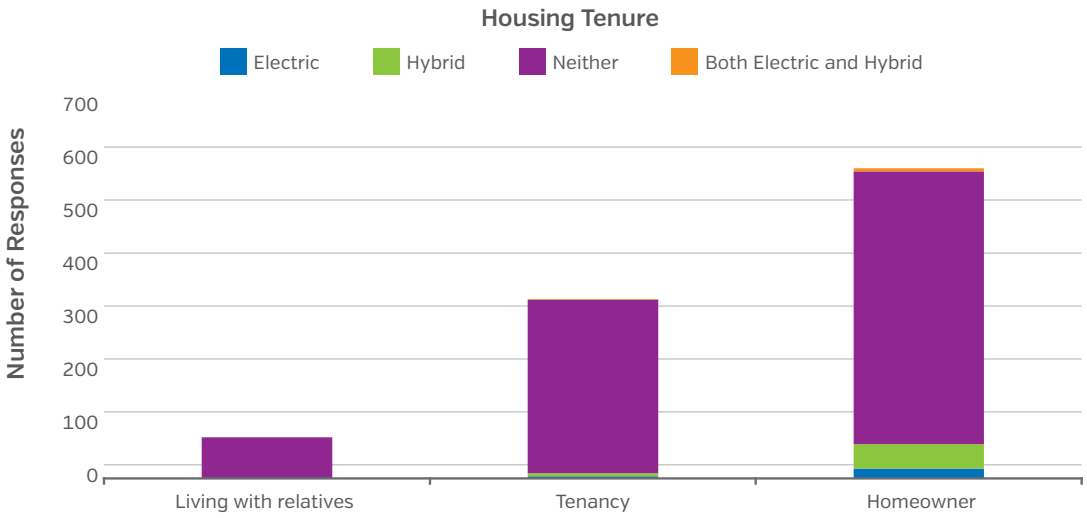
Table AP2.31: Question 1.11 – Vehicle-type
By Housing Tenure; Number of Respondents

	Living with relatives	Tenancy	Homeowner
Electric	0	3	18
	0%	1%	3%
Hybrid	0	6	46
	0%	2%	8%
Neither	77	328	515
	100%	97%	88%
Both Electric and Hybrid	0	1	6
	0%	0%	1%
Total (n)	77	338	585

Source: IHS © 2013 IHS

- Homeowners, typically with higher household income levels, were most likely to own an electric or hybrid vehicle.

Chart AP2.19: Question 1.11 – Vehicle-type



Source: IHS © 2013 IHS

PHOTOVOLTAIC SYSTEM

This section presents responses to Question 1.12 "Do you currently own a photovoltaic system?"

Table AP2.32 presents an overview of responses to this question.

Table AP2.32: Question 1.12 – Photovoltaic System
Overview; Number of Respondents

	Number of Respondents
Non-owners	965
	97%
Owners	35
	4%
Total (n)	1,000

Source: IHS © 2013 IHS

- Such a small number of respondents stated they owned a photovoltaic system, which makes further analysis of limited value.
- However, the West Coast region of the United States had the greatest proportion of respondents with these systems, and, inevitably, homeowners were most likely to own these type of systems.

POOL PUMP

This section presents responses to Question 1.13 "Do you own a pool which uses a pool pump?"

Table AP2.33 presents an overview of responses to this question.

Table AP2.33: Question 1.13 – Pool Pump
Overview; Number of Respondents

	Number of Respondents
Non-owners	899
	90%
Owners	101
	10%
Total (n)	1,000

Source: IHS © 2013 IHS

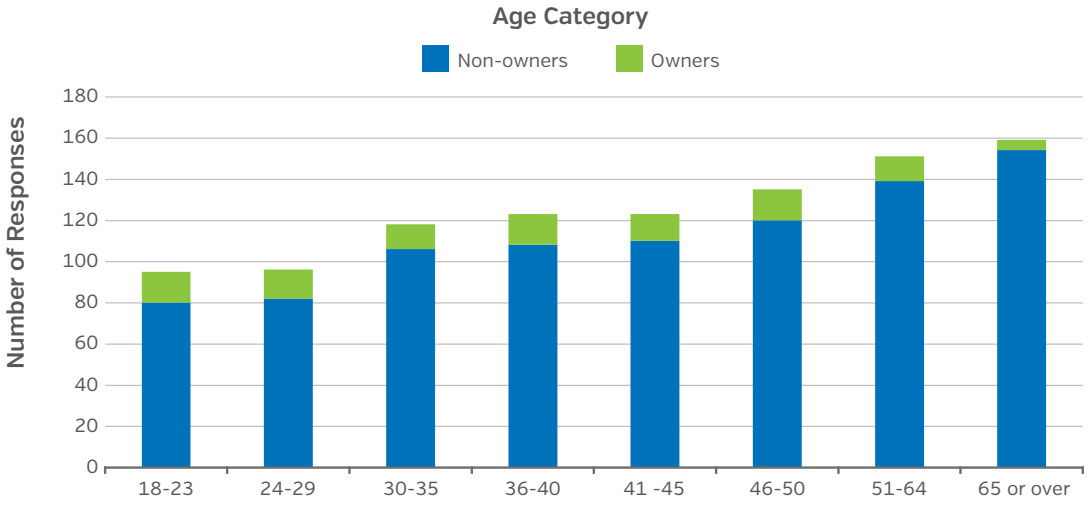
Table AP2.34 and Chart AP2.20 present this information by age category.

Table AP2.34: Question 1.13 – Pool Pump
By Age; Number of Respondents

	18-23	24-29	30-35	36-40	41 -45	46-50	51-64	65 or over
Non-owners	80	82	106	108	110	120	139	154
	84%	85%	90%	88%	89%	89%	92%	97%
Owners	15	14	12	15	13	15	12	5
	16%	15%	10%	12%	11%	11%	8%	3%
Total (n)	95	96	118	123	123	135	151	159

Source: IHS © 2013 IHS

Chart AP2.20: Question 1.13 – Pool Pump



Source: IHS © 2013 IHS

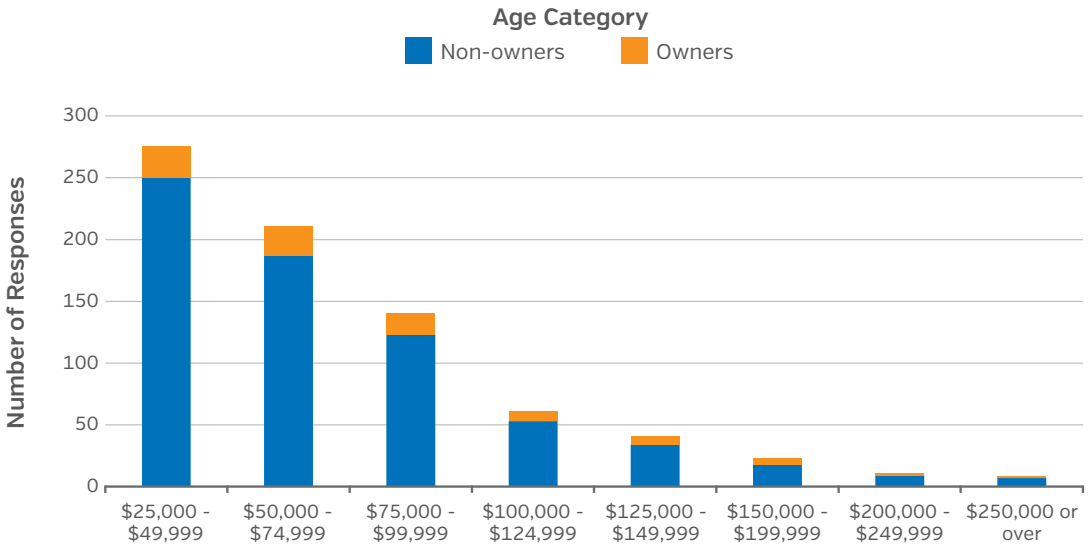
Table AP2.35 and Chart AP2.21 present this information by household income level.

Table AP2.35: Question 1.13 – Pool Pump
By Household Income Level; Number of Respondents

	Under $25,000	$25,000 - $49,999	$50,000 - $74,999	$75,000 - $99,999	$100,000 - $124,999	$125,000 - $149,999	$150,000 - $199,999	$200,000 - $249,999	$250,000 or over
Non-owners	218	250	187	123	53	34	18	9	7
	95%	91%	89%	88%	87%	83%	78%	82%	88%
Owners	11	26	24	17	8	7	5	2	1
	5%	9%	11%	12%	13%	17%	22%	18%	13%
Total (n)	229	276	211	140	61	41	23	11	8

Source: IHS © 2013 IHS

Chart AP2.21: Question 1.13 – Pool Pump



Source: IHS © 2013 IHS

SECURITY SYSTEM

This section presents responses to Question 1.14 "Does your home have a security system, such as an intruder alarm?"

Table AP2.36 presents an overview of responses to this question.

Table AP2.36: Question 1.14 – Security System
Overview; Number of Respondents

	Number of Respondents
Not present	746
	75%
Present	254
	25%
Total (n)	1,000

Source: IHS © 2013 IHS

- There was little variation in responses between location and age. Homeowners were more likely to have a security system than non-homeowners, and male respondents were more likely to have a security system than female respondents.

Table AP2.37 and Chart AP2.22 present this information by dwelling-type.

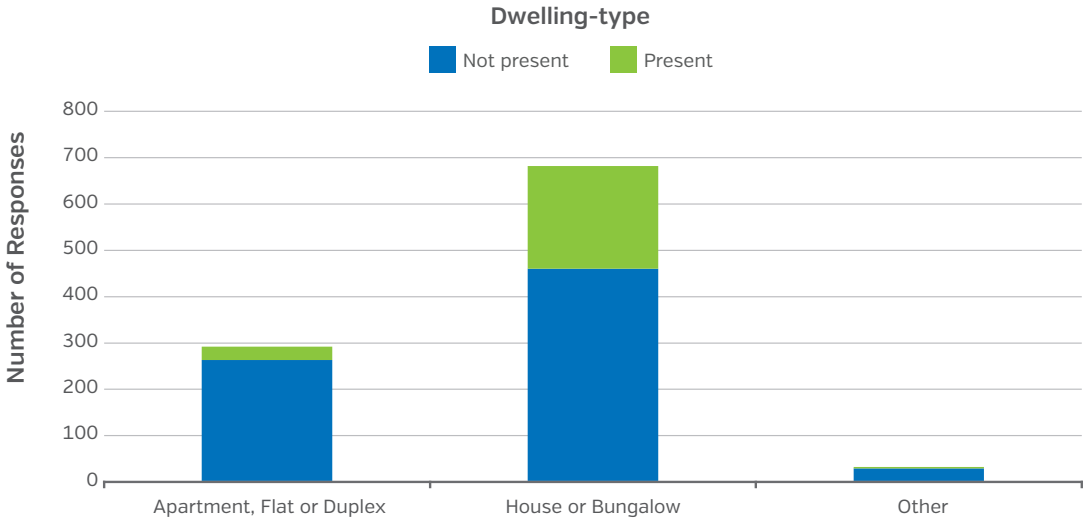
Table AP2.37: Question 1.14 – Security System
By Dwelling-type; Number of Respondents

	Apartment, Flat or Duplex	House or Bungalow	Other
Not present	261	458	27
	90%	67%	90%
Present	29	222	3
	10%	33%	10%
Total (n)	290	680	30

Source: IHS © 2013 IHS

- Security systems were more common in respondents that lived in houses or bungalows than those living in apartments, flats or duplexes.

Chart AP2.22: Question 1.14 – Secutiry System



Source: IHS © 2013 IHS

Table AP2.38 and ChartAP2.23 present this information by household income level.

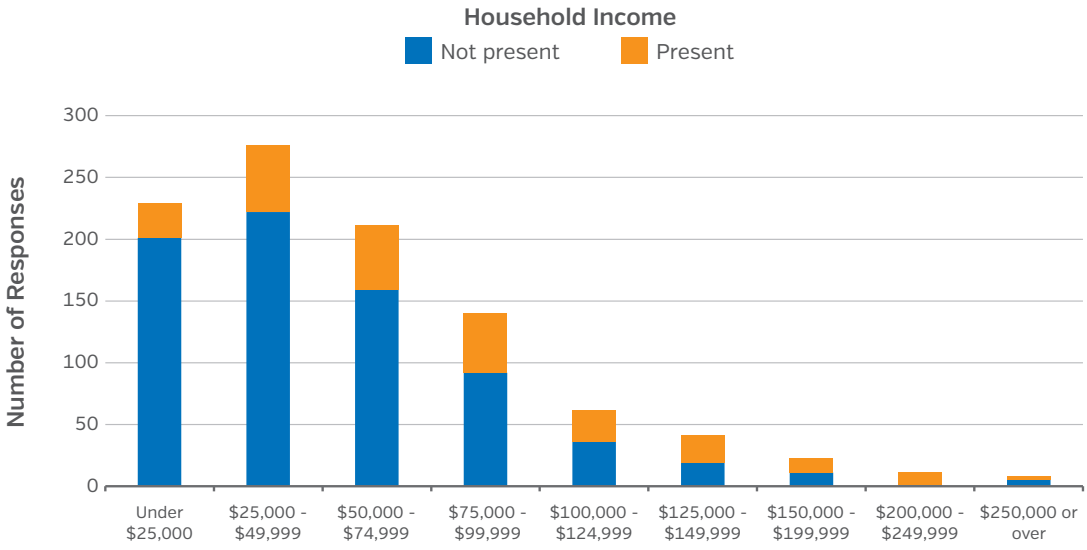
Table AP2.38: Question 1.14 – Security System
By Household Income Level; Number of Respondents

	Under $25,000	$25,000 - $49,999	$50,000 - $74,999	$75,000 - $99,999	$100,000 - $124,999	$125,000 - $149,999	$150,000 - $199,999	$200,000 - $249,999	$250,000 or over
Not present	201	222	159	92	36	19	11	1	5
	88%	80%	75%	66%	59%	46%	48%	9%	63%
Present	28	54	52	48	25	22	12	10	3
	12%	20%	25%	34%	41%	54%	52%	91%	38%
Total (n)	229	276	211	140	61	41	23	11	8

Source: IHS © 2013 IHS

- As expected, the likelihood of owning a security system increased alongside household income levels.

Chart AP2.23: Question 1.14 – Security System



Source: IHS © 2013 IHS

SYSTEM DESCRIPTION

This section presents responses to Question 1.15 "Which best describes your security system?" which analysis the notification-type offered by the system. This was asked only of respondents that had previously stated they owned a security system.

Options were:

- Alarm – "if triggered, the security system has a loud alarm but doesn't automatically notify anyone"
- Professional – "the system automatically notifies a professional management company or police when the alarm is triggered"
- Personal – "the system automatically notifies me, a friend or a relative directly when the alarm is triggered"
- Personal and Professional – "the system automatically notifies both me (or a friend or relative) and a professional security company or police when the alarm is triggered"

Table AP2.39 presents an overview of responses to this question.

Table AP2.39: Question 1.15 – Security System Description
Overview; Number of Respondents

	Number of Respondents
Alarm Only	43
	17%
Alarm & Professional	102
	40%
Alarm, Personal & Professional	84
	33%
Alarm & Personal	25
	10%
Total (n)	254

Source: IHS © 2013 IHS

- There was little variation in responses between location, age, dwelling-type or household income level.

Table AP2.40 and Chart AP2.24 present this information by gender.

Table AP2.40: Question 1.15 – Security System Description
By Gender; Number of Respondents

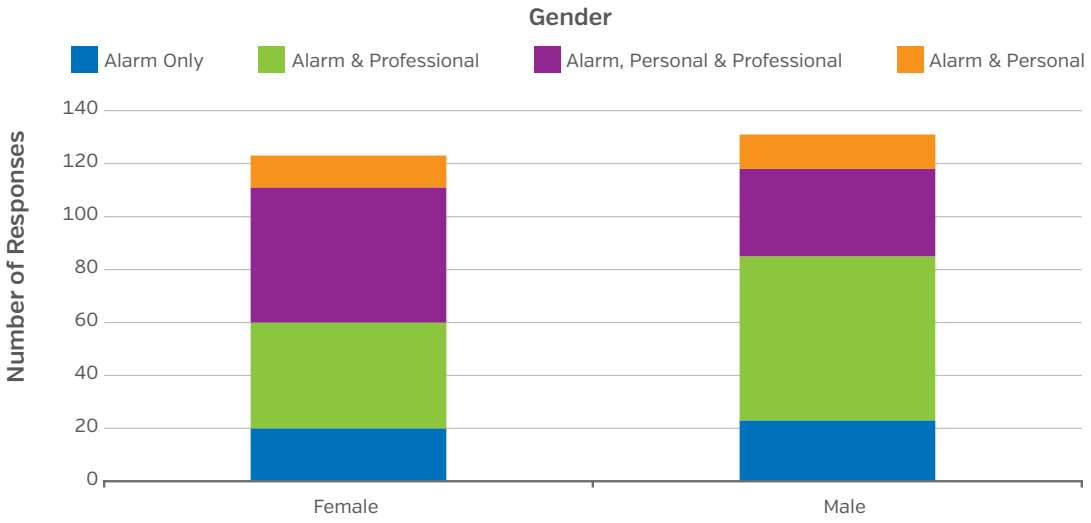
	Female	Male
Alarm Only	20	23
	16%	18%
Alarm & Professional	40	62
	33%	47%

	Female	Male
Alarm, Personal & Professional	51	33
	41%	25%
Alarm & Personal	12	13
	10%	10%
Total (n)	123	131

Source: IHS © 2013 IHS

- Interestingly, female respondents were more likely to have had a system that informs family or friends of a security alert, with 51% of female responses indicating this was the system they had. This compared to just 35% of male responses.

Chart AP2.24: Question 1.15 – Security System Description



Source: IHS © 2013 IHS

APPENDIX 3
ADDITIONAL END-USER SURVEY ANALYSIS

AP3.0 INTRODUCTION

This appendix presents additional tables and figures related to section 4 of the consumer survey designed as part of the research project conducted by IHS for the Continental Automated Building Association (CABA).

AP3.1 RETURN ON DEVICE INVESTMENT VIA ENERGY SAVING

Table AP3.1: Return on Investment via Energy Saving
By Location

	Canada	U.S. – East Coast	U.S. – Midwest	U.S. – South	U.S. – West Coast
Under 1 year	64	15	21	22	12
	26%	18%	29%	26%	18%
1-2 years	73	26	22	33	24
	29%	31%	30%	38%	37%
2-5 years	57	20	20	22	21
	23%	24%	27%	26%	32%
5-10 years	10	5	4	0	4
	4%	6%	5%	0%	6%
Over 10 years	3	6	1	1	0
	1%	7%	1%	1%	0%
Not concerned with the pay-back	43	11	5	8	4
	17%	13%	7%	9%	6%
Total (n)	250	83	73	86	65

Source: IHS © 2013 IHS

Table AP3.2: Return on Investment via Energy Saving
By Age

	18-23	24-29	30-35	36-40	41 -45	46-50	51-64	65 or over
Under 1 year	18	14	21	18	25	18	15	5
	29%	22%	28%	25%	29%	24%	21%	9%
1-2 years	16	25	22	21	20	24	30	20
	25%	40%	29%	30%	24%	32%	42%	38%
2-5 years	15	16	18	18	22	19	15	17
	24%	25%	24%	25%	26%	25%	21%	32%
5-10 years	2	2	3	1	8	3	2	2
	3%	3%	4%	1%	9%	4%	3%	4%
Over 10 years	1	0	2	3	1	1	2	1
	2%	0%	3%	4%	1%	1%	3%	2%
Not concerned with the pay-back	11	6	9	10	9	11	7	8
	17%	10%	12%	14%	11%	14%	10%	15%
Total (n)	63	63	75	71	85	76	71	53

Source: IHS © 2013 IHS

Table AP3.3: Return on Investment via Energy Saving
By Gender

	Female	Male
Under 1 year	99	35
	32%	14%
1-2 years	99	79
	32%	32%
2-5 years	61	79
	20%	32%
5-10 years	9	14
	3%	6%
Over 10 years	7	4
	2%	2%
Not concerned with the pay-back	32	39
	10%	16%
Total (n)	307	250

Source: IHS © 2013 IHS

Table AP3.4: Return on Investment via Energy Saving
By Housing Tenure

	Living with Relatives	Renting a property	Living in own property
Under 1 year	7	26	71
	18%	18%	21%
1-2 years	10	56	112
	26%	38%	33%
2-5 years	8	32	100
	21%	22%	29%
5-10 years	0	5	18
	0%	3%	5%
Over 10 years	12	26	33
	32%	18%	10%
Not concerned with the pay-back	1	1	9
	3%	1%	3%
Total (n)	38	146	343

Source: IHS © 2013 IHS

Table AP3.5: Return on Investment via Energy Saving
By Monthly Electricity Expenditure

	Under $50	$50- $99	$100-$149	$150-$199	$200 and over	I don't know
Under 1 year	11	22	47	23	18	13
	22%	17%	25%	28%	22%	30%
1-2 years	15	47	64	22	17	13
	31%	37%	35%	27%	21%	30%
2-5 years	10	35	39	30	19	7
	20%	28%	21%	36%	19%	16%
5-10 years	2	2	10	2	6	1
	4%	2%	5%	2%	10%	2%
Over 10 years	1	3	2	1	3	1
	2%	2%	1%	1%	5%	2%
Not concerned with the pay-back	10	18	23	5	6	9
	20%	14%	12%	6%	23%	20%
Total (n)	49	127	185	83	69	44

Source: IHS © 2013 IHS

Table AP3.6: Return on Investment via Energy Saving
By Annual Household Income

	Under $25,000	$25,000 - $49,999	$50,000 - $74,999	$75,000 - $99,999	$100,000 or over
Under 1 year	29	39	38	15	13
	28%	27%	30%	17%	13%
1-2 years	34	51	32	26	35
	33%	35%	26%	30%	33%
2-5 years	16	32	27	32	33
	16%	22%	22%	37%	28%
5-10 years	3	6	8	4	2
	3%	4%	6%	5%	3%
Over 10 years	3	2	2	1	3
	3%	1%	2%	1%	4%
Not concerned with the pay-back	17	16	18	8	12
	17%	11%	14%	9%	19%
Total (n)	102	146	125	86	144

Source: IHS © 2013 IHS

Table AP3.7: Return on Investment via Energy Saving
By Decision Making Index

	Major Decision Making Role	Minor Decision Making Role	No Decision Making Role
Under 1 year	58	57	19
	23%	25%	26%
1-2 years	84	76	18
	33%	33%	25%
2-5 years	72	55	13
	28%	24%	18%
5-10 years	9	12	2
	4%	5%	3%
Over 10 years	8	1	2
	3%	0%	3%
Not concerned with the pay-back	23	29	19
	9%	13%	26%
Total (n)	254	230	73

Source: IHS © 2013 IHS

Table AP3.8: Return on Investment via Energy Saving
By Technology Adoption Index

	Strong Positive	Weak Positive	Positive	Neutral	Weak Negative	Negative
Under 1 year	32	45	62	48	24	24
	26%	19%	22%	24%	16%	31%
1-2 years	34	63	86	71	21	21
	28%	26%	31%	35%	14%	27%
2-5 years	34	59	85	41	14	14
	28%	25%	31%	20%	9%	18%
5-10 years	7	12	12	8	7	3
	6%	5%	4%	4%	5%	4%
Over 10 years	3	4	3	4	12	4
	2%	2%	1%	2%	8%	5%
Not concerned with the pay-back	12	56	30	29	72	12
	10%	23%	11%	14%	48%	15%
Total (n)	**122**	**239**	**278**	**201**	**150**	**78**

Source: IHS © 2013 IHS

Table AP3.9: Return on Investment via Energy Saving
By Energy Efficiency Index

	Strong Positive	Weak Positive	Positive	Neutral	Weak Negative	Negative
Under 1 year	70	3	85	43	6	6
	19%	19%	23%	25%	13%	40%
1-2 years	76	1	125	51	4	2
	21%	6%	34%	30%	8%	13%
2-5 years	52	0	105	34	1	1
	14%	0%	28%	20%	2%	7%
5-10 years	23	0	13	10	1	0
	6%	0%	3%	6%	2%	0%
Over 10 years	15	2	6	5	2	0
	4%	13%	2%	3%	4%	0%
Not concerned with the pay-back	130	10	39	26	34	6
	36%	63%	10%	15%	71%	40%
Total (n)	**366**	**16**	**373**	**169**	**48**	**15**

Source: IHS © 2013 IHS

Table AP3.10: Return on Investment via Energy Saving
Cross-Question Analysis: Remote HVAC Control

	Strong Positive	Weak Positive	Would like to control AC / thermostat remotely	Would not like to control AC/ thermostat remotely
Under 1 year	70	3	59	75
	19%	19%	24%	24%
1-2 years	76	1	80	98
	21%	6%	32%	32%
2-5 years	52	0	56	84
	14%	0%	22%	27%
5-10 years	23	0	11	12
	6%	0%	4%	4%
Over 10 years	15	2	8	3
	4%	13%	3%	1%
Not concerned with the pay-back	130	10	36	35
	36%	63%	14%	11%
Total (n)	366	16	250	307

Source: IHS © 2013 IHS

AP3.2 SCENARIO CREATION

Table AP3.11: Scenario One - Use of GPS in Car or Smartphone
By Location

	Canada	U.S. – East Coast	U.S. – Midwest	U.S. – South	U.S. – West Coast
Very Valuable	60	28	21	29	21
	24%	34%	29%	34%	32%
Moderately Valuable	93	31	29	31	22
	37%	37%	40%	36%	34%
Neutral	60	16	14	18	13
	24%	19%	19%	21%	20%
Not of Value	37	8	9	8	9
	15%	10%	12%	9%	14%
Total (n)	250	83	73	86	65

Source: IHS © 2013 IHS

Table AP3.12: Scenario One - Use of GPS in Car or Smartphone
By Security System Ownership

	Owns a Security System	Does Not Own a Security System
Very Valuable	87	72
	24%	37%
Moderately Valuable	135	71
	37%	37%
Neutral	89	32
	25%	16%
Not of Value	52	19
	14%	10%
Total (n)	**363**	**194**

Source: IHS © 2013 IHS

Table AP3.13: Scenario Two - Security System as Trigger for Lights and Heating/Cooling
By Housing Tenure

	Living with Relatives	Renting a Property	Living in Own Property
Very Valuable	17	86	144
	45%	49%	42%
Moderately Valuable	11	56	134
	29%	32%	39%
Neutral	7	26	52
	18%	15%	15%
Not of Value	3	8	13
	8%	5%	4%
Total (n)	**38**	**176**	**343**

Source: IHS © 2013 IHS

Table AP3.14: Scenario Two - Security System as Trigger for Lights and Heating/Cooling
By Security System Ownership

	Owns a Security System	Does Not Own a Security System
Very Valuable	145	102
	40%	53%
Moderately Valuable	137	64
	38%	33%

	Owns a Security System	Does Not Own a Security System
Neutral	60	25
	17%	13%
Not of Value	21	3
	6%	2%
Total (n)	363	194

Source: IHS © 2013 IHS

Table AP3.15: Scenario Three - Media as Trigger for Device Automation
By Location

	Canada	U.S. – East Coast	U.S. – Midwest	U.S. – South	U.S. – West Coast
Very Valuable	41	19	8	16	13
	16%	23%	11%	19%	20%
Moderately Valuable	85	22	23	30	23
	34%	27%	32%	35%	35%
Neutral	75	24	28	19	17
	30%	29%	38%	22%	26%
Not of Value	49	18	14	21	12
	20%	22%	19%	24%	18%
Total (n)	250	83	73	86	65

Source: IHS © 2013 IHS

Table AP3.16: Scenario Three - Media as Trigger for Device Automation
By Housing Tenure

	Living with Relatives	Renting a Property	Living in Own Property
Very Valuable	3	46	48
	8%	26%	14%
Moderately Valuable	15	57	111
	39%	32%	32%
Neutral	9	46	108
	24%	26%	31%
Not of Value	11	27	76
	29%	15%	22%
Total (n)	38	176	343

Source: IHS © 2013 IHS

Table AP3.17: Scenario Four - Automatic Reaction of Devices to Climate
By Location

	Canada	U.S. – East Coast	U.S. – Midwest	U.S. – South	U.S. – West Coast
Very Valuable	82	26	24	29	25
	33%	31%	33%	34%	38%
Moderately Valuable	108	32	25	31	27
	43%	39%	34%	36%	42%
Neutral	44	20	17	18	10
	18%	24%	23%	21%	15%
Not of Value	16	5	7	8	3
	6%	6%	10%	9%	5%
Total (n)	250	83	73	86	65

Source: IHS © 2013 IHS

Table AP3.18: Scenario Four - Automatic Reaction of Devices to Climate
By Housing Tenure

	Living with Relatives	Renting a Property	Living in Own Property
Very Valuable	11	63	112
	29%	36%	33%
Moderately Valuable	13	74	136
	34%	42%	40%
Neutral	10	30	69
	26%	17%	20%
Not of Value	4	9	26
	11%	5%	8%
Total (n)	38	176	343

Source: IHS © 2013 IHS

Table AP3.19: Scenario Five - Automatic Reaction of Devices to Online Information
By Location

	Canada	U.S. – East Coast	U.S. – Midwest	U.S. – South	U.S. – West Coast
Very Valuable	80	29	24	30	21
	32%	35%	33%	35%	32%
Moderately Valuable	102	30	31	40	27
	41%	36%	42%	47%	42%

	Canada	U.S. – East Coast	U.S. – Midwest	U.S. – South	U.S. – West Coast
Neutral	46	18	12	13	13
	18%	22%	16%	15%	20%
Not of Value	22	6	6	3	4
	9%	7%	8%	3%	6%
Total (n)	250	83	73	86	65

Source: IHS © 2013 IHS

Table AP3.20: Scenario Six - Automation of Today's Manual Processes
By Location

	Canada	U.S. – East Coast	U.S. – Midwest	U.S. – South	U.S. – West Coast
Very Valuable	48	24	12	21	18
	19%	29%	16%	24%	28%
Moderately Valuable	102	24	31	26	28
	41%	29%	42%	30%	43%
Neutral	68	21	16	25	14
	27%	25%	22%	29%	22%
Not of Value	32	14	14	14	5
	13%	17%	19%	16%	8%
Total (n)	250	83	73	86	65

Source: IHS © 2013 IHS

AP3.3 VOICE ACTIVATION

Table AP3.21: Consumer Attitudes to Voice Activation
By Location

	Canada	U.S. – East Coast	U.S. – Midwest	U.S. – South	U.S. – West Coast
Very Valuable	49	18	13	20	12
	20%	22%	18%	23%	18%
Moderately Valuable	105	35	36	43	34
	42%	42%	49%	50%	52%
Neutral	73	18	19	17	14
	29%	22%	26%	20%	22%
Not of Value	23	12	5	6	5
	9%	14%	7%	7%	8%
Total (n)	250	83	73	86	65

Source: IHS © 2013 IHS

Table AP3.22: Consumer Attitudes to Voice Activation
By Gender

	Female	Male
Very Valuable	67	45
	22%	18%
Moderately Valuable	141	112
	46%	45%
Neutral	70	71
	23%	28%
Not of Value	29	22
	9%	9%
Total (n)	307	250

Source: IHS © 2013 IHS

Table AP3.23: Consumer Attitudes to Voice Activation
By Housing Tenure

	Living with Relatives	Renting a Property	Living in Own Property
Very Valuable	4	39	69
	11%	22%	20%
Moderately Valuable	19	81	153
	50%	46%	45%
Neutral	11	42	88
	29%	24%	26%
Not of Value	4	14	33
	11%	8%	10%
Total (n)	38	176	343

Source: IHS © 2013 IHS

AP3.4 REMOTE DIAGNOSTICS

Table AP3.24: Consumer Attitudes to Pre-Emption of Device Repairs
By Location

	Canada	U.S. – East Coast	U.S. – Midwest	U.S. – South	U.S. – West Coast
Very Valuable	75	26	21	29	27
	30%	31%	29%	34%	42%
Moderately Valuable	112	40	45	41	30

	Canada	U.S. – East Coast	U.S. – Midwest	U.S. – South	U.S. – West Coast
	45%	48%	62%	48%	46%
Neutral	53	15	7	14	8
	21%	18%	10%	16%	12%
Not of Value	10	2	0	2	0
	4%	2%	0%	2%	0%
Total (n)	250	83	73	86	65

Source: IHS © 2013 IHS

Table AP3.25: Consumer Attitudes to Pre-Emption of Device Repairs
By Gender

	Female	Male
Very Valuable	99	79
	32%	32%
Moderately Valuable	146	122
	48%	49%
Neutral	53	44
	17%	18%
Not of Value	9	5
	3%	2%
Total (n)	307	250

Source: IHS © 2013 IHS

Table AP3.26: Consumer Attitudes to Pre-Emption of Device Repairs
By Housing Tenure

	Living with Relatives	Renting a Property	Living in Own Property
Very Valuable	9	64	105
	24%	36%	31%
Moderately Valuable	14	82	172
	37%	47%	50%
Neutral	14	26	57
	37%	15%	17%
Not of Value	1	4	9
	3%	2%	3%
Total (n)	38	176	343

Source: IHS © 2013 IHS

AP3.5 REMOTE SOFTWARE UPGRADES

Table AP3.27: Consumer Attitudes to Remote Software Upgrades
By Location

	Canada	U.S. – East Coast	U.S. – Midwest	U.S. – South	U.S. – West Coast
Very Valuable	72	26	18	27	22
	29%	31%	25%	31%	34%
Moderately Valuable	126	41	34	38	30
	50%	49%	47%	44%	46%
Neutral	38	12	20	17	10
	15%	14%	27%	20%	15%
Not of Value	14	4	1	4	3
	6%	5%	1%	5%	5%
Total (n)	250	83	73	86	65

Source: IHS © 2013 IHS

Table AP3.28: Consumer Attitudes to Remote Software Upgrades
By Age

	18-23	24-29	30-35	36-40	41 -45	46-50	51-64	65 or over
Very Valuable	19	18	25	21	27	18	21	16
	30%	29%	33%	30%	32%	24%	30%	30%
Moderately Valuable	30	31	36	34	44	37	33	24
	48%	49%	48%	48%	52%	49%	46%	45%
Neutral	12	13	14	16	7	15	13	7
	19%	21%	19%	23%	8%	20%	18%	13%
Not of Value	2	1	0	0	7	6	4	6
	3%	2%	0%	0%	8%	8%	6%	11%
Total (n)	63	63	75	71	85	76	71	53

Source: IHS © 2013 IHS

Table AP3.29: Consumer Attitudes to Remote Software Upgrades
By Gender

	Female	Male
Very Valuable	88	77
	53%	47%
Moderately Valuable	138	131
	51%	49%
Neutral	64	33
	66%	34%
Not of Value	17	9
	65%	35%
Total (n)	307	250

Source: IHS © 2013 IHS

Table AP3.30: Consumer Attitudes to Remote Software Upgrades
By Housing Tenure

	Living with Relatives	Renting a Property	Living in Own Property
Very Valuable	8	54	103
	21%	31%	30%
Moderately Valuable	15	88	166
	39%	50%	48%
Neutral	10	29	58
	26%	16%	17%
Not of Value	5	5	16
	13%	3%	5%
Total (n)	38	176	343

Source: IHS © 2013 IHS

Table AP3.31: Consumer Attitudes to Remote Software Upgrades
By Annual Household Income

	Under $25,000	$25,000 - $49,999	$50,000 - $74,999	$75,000 - $99,999	$100,000 or over
Very Valuable	26	47	43	19	30
	25%	32%	34%	22%	21%
Moderately Valuable	47	66	56	50	50
	46%	45%	45%	58%	35%

	Under $25,000	$25,000 - $49,999	$50,000 - $74,999	$75,000 - $99,999	$100,000 or over
Neutral	19	26	24	14	14
	19%	18%	19%	16%	10%
Not of Value	10	7	2	3	4
	10%	5%	2%	3%	3%
Total (n)	102	146	125	86	144

Source: IHS © 2013 IHS

Table AP3.32: Consumer Attitudes to Remote Software Upgrades
By Decision Making Index

	Major Decision Making Role	Minor Decision Making Role	No Decision Making Role
Very Valuable	80	71	14
	31%	31%	19%
Moderately Valuable	128	101	40
	50%	44%	55%
Neutral	38	44	15
	15%	19%	21%
Not of Value	8	14	4
	3%	6%	5%
Total (n)	254	230	73

Source: IHS © 2013 IHS

Table AP3.33: Consumer Attitudes to Remote Software Upgrades
By Technology Adoption Index

	Positive	Neutral	Negative
Very Valuable	112	40	13
	40%	20%	17%
Moderately Valuable	132	98	39
	47%	49%	50%
Neutral	32	51	14
	12%	25%	18%
Not of Value	2	12	12
	1%	6%	15%
Total (n)	278	201	78

Source: IHS © 2013 IHS

AP3.6 PERIPHERAL PRODUCT REPLACEMENT & E-COMMERCE

Table AP3.34: Consumer Attitudes to Peripheral Product Replacement and E-Commerce
By Gender

	Female	Male
Very Valuable	84	65
	27%	26%
Moderately Valuable	126	89
	41%	36%
Neutral	66	70
	21%	28%
Not of Value	31	26
	10%	10%
Total (n)	307	250

Source: IHS © 2013 IHS

Table AP3.35: Consumer Attitudes to Peripheral Product Replacement and E-Commerce
By Housing Tenure

	Living with Relatives	Renting a Property	Living in Own Property
Very Valuable	7	57	85
	18%	32%	25%
Moderately Valuable	15	61	139
	39%	35%	41%
Neutral	9	39	88
	24%	22%	26%
Not of Value	7	19	31
	18%	11%	9%
Total (n)	38	176	343

Source: IHS © 2013 IHS

Table AP3.36: Consumer Attitudes to Peripheral Product Replacement and E-Commerce
By Annual Household Income

	Under $25,000	$25,000 - $49,999	$50,000 - $74,999	$75,000 - $99,999	$100,000 or over
Very Valuable	22	46	35	22	24
	22%	32%	28%	26%	17%

	Under $25,000	$25,000 - $49,999	$50,000 - $74,999	$75,000 - $99,999	$100,000 or over
Moderately Valuable	43	51	46	36	39
	42%	35%	37%	42%	27%
Neutral	20	32	36	20	28
	20%	22%	29%	23%	19%
Not of Value	17	17	8	8	7
	17%	12%	6%	9%	5%
Total (n)	102	146	125	86	144

Source: IHS © 2013 IHS

Table AP3.37: Consumer Attitudes to Peripheral Product Replacement and E-Commerce
By Decision Making Index

	Major Decision Making Role	Minor Decision Making Role	No Decision Making Role
Very Valuable	74	59	16
	29%	26%	22%
Moderately Valuable	113	78	24
	44%	34%	33%
Neutral	50	66	20
	20%	29%	27%
Not of Value	17	27	13
	7%	12%	18%
Total (n)	254	230	73

Source: IHS © 2013 IHS

AP3.7 UNIVERSAL HELP BUTTTONS

Table AP3.38: Consumer Attitudes to Universal Help Buttons
By Location

	Canada	U.S. – East Coast	U.S. – Midwest	U.S. – South	U.S. – West Coast
Very Valuable	82	26	18	22	17
	33%	31%	25%	26%	26%
Moderately Valuable	85	30	33	38	29
	34%	36%	45%	44%	45%
Neutral	63	20	18	22	17
	25%	24%	25%	26%	26%

	Canada	U.S. – East Coast	U.S. – Midwest	U.S. – South	U.S. – West Coast
Not of Value	20	7	4	4	2
	8%	8%	5%	5%	3%
Total (n)	250	83	73	86	65

Source: IHS © 2013 IHS

Table AP3.39: Consumer Attitudes to Universal Help Buttons
By Age

	18-23	24-29	30-35	36-40	41 -45	46-50	51-64	65 or over
Very Valuable	22	19	24	20	26	19	21	14
	35%	30%	32%	28%	31%	25%	30%	26%
Moderately Valuable	28	23	27	26	35	35	26	15
	44%	37%	36%	37%	41%	46%	37%	28%
Neutral	11	14	20	23	19	19	14	20
	17%	22%	27%	32%	22%	25%	20%	38%
Not of Value	2	7	4	2	5	3	10	4
	3%	11%	5%	3%	6%	4%	14%	8%
Total (n)	63	63	75	71	85	76	71	53

Source: IHS © 2013 IHS

Table AP3.40: Consumer Attitudes to Universal Help Buttons
By Gender

	Female	Male
Very Valuable	99	66
	32%	26%
Moderately Valuable	121	94
	39%	38%
Neutral	67	73
	22%	29%
Not of Value	20	17
	7%	7%
Total (n)	307	250

Source: IHS © 2013 IHS

Table AP3.41: Consumer Attitudes to Universal Help Buttons
By Housing Tenure

	Living with Relatives	Renting a Property	Living in Own Property
Very Valuable	7	61	97
	18%	35%	28%
Moderately Valuable	16	67	132
	42%	38%	38%
Neutral	9	41	90
	24%	23%	26%
Not of Value	6	7	24
	16%	4%	7%
Total (n)	38	176	343

Source: IHS © 2013 IHS

Table AP3.42: Consumer Attitudes to Universal Help Buttons
By Annual Household Income

	Under $25,000	$25,000 - $49,999	$50,000 - $74,999	$75,000 - $99,999	$100,000 or over
Very Valuable	34	41	37	27	26
	33%	28%	30%	31%	18%
Moderately Valuable	41	56	49	26	43
	40%	38%	39%	30%	30%
Neutral	21	38	34	23	24
	21%	26%	27%	27%	17%
Not of Value	6	11	5	10	5
	6%	8%	4%	12%	3%
Total (n)	102	146	125	86	144

Source: IHS © 2013 IHS

Table AP3.43: Consumer Attitudes to Universal Help Buttons
By Decision Making Index

	Major Decision Making Role	Minor Decision Making Role	No Decision Making Role
Very Valuable	85	65	15
	33%	28%	21%
Moderately Valuable	101	83	31
	40%	36%	42%

	Major Decision Making Role	Minor Decision Making Role	No Decision Making Role
Neutral	60	63	17
	24%	27%	23%
Not of Value	8	19	10
	3%	8%	14%
Total (n)	254	230	73

Source: IHS © 2013 IHS

AP3.8 DATA SHARING & DATA PRIVACY

Table AP3.44: Consumer Attitudes to Data Sharing
By Location

	Canada	U.S. – East Coast	U.S. – Midwest	U.S. – South	U.S. – West Coast
Not willing to provide data	109	23	27	26	23
	44%	28%	37%	30%	35%
Willing to provide data in return for incentive	141	60	46	60	42
	56%	72%	63%	70%	65%
Total (n)	250	83	73	86	65

Source: IHS © 2013 IHS

Table AP3.45: Consumer Attitudes to Data Sharing
By Age

	18-23	24-29	30-35	36-40	41 -45	46-50	51-64	65 or over
Not willing to provide data	27	19	25	28	32	28	30	19
	43%	30%	33%	39%	38%	37%	42%	36%
Willing to provide data in return for incentive	36	44	50	43	53	48	41	34
	57%	70%	67%	61%	62%	63%	58%	64%
Total (n)	63	63	75	71	85	76	71	53

Source: IHS © 2013 IHS

Table AP3.46: Consumer Attitudes to Data Sharing
By Gender

	Female	Male
Not willing to provide data	121	87
	39%	35%
Willing to provide data in return for incentive	186	163
	61%	65%
Total (n)	307	250

Source: IHS © 2013 IHS

Table AP3.47: Consumer Attitudes to Data Sharing
By Housing Tenure

	Living with Relatives who Own/Rent	Renting a Property	Living in Own Property
Not willing to provide data	23	71	114
	61%	40%	33%
Willing to provide data in return for incentive	15	105	229
	39%	60%	67%
Total (n)	38	176	343

Source: IHS © 2013 IHS

Table AP3.48: Consumer Attitudes to Data Sharing
By Annual Household Income

	Under $25,000	$25,000 - $49,999	$50,000 - $74,999	$75,000 - $99,999	$100,000 or over
Not willing to provide data	40	58	43	30	37
	39%	40%	34%	35%	26%
Willing to provide data in return for incentive	62	88	82	56	61
	61%	60%	66%	65%	42%
Total (n)	102	146	125	86	144

Source: IHS © 2013 IHS

Table AP3.49: Consumer Attitudes to Data Sharing
By Decision Making Index

	Major Decision Making Role	Minor Decision Making Role	No Decision Making Role
Not willing to provide data	76	96	36
	30%	42%	49%
Willing to provide data in return for incentive	178	134	37
	70%	58%	51%
Total (n)	254	230	73

Source: IHS © 2013 IHS

Table AP3.50: Consumer Attitudes to Data Privacy
By Location

	Canada	U.S. – East Coast	U.S. – Midwest	U.S. – South	U.S. – West Coast
Not comfortable with data being available to any company	81	14	20	27	18
	32%	17%	27%	31%	28%
Comfortable with sharing data, but only for incentive	84	33	28	24	19
	34%	40%	38%	28%	29%
Comfortable sharing with company & partner companies	36	7	7	13	13
	14%	8%	10%	15%	20%
Comfortable sharing ONLY with service provider	49	29	18	22	15
	20%	35%	25%	26%	23%
Total (n)	250	83	73	86	65

Source: IHS © 2013 IHS

Table AP3.51: Consumer Attitudes to Data Privacy
By Age

	18-23	24-29	30-35	36-40	41 -45	46-50	51-64	65 or over
Not comfortable with data being available to any company	16	14	15	27	19	27	26	16
	25%	22%	20%	38%	22%	36%	37%	30%

	18-23	24-29	30-35	36-40	41 -45	46-50	51-64	65 or over
Comfortable with sharing data, but only for incentive	21	25	31	23	31	20	24	13
	33%	40%	41%	32%	36%	26%	34%	25%
Comfortable sharing with company & partner companies	6	6	11	5	16	11	8	13
	10%	10%	15%	7%	19%	14%	11%	25%
Comfortable sharing ONLY with service provider	20	18	18	16	19	18	13	11
	32%	29%	24%	23%	22%	24%	18%	21%
Total (n)	63	63	75	71	85	76	71	53

Source: IHS © 2013 IHS

Table AP3.52: Consumer Attitudes to Data Privacy
By Gender

	Female	Male
Not comfortable with data being available to any company	96	64
	31%	26%
Comfortable with sharing data, but only for incentive	104	84
	34%	34%
Comfortable sharing with company & partner companies	32	44
	10%	18%
Comfortable sharing ONLY with service provider	75	58
	24%	23%
Total (n)	307	250

Source: IHS © 2013 IHS

Table AP3.53: Consumer Attitudes to Data Privacy
By Housing Tenure

	Living with Relatives who Own/Rent	Renting a Property	Living in Own Property
Not comfortable with data being available to any company	16	56	88
	42%	41%	32%
Comfortable with sharing data, but only for incentive	14	56	118

	Living with Relatives who Own/Rent	Renting a Property	Living in Own Property
	37%	41%	44%
Comfortable sharing with company & partner companies	2	23	51
	5%	17%	19%
Comfortable sharing ONLY with service provider	6	41	86
	16%	30%	32%
Total (n)	38	136	271

Source: IHS © 2013 IHS

Table AP3.54: Consumer Attitudes to Data Privacy
By Annual Household Income

	Under $25,000	$25,000 - $49,999	$50,000 - $74,999	$75,000 - $99,999	$100,000 or over
Not comfortable with data being available to any company	32	39	38	21	30
	31%	27%	30%	24%	21%
Comfortable with sharing data, but only for incentive	36	54	42	24	32
	35%	37%	34%	28%	22%
Comfortable sharing with company & partner companies	10	16	18	14	18
	10%	11%	14%	16%	13%
Comfortable sharing ONLY with service provider	24	37	27	27	18
	24%	25%	22%	31%	13%
Total (n)	102	146	125	86	144

Source: IHS © 2013 IHS

Table AP3.55: Consumer Attitudes to Data Privacy
By Decision Making Index

	Major Decision Making Role	Minor Decision Making Role	No Decision Making Role
Not comfortable with data being available to any company	67	69	24
	26%	30%	33%
Comfortable with sharing data, but only for incentive	86	78	24
	34%	34%	33%

	Major Decision Making Role	Minor Decision Making Role	No Decision Making Role
Comfortable sharing with company & partner companies	47	23	6
	19%	10%	8%
Comfortable sharing ONLY with service provider	54	60	19
	21%	26%	26%
Total (n)	254	230	73

Source: IHS © 2013 IHS

Table AP3.56: Consumer Attitudes to Data Privacy
By Technology Adoption Index

	Positive	Neutral	Negative
Not comfortable with data being available to any company	67	64	29
	24%	32%	37%
Comfortable with sharing data, but only for incentive	97	69	22
	35%	34%	28%
Comfortable sharing with company & partner companies	41	24	11
	15%	12%	14%
Comfortable sharing ONLY with service provider	73	44	16
	26%	22%	21%
Total (n)	278	201	78

Source: IHS © 2013 IHS

AP3.9 EXPECTATION & LENGTH OF WARRANTIES

Table AP3.57: Consumer Expectation of Warranties
By Age

	18-23	24-29	30-35	36-40	41 -45	46-50	51-64	65 or over
Would not expect a warranty on either devices or system	3	6	3	2	4	4	0	1
	5%	10%	4%	3%	5%	5%	0%	2%
Would expect a warranty on both devices and system	32	28	36	36	39	44	42	30
	51%	44%	48%	51%	46%	58%	59%	57%
Would expect a warranty on devices	23	22	30	30	39	27	24	21
	37%	35%	40%	42%	46%	36%	34%	40%

	18-23	24-29	30-35	36-40	41 -45	46-50	51-64	65 or over
Would expect a warranty on system	5	7	6	3	3	1	5	1
	8%	11%	8%	4%	4%	1%	7%	2%
Total (n)	63	63	75	71	85	76	71	53

Source: IHS © 2013 IHS

Table AP3.58: Consumer Expectation of Warranties
By Gender

	Female	Male
Would not expect a warranty on either devices or system	14	9
	5%	4%
Would expect a warranty on both devices and system	158	129
	51%	52%
Would expect a warranty on devices	116	100
	38%	40%
Would expect a warranty on system	19	12
	6%	5%
Total (n)	307	250

Source: IHS © 2013 IHS

Table AP3.59: Consumer Expectation of Warranties
By Housing Tenure

	Living with Relatives who Own/Rent	Renting a Property	Living in Own Property
Would not expect a warranty on either devices or system	3	8	12
	11%	8%	6%
Would expect a warranty on both devices and system	24	90	173
	89%	92%	94%
Would expect a warranty on devices	9	67	140
	33%	68%	76%
Would expect a warranty on system	2	11	18
	7%	11%	10%
Total (n)	27	98	185

Source: IHS © 2013 IHS

Table AP3.60: Consumer Expectation of Warranties
By Decision Making Index

	Major Decision Making Role	Minor Decision Making Role	No Decision Making Role
Would not expect a warranty on either devices or system	15	7	1
	11%	5%	2%
Would expect a warranty on both devices and system	116	123	48
	89%	95%	98%
Would expect a warranty on devices	110	86	20
	84%	66%	41%
Would expect a warranty on system	13	14	4
	10%	11%	8%
Total (n)	131	130	49

Source: IHS © 2013 IHS

Table AP3.61: Consumer Expectation of Warranties
By Technology Adoption Index

	Positive	Neutral	Negative
Would not expect a warranty on either devices or system	14	7	2
	5%	3%	4%
Would expect a warranty on both devices and system	121	117	49
	44%	58%	96%
Would expect a warranty on devices	126	64	26
	45%	32%	51%
Would expect a warranty on system	17	13	1
	6%	6%	2%
Total (n)	278	201	51

Source: IHS © 2013 IHS

Table AP3.62: Consumer Expectation of Warranties
By Annual Household Income

	Under $25,000	$25,000 - $49,999	$50,000 - $74,999	$75,000 - $99,999	$100,000 or over
Would not expect a warranty on either devices or system	5	5	5	1	7
	7%	6%	7%	3%	12%

	Under $25,000	$25,000 - $49,999	$50,000 - $74,999	$75,000 - $99,999	$100,000 or over
Would expect a warranty on both devices and system	62	76	65	34	50
	93%	94%	93%	97%	88%
Would expect a warranty on devices	29	54	48	48	37
	43%	67%	69%	137%	65%
Would expect a warranty on system	6	11	7	3	4
	9%	14%	10%	9%	7%
Total (n)	67	81	70	35	57

Source: IHS © 2013 IHS

Table AP3.63: Consumer Expectation of Warranty Length
By Location

	Canada	U.S. – East Coast	U.S. – Midwest	U.S. – South	U.S. – West Coast
1 year	10	2	3	3	2
	4%	3%	4%	4%	3%
3 years	55	14	14	21	11
	23%	18%	20%	26%	18%
5 years	97	29	23	26	28
	40%	37%	33%	32%	45%
10 years	37	12	15	15	19
	15%	15%	21%	18%	31%
20 years	1	1	1	2	1
	0%	1%	1%	2%	2%
Lifetime	41	21	14	15	1
	17%	27%	20%	18%	2%
Total (n)	241	79	70	82	62

Source: IHS © 2013 IHS

Table AP3.64: Consumer Expectation of Warranty Length
By Age

	18-23	24-29	30-35	36-40	41 -45	46-50	51-64	65 or over
1 year	1	3	4	1	2	6	1	2
	2%	5%	6%	1%	2%	8%	1%	4%
3 years	14	15	13	11	18	18	16	10
	23%	26%	18%	16%	22%	25%	23%	19%
5 years	24	26	30	32	26	26	23	16
	40%	46%	42%	46%	32%	36%	32%	31%
10 years	8	8	13	11	19	7	13	19
	13%	14%	18%	16%	23%	10%	18%	37%
20 years	1	0	0	1	1	0	3	0
	2%	0%	0%	1%	1%	0%	4%	0%
Lifetime	12	5	12	13	15	15	15	5
	20%	9%	17%	19%	19%	21%	21%	10%
Total (n)	**60**	**57**	**72**	**69**	**81**	**72**	**71**	**52**

Source: IHS © 2013 IHS

Table AP3.65: Consumer Expectation of Warranty Length
By Gender

	Female	Male
1 year	13	7
	4%	3%
3 years	55	60
	19%	25%
5 years	121	82
	41%	34%
10 years	40	58
	14%	24%
20 years	4	2
	1%	1%
Lifetime	60	32
	20%	13%
Total (n)	**293**	**241**

Source: IHS © 2013 IHS

Table AP3.66: Consumer Expectation of Warranty Length
By Annual Household Income

	Under $25,000	$25,000 - $49,999	$50,000 - $74,999	$75,000 - $99,999	$100,000 or over
1 year	3	11	3	0	3
	3%	8%	3%	0%	2%
3 years	27	22	30	20	16
	28%	16%	25%	24%	13%
5 years	27	60	44	34	38
	28%	43%	37%	40%	30%
10 years	17	23	19	18	21
	18%	16%	16%	21%	17%
20 years	0	1	3	2	0
	0%	1%	3%	2%	0%
Lifetime	23	24	21	11	13
	24%	17%	18%	13%	10%
Total (n)	97	141	120	85	127

Source: IHS © 2013 IHS

Table AP3.67: Consumer Expectation of Warranty Length
By Decision Making Index

	Major Decision Making Role	Minor Decision Making Role	No Decision Making Role
1 year	10	8	2
	4%	4%	3%
3 years	60	40	15
	25%	18%	21%
5 years	92	83	28
	38%	37%	39%
10 years	48	41	9
	20%	18%	13%
20 years	2	4	0
	1%	2%	0%
Lifetime	27	47	18
	11%	21%	25%
Total (n)	239	223	72

Source: IHS © 2013 IHS

Table AP3.68: Consumer Expectation of Warranty Length
By Technology Adoption Index

	Positive	Neutral	Negative
1 year	12	7	1
	5%	4%	1%
3 years	65	40	10
	25%	21%	13%
5 years	107	71	25
	41%	37%	33%
10 years	48	34	16
	18%	18%	21%
20 years	1	4	1
	0%	2%	1%
Lifetime	31	38	23
	12%	20%	30%
Total (n)	264	194	76

Source: IHS © 2013 IHS

AP3.10 EXPECTATION OF INSURANCE

Table AP3.69: Consumer Expectation of Insurance Provision
By Location

	Canada	U.S. – East Coast	U.S. – Midwest	U.S. – South	U.S. – West Coast
Would like option to purchase insurance	162	52	43	56	40
	65%	63%	59%	65%	62%
Would not like option to purchase insurance	88	31	30	30	25
	35%	37%	41%	35%	38%
Total (n)	250	83	73	86	65

Source: IHS © 2013 IHS

Table AP3.70: Consumer Expectation of Insurance Provision
By Housing Tenure

	Living with Relatives who Own/Rent	Renting a Property	Living in Own Property
Would like option to purchase insurance	23	123	207
	61%	70%	60%
Would not like option to purchase insurance	15	53	136
	39%	30%	40%
Total (n)	38	176	343

Source: IHS © 2013 IHS

Table AP3.71: Consumer Expectation of Insurance Provision
By Decision Making Index

	Major Decision Making Role	Minor Decision Making Role	No Decision Making Role
Would like option to purchase insurance	169	140	44
	67%	61%	60%
Would not like option to purchase insurance	85	90	29
	33%	39%	40%
Total (n)	254	230	73

Source: IHS © 2013 IHS

AP3.11 ADVERTISING & EDUCATION CHANNELS

Table AP3.72: Advertising and Education Channels
By Housing Tenure

	Living with Relatives who Own/Rent	Renting a Property	Living in Own Property
Internet	7	48	90
	18%	27%	26%
Television	7	32	74
	18%	18%	22%
Retail store	0	3	9
	0%	2%	3%
Utility mailing	0	3	7
	0%	2%	2%
Word of mouth	5	21	60

	Living with Relatives who Own/Rent	Renting a Property	Living in Own Property
	13%	12%	17%
In this survey	16	64	97
	42%	36%	28%
Other	3	5	6
	8%	3%	2%
Total (n)	**38**	**176**	**343**

Source: IHS © 2013 IHS

Table AP3.73: Advertising and Education Channels
By Annual Household Income

	Under $25,000	$25,000 - $49,999	$50,000 - $74,999	$75,000 - $99,999	$100,000 or over
Internet	21	34	32	25	33
	21%	23%	26%	29%	34%
Television	21	32	27	16	17
	21%	22%	22%	19%	17%
Retail store	2	2	2	3	3
	2%	1%	2%	3%	3%
Utility mailing	1	3	4	1	1
	1%	2%	3%	1%	1%
Word of mouth	10	22	19	13	22
	10%	15%	15%	15%	22%
In this survey	44	49	38	25	21
	43%	34%	30%	29%	21%
Other	3	4	3	3	1
	3%	3%	2%	3%	1%
Total (n)	**102**	**146**	**125**	**86**	**98**

Source: IHS © 2013 IHS

Table AP3.74: Advertising and Education Channels
By Decision Making Index

	Major Decision Making Role	Minor Decision Making Role	No Decision Making Role
Internet	87	45	13
	34%	20%	18%

	Major Decision Making Role	Minor Decision Making Role	No Decision Making Role
Television	65	35	13
	26%	15%	18%
Retail store	8	3	1
	3%	1%	1%
Utility mailing	5	5	0
	2%	2%	0%
Word of mouth	38	40	8
	15%	17%	11%
In this survey	46	97	34
	18%	42%	47%
Other	5	5	4
	2%	2%	5%
Total (n)	**254**	**230**	**73**

Source: IHS © 2013 IHS

Table AP3.75: Advertising and Education Channels
By Technology Adoption Index

	Positive	Neutral	Negative
Internet	98	40	7
	35%	20%	9%
Television	66	34	13
	24%	17%	17%
Retail store	9	3	0
	3%	1%	0%
Utility mailing	3	4	3
	1%	2%	4%
Word of mouth	35	38	13
	13%	19%	17%
In this survey	63	75	39
	23%	37%	50%
Other	4	7	3
	1%	3%	4%
Total (n)	**278**	**201**	**78**

Source: IHS © 2013 IHS

APPENDIX 4
NORTH AMERICAN ELECTRICITY INFRASTRUCTURE OVERVIEW

NORTH AMERICAN ELECTRICITY INFRASTRUCTURE OVERVIEW

This appendix presents an overview of the North American electric utility environment, taken from a previous IHS study: "Smart Home Energy Management Systems – 2012 Edition".

CANADA

STRUCTURE OF ELECTRICITY MARKET

Canada's federal system of government means that jurisdiction over energy is divided between the federal, provincial and territorial governments. Federal jurisdiction of energy is primarily concerned with regulation of inter-provincial and international trade and commerce, and the management of non-renewable resources on federal lands. Provincial governments have jurisdiction over the exploration, development, conservation, and management of non-renewable resources, as well as the generation and production of electricity. All provinces and territories have set up utilities boards and regulate transmission and distribution rates.

The Canadian liberalization process of the 1990s changed some elements of the market such as the unbundling of generation, transmission and distribution functions of incumbent utility companies, in order to foster a competitive wholesale market. However, most provincial governments still maintain a strong financial stake as operators in the electrical markets.

The National Energy Board is an independent federal agency that regulates several aspects of the Canadian energy industry, such as the promotion of safety and security, environmental protection, and efficient energy infrastructure.

INVESTMENT IN SMART GRID INFRASTRUCTURE & SMART METER ROLL-OUT

The Canadian federal government has committed various funds to further the development of smart grid technologies and support demonstration pilots. For example, it has contributed CAD32 million towards the four-year New Brunswick Power Smart Grid research project, which focuses on managing renewable energy sources as well as introducing in-home displays to help customers monitor costs and become aware of wasted energy. See further information under "Other Comments".

However, smart meter deployments vary greatly by province. Ontario is the most advanced stage, led by Hydro One, which began smart meter deployment back in 2006. Examples of smart meter

deployments and trials in various Canadian provinces are highlighted in the 'Other Comments' section below.

MAJOR REGULATORY ISSUES AND/OR MANDATES

Specific smart grid policies are determined at the provincial government level in Canada. Canada's grid is ageing; replacing old elements with new smart grid technology meets many of Canada's energy and environment policy objectives. To date, Ontario is the frontrunner in Canada's growing adoption of smart grid technology. The Energy Conservation Responsibility Act of 2006 mandated that all Ontario homes and businesses must be equipped with smart meters by 2011. Ontario's Provincial Government introduced the Green Energy Act in 2009, which mandated a smart grid rollout, ahead of its 2011 schedule. Other provinces are following with rollouts and legislation.

In Ontario, increasing electricity demand peaks was one of the drivers for smart meter deployments. Energy conservation and demand side management are two other important objectives of the energy policy. The Ontario Energy Board has proposed basic smart metering functions and some minimum technical standards. Each energy company is free to develop its own smart metering framework, although Ontario has installed a common meter data-management system supporting all its 90 distribution utility companies.

The Ontario Smart Grid Forum – a task force made up of people from the electricity sector and government officials – recommended in February 2009 that the province should spend CAD320 million annually on the smart grid sector for the next five years. Much has changed in terms of the desired smart meter functionality since Ontario began to deploy smart meters, such as the presence of HAN gateways. Consequently, Ontario has to catch up on such features to avoid stranded assets.

As mentioned, other Canadian provinces are at different stages of smart meter deployment. For example, in Alberta, although most industrial and large commercial customers have smart meters deployed, the approach to residential smart meter deployment remains fragmented, with only some utility companies having wide-scale rollouts.

TIME-OF-USE (TOU) OR DYNAMIC PRICING, OR OTHER CONSUMER INCENTIVES

Electricity pricing varies by province or territory, according to the volume and type of available generation and whether prices are market-based or regulated. Alberta has moved the furthest in restructuring its electricity market. Its electricity prices are more market-based than those of other provinces and territories. Ontario has chosen to partially restructure its electricity market. Prices in other provinces and territories are set by the electricity regulator to cover costs and allow for a reasonable rate of return to investors.

ToU pricing has been employed in a number of tariffs in Canada, with varying levels of success. One example of a poor implementation of ToU is in Ontario, where the off-peak, mid-peak, and on-peak rates were too similar to create an incentive for consumers to shift peak loads to off-peak times; so there were no financial benefits to any parties involved.

Ontario is advanced in moving customers to ToU tariffs, under which electricity prices vary according to time of day, the day of the week, and the season. Toronto Hydro has over 0.5 million customers on ToU plans; while as of September 2011 over 1.05 million Hydro One customers had switched to ToU pricing plans. Bills are issued based on actual rather than estimated consumption; and customers can view their usage from the previous day over the Internet. In contrast, BC Hydro does not plan to introduce ToU tariffs in the short term, although it does not rule out introducing voluntary or mandatory ToU tariffs in future, subject to public consultation and regulatory approval. It is, however, making IHDs (in-home displays) available to customers on a voluntary basis at a discounted price.

OTHER COMMENTS

Some examples of pilot programs and deployments are highlighted below, but this list is not intended to be exhaustive due to the abundance of separate programs.

Several pilots using HAN devices have taken place, one of which was the Ontario Power Authority (OPA) Pilot with Energate. This was a six-month pilot project with the OPA to deploy its Consumer-Connected Demand Response (CCDR) solution platform to control home energy use via the Internet, while giving consumers access to smart-meter data. The project used smart thermostats on air conditioning, load-control switches on water heaters and pool pumps, and energy displays paired with smart meters to share real-time data. A Web-based portal enabled consumers to easily program thermostats remotely to manage home comfort and energy use.

By mid-2012, Toronto Hydro had already installed over 674,000 smart meters and moved over 75% of customers on smart meters to ToU pricing plans. Billing based on ToU tariffs is enabled using eMeter's interval data module, in conjunction with the vendor's meter data-management system.

The New Brunswick Power Smart Grid research project is a project funded by the Federal Government and led by NB Power into smart grid technology that could lead to more renewable energy being used. The four-year research project will see a total investment of CAD32 million, with CAD15.9 million coming from the federal Clean Energy Fund, with partners including Nova Scotia Power and the University of New Brunswick. The New Brunswick Government will pay CAD2 million. The project will study the changing patterns of power consumption and help electricity companies to alter energy production to reduce greenhouse gas emissions. Participation is voluntary and customers will be given an in-home display during a 12-month trial to monitor their consumption and ultimately lower their electricity bills. The study will run for 12 months, until February 2013.

BC Hydro of British Columbia started to roll out a smart metering program in July 2011, of which a theft-detection system is a key component. The smart metering program is part of a broader plan to modernize the grid; and entails installing 1.8 million smart meters and communications infrastructure, as well as a theft-detection solution. In-home displays (IHDs) and Web tools will provide information on customer energy usage and pricing. The program had a deadline of the end of 2012, which is dictated by regional legislation. BC Hydro will not be introducing tariffs until after completion of the pilot; but voluntary or mandatory ToU tariffs may be introduced in future, subject to a public consultation and regulatory approval. IHDs will be optional for customers, and will be made available at a discounted price.

OTHER COMMENTS – PUBLIC BACKLASH

Smart meters also bear the disproportionate brunt of the backlash when utility companies have to raise rates to pay for modernizing old or installing new electricity infrastructure. Countries such as Canada have maintained caps on electricity prices for decades. In Ontario, about $8 billion in subsidies went towards keeping the cost of electricity down. Phasing out coal plant and building new electricity generation plant will increase electricity costs for Canadians. Smart meters are associated with the revelation of the true cost of electricity as they enable consumers to view their increased charges on a Web site or in-home display on a daily basis. As consumers become aware of their electricity consumption and the higher costs, this often results in a backlash against utility rate increases, ToU tariffs, and current and future smart- grid and smart metering initiatives.

UNITED STATES

STRUCTURE OF ELECTRICITY MARKET

The U.S. has a highly deregulated utility environment and this has enabled thousands of utility

companies of varying sizes to exist. Since the 1930s, electric utility companies in the U.S. have been regulated by the specific states in which they provide services.

The U.S. Department of Energy (DOE) was created in 1977 along with an independent regulatory authority, The Federal Energy Regulatory Commission (FERC), that assumed most of the statutory duties of the former Federal Power Commission.

Congress formally deregulated the wholesale electric market with the Energy Policy Act of 1992. On April 1, 1998, the largest electric power market in the U.S., California, further pushed competition by allowing utility ratepayers to buy from any supplier they chose. At the time, other states such as Massachusetts, New Hampshire, New Jersey, New York, Oregon, Pennsylvania, and Rhode Island were in various states of restructuring their electricity markets. According to the Department of Energy's (DOE) September 2000 deregulation update, 23 states had enacted deregulation legislation, while another 20 had orders pending or ongoing legislative deregulation investigations. Although 18 states had deregulated by 2005, they did so by retaining control of the physical delivery side of the business, but removing restrictions on the generation and sale of electricity.

The U.S. has seven organized wholesale electricity markets that operate in about one-half of the states. They serve roughly two-thirds of U.S. electricity consumers and operate under independent power-grid operators known as independent system operators (ISOs) or regional transmission organizations (RTOs)

ISOs/RTOs are independent, federally regulated organizations established to coordinate regional transmission and wholesale sales and to ensure the reliability of the electricity system.

The Federal Energy Regulatory Commission (FERC) has jurisdiction over six of the seven ISOs/RTOs in the U.S. In this role, the FERC regulates the transmission and wholesale sales of electricity to ensure that the rates, terms, and conditions for wholesale electricity sales and transmission in interstate commerce are just and reasonable and not unduly discriminatory or preferential. The Electric Reliability Council of Texas (ERCOT), the wholesale market encompassing most of Texas, is the exception, as it is mostly isolated from the rest of the nation's power grid. The Public Utilities Commission of Texas (PUCT) has regulatory jurisdiction over most aspects of the ERCOT market.

In 2008 and 2009, FERC issued a series of rulings, Orders No. 719, No. 719-A, and No. 719-B, which required ISOs/RTOs to implement reforms that allow qualified demand response resources to provide services and allow aggregators to bid demand response resources into the market on behalf of retail customers, unless prohibited by state or local law. As a result, wholesale markets have been required to make changes to allow new technologies to compete with traditional generation assets.

Unlike many consumer retail markets, the U.S. electricity retail market is highly fragmented. States have developed a full spectrum of regulatory and market models. Recently, competitive retail markets have emerged that exist well outside the traditional model; there, customers interface with retail electricity providers, which provide consumers with electricity but which may not own generation assets themselves. These markets are regulated according to state-specific rulings, and vary widely across the U.S. An example is Texas, where the typical residential customer can choose from well over 200 retail electricity offers.

INVESTMENT IN SMART GRID INFRASTRUCTURE & SMART METER ROLL-OUT

The U.S. is considered a pioneer in smart grids and smart metering context; its government has placed energy reform high on the political agenda and is committing considerable investment to smart grid development.

The U.S. Government offered well over $10 billion in direct funds for smart grid development with the launch of the American Recovery and Reinvestment Act (ARRA) of 2009. It offered utility companies

matching funds for investment in smart grid technologies, which directly stimulated large investment in upgrading metering stock to smart meters. This was reflected in the surge in smart meter shipments from 2010. This sort of stimulus funding for smart grid projects may help accelerate smart meter roll-out and the broader aspects of smart grid development.

The 2012 budget submitted by President Obama to Congress calls for a 70% increase over the 2011 allocation for federal research and development activities related to renewable energy. The Office of Science in the Department of Energy would receive $2 billion for basic energy sciences to discover new ways to produce, store and use energy. The budget includes funding to accelerate the deployment of new models of energy research pioneered in the last few years.

EPRI (the Electric Power Research Institute) claimed in a report it published in March 2011, that full implementation of smart grids in the U.S. would require investments between $338 and $476 billion by 2030. Allocated costs for transmission and substations are 19%-24% of the total; costs for distribution are 69%-71%; costs for consumer systems are 7%-10%. These costs are in addition to the investments needed to maintain the existing system and meet the growth in the load.

MAJOR REGULATORY ISSUES AND/OR MANDATES

The energy policy of the United States is determined by federal, state and local public entities, which address issues of energy production, distribution, and consumption.

Major federal Energy Policy Acts have been passed in the U.S. They include:

- Energy Policy Act of 2005 (EPAct)

The EPAct 2005 called for the development of grant programs, demonstration and testing initiatives, and tax incentives that promoted alternative fuels and production and use of advanced vehicles. EPAct 2005 also amended existing regulations, including the EPAct 1992 requirements for federal, state, and alternative fuel provider fleets. Moreover, the Act also encouraged time-based pricing and other forms of demand-response mechanisms.

- Energy Independence and Security Act of 2007 (EISA)

The EISA 2007 aimed to improve vehicle fuel economy and reduce U.S. dependence on petroleum. EISA includes provisions to increase the supply of renewable alternative fuel sources by setting a mandatory Renewable Fuel Standard. EISA also includes grant programs to encourage the development of cellulosic biofuels, plug-in hybrid electric vehicles, and other emerging electric technologies. The Act is projected to reduce greenhouse gas emissions by 9% by 2030. Moreover, the Act stated that the Member States should "consider" smart grid investments before proceeding with traditional investments, and that consumers should be provided with information on time-of-use (ToU) pricing. The funding of the "Regional Smart Grid Demonstration Initiative" was $100 million per year from 2008 to 2012, with a grant of up to 50% and creation of a Smart Grid Authorization Fund to fund up to 20% of qualified investment (investment capped at $20 million per project).

- American Recovery and Reinvestment Act of 2009 (ARRA)

The ARRA of 2009 appropriated nearly $800 billion towards the creation of jobs, economic growth, tax relief, improvements in education and healthcare, infrastructure modernization, and investments in

energy independence and renewable energy technologies. The ARRA supports a variety of alternative fuel and advanced vehicle technologies through grant programs, tax credits, research and development, fleet funding, and other measures. Furthermore, the ARRA raised the federal match limit on Smart Grid Authorization Fund from EISA 2007 levels, to fund up to 50% of qualified investment. The maximum investment on the Smart Grid Authorization Fund was raised to $200 million. There was funding of $4.5 billion for smart grid investments: with individual projects ranging from $0.3 million to $200 million.

In the U.S., the decision for smart metering deployment is typically triggered by the utility company, thus making it also a voluntary approach. However, in most states the regulator's approval is required for tariff adjustments and cost recovery plans.

State regulatory commissions are encouraging and guiding smart meter deployments, while also regulating them to protect the public interest. Both the novelty and complexity of smart meter deployments present challenges for state regulatory commissions because of consumer protection and public interest concerns. Across states, common regulatory issues are emerging concerning the smart meter deployments; state commissions have raised concerns about cost/benefit, cost recovery, technology, consumer protection, privacy, cyber security, health effects, and public interest aspects of the projects. Many of these issues are evolving as the complexities and effects of smart-meter deployments become better known and understood.

TIME-OF-USE (TOU) OR DYNAMIC PRICING, OR OTHER CONSUMER INCENTIVES

With introduction of smart meters and advanced technology, many utility companies and states are aiming to start offering some sort of consumer incentives to cut back on energy consumption and save money for the consumers in the process. There is no one preferred way to go about it; some offer ToU tariffs, some offer dynamic pricing, while others offer a combination of these. The issue of cutting back both energy consumption and wastage is high on everybody's agenda, so it is a prioritized issue in many U.S. states.

For decades, vertically integrated utility companies have used demand response (DR) for emergency response and peak shaving to help meet grid reliability. Prices for this service typically were set administratively and did not reflect the market value of DR. In recent years, wholesale electricity markets have evolved in various ways to allow DR resources to compete for services. The introduction of market price signals encourages consumers to alter their usage behavior. With the additional integration of DR into wholesale markets, new curtailment service providers have begun aggregating and offering DR as a resource. Initial participants in the wholesale markets were legacy demand response programs offered by utility companies, governed by ISO/RTO dispatch, settlement and demand-response rules. However, this rapidly changed as competitive entities other than utility companies also began offering the ability to reduce load – aggregating the willingness of some customers to reduce load into a grid resource.

OTHER COMMENTS

Pilot programs and deployments are very common across the U.S. Some examples are highlighted below, but this list is not intended to be exhaustive due to the abundance of separate programs.

Oklahoma Gas & Electricity (OG&E) - has set significant 2012 goals for both peak demand reduction as well as consumer adoption. In one of the OG&E projects, smart thermostats from Energate were deployed. The goal of a 1.3 kilowatt peak reduction per residential customer was exceeded by nearly 50%, with an achieved peak reduction of 1.92 kilowatts per home. These results were achieved without the use of time-of-use rates by sending a price signal to consumers who had previously programmed

their systems to know when and whether to respond to OG&E's signals via its opt-in program. Energate worked with the smart grid platform provider, Silver Spring Networks; and enabled the customers to manage and optimize their energy use with in-home devices and Internet portals that provided pricing and usage information. OG&E's 2012 expansion of its residential demand-response program is targeted to include some 40,000 residences and implement Energate smart thermostat and accessories, as well as dynamic pricing.

The DTE Energy SmartCurrents Program – In August 2008, DTE Energy launched its SmartCurrents program, which includes three major projects in its southeastern Michigan service territory.

The SmartCurrents program was awarded a grant of nearly $84 million by the U.S. Department of Energy (DOE), which will allow the company to provide customers with improved electric service reliability, the distribution of smart appliances and ways to control and reduce energy consumption and costs. The DOE funding through the federal economic stimulus program will be matched by DTE Energy itself and its technology partners. The DOE funding meant that DTE Energy was able to install nearly 700,000 new smart meters, and offer smart home technology with in-home displays and smart thermostats to 5,000 customers.

The Edison SmartConnect Program – The Edison SmartConnect is Southern California Edison's (SCE) smart metering program, which has scheduled deployment, from 2009 to 2012, of approximately five million digital meters and two-way communications system for residential and commercial customers of below 200 kW demand. SCE customers will be able to view near real-time energy usage information from a computer, mobile phone, or other device. SCE will send alerts to their customers about periods of peak electricity demand, directly to the smart appliances and devices. The customers can program these devices to respond to energy use preferences based on cost, comfort and convenience. PCTs (Programmable Communicating Thermostats) – or smart thermostats – will be able to communicate with SCE alerts to respond automatically to peak electricity demand, by adjusting or turning off appliances and devices.

SCE Edison also says it will deploy in-home devices for convenient viewing of energy consumption levels and also make new dynamic pricing plans available. They will include rebate programs for reduction of energy use at peak times, and time-of-use (ToU) rates for residential customers. The program will be funded by an increase in customer rates of about 1.5% during 2010 and 2012, but it is said that customers adopting the new programs and services available through Edison SmartConnect can benefit from monthly savings of 5% or more. From mid-2010, dynamic pricing, including time-of-use rates, was available to customers with smart meters.

NV Energy began rolling out a $298 million investment in smart grid technology, including a home energy management system in the form of a demand response program, in September 2010 in southern Nevada and in December 2011 in northern Nevada. The investment includes $138 million in government stimulus funding. The company expects to have covered 1.3 million customers by December 2012.

Home control company Control4 provided 20,000 EMS100 energy management systems, which consist of a 5-inch EC-100 touchscreen display and a WT-100 wireless smart thermostat. Control4 began implementation of its units in June 2011 in southern Nevada, and will continue through 2012. The touchscreen display provides up-to-the-minute feedback on electricity consumption and costs; and the system analyses the electricity usage and accommodates load controllers on the home area network. The smart thermostat can automatically react to price signals or utility signals to reduce peak load requirements. The company says it is preparing to launch a sizable dynamic pricing pilot on January 1, 2013.

The system uses communications and meters from Sensus, a meter data management system

from Itron, a demand-response management system from UISOL, and home area network (HAN) technology from Control4. IBM WebSphere provides the underlying enterprise engine.

Once the deployment is concluded, NV Energy plans to turn its attention to distribution automation, outage management, and other ways to leverage the new infrastructure to improve reliability and increase customer satisfaction.

Allete Minnesota Power – began technology evaluation in late 2007 and launched a pilot to provide customers with rate options and to enhance system operational requirements, i.e., demand response, and outage management. The system infrastructure was installed in 4Q 2008; the company then received a $1.54 million ARRA stimulus grant from the U.S. Department of Energy in October 2009, to help modernize its power grid and to expand the demand response pilot from 2010 to 2012. An additional 8,000 smart meters were to be deployed in northeast Minnesota. Allete will devote an additional $1.5 million itself to implement the project. The company says it will use the funding to purchase new measurement and automation equipment, and to begin experimenting with a new dynamic-pricing program.

Baltimore G&E (BG&E) initiated a smart meter pilot of 3,000 meters in 2008 and was then awarded $200 million in Smart Grid Investment Grant funds (total project value is $452 million) to deploy 1.1 million smart meters, coupled with dynamic pricing. The utility aimed to deploy smart meters throughout the BG&E service territory with a planned completion date of 2014. However, the smart meter rollout and ToU tariffs were rejected in June 2010 by the Maryland Public Service Commission (PSC). BG&E filed an amended proposal, in July 2010, which was granted conditional approval in August 2010. The amended plan still calls for some tariff increases (about 30 cents per user per month according to the filing), but BG&E claims that will be offset by an average customer savings of about $100 per year. In the amended proposal, BG&E dropped its plans to introduce mandatory ToU pricing and instead made it optional for customers to pay lower rates off peak, while also enrolling all customers in a rebate plan for those who conserve energy during peak demand.

Commonwealth Edison (ComEd) began smart meter implementation in nine towns in the Greater Chicago area in November 2009 and finished in May 2010. The cost of the pilot was approximately $69 million and deployed 131,000 smart meters. No U.S. stimulus grant was approved for the project, which otherwise would have deployed 310,000 units. The pilot included a customer applications experiment for around 8,500 households, where combinations of dynamic pricing, alternative pricing plans, Web interfaces, home area network (HAN) control systems, smart thermostats and in-home displays were tested in 2010.

PEPCO Holdings – PEPCO received $149.4 million in Smart Grid Investment Grant funds (of $298 million total for two projects) for smart grid investments, including 280,000 smart meters for District of Columbia customers and 570,000 meters for Maryland customers. PEPCO originally proposed deployment for the entire service area with a target date for full deployment by 2013; 258,000 were deployed by January 2009, with a pilot testing hourly pricing, critical peak pricing (CPP), and real-time pricing (RTP) rate structures.

APPENDIX 5
BIBLIOGRAPHY

BIBLIOGRAPHY

The sources used in this research are predominantly derived from primary research conducted by IHS as part of this study. This included both an online end-user survey and in-depth interviews with existing industry participants. For more information, please refer to Section 1.2 of this report.

In addition to the primary research, IHS also makes reference to a number of previous reports which are cited in the text, as follows:

- Connectivity Opportunities in the Smart Home – World – 2012 (published November 2012)
- Smart Home Consumer Survey – US, Brazil, UK, Germany and China – 2013 (published April 2013)
- Home Networking and Residential Gateways – World – 2013 (published April 2013)
- Integrated PV Market Demand Tracker – World – Quarterly (last published September 2013)
- Telehealth – An Analysis of Demand Dynamics – World – 2012 (published November 2012)
- Automotive Infotainment Market Tracker – Systems – H1 2013 (published September 2013)

CONNECTIVITY OPPORTUNITIES IN THE SMART HOME – WORLD – 2012 (PUBLISHED NOVEMBER '12)

Driven by factors such as the ubiquity of smartphones and the growing deployment of managed home systems from a range of service providers, the 'smart home' market is evolving. This report presents unit shipment, revenue and pricing estimates (2010 - 2011) and annual forecasts (2012 - 2017) for 14 key 'smart home' devices, ranging from magnetic door contacts used for home monitoring, to in-home displays deployed by utility companies.

As a result, this report offers detailed analysis across a number of key application areas, including home energy management, home monitoring and control, lighting applications, and other home automation devices. Each device market is further segmented by system-type: high-end home automation, mainstream home automation & DIY systems, managed home systems, and demand-response or HAN systems.

This report provides detailed analysis of the adoption of a range of 14 different connectivity

technologies, including RF, powerline and wired solutions, with connectivity segmentation provided by region for each device. Additionally, this report includes analysis and projections for connectivity IC and module shipments, revenues and ASPs within the 'smart home' market, segmented by major region.

SMART HOME CONSUMER SURVEY – US, BRAZIL, UK, GERMANY & CHINA – 2013 (PUBLISHED APRIL '13)

In 2013, IMS Research conducted a consumer survey, covering 2,500 respondents across the U.S., Brazil, the U.K., Germany and China. This report presents the findings of this survey, which included 76 questions across a range of 'smart home' topics. It includes over 175 data tables and figures, with additional qualitative insight and analysis to provide an overview of the 'smart home' market from a strategic viewpoint, highlighting key trends in consumer data.

This report provides insight into consumer expectations and demand for 'smart home' systems, across a wide range of application areas (such as home monitoring and energy management) and system types (including cloud-based remote home control, demand-response, and home automation). This includes analysis of consumer responses surrounding a range of key issues, such as the desirability of different features, the acceptability of different price points, attitudes to different business models (such as up-front costs versus subscriber fees), and willingness to participate in demand-response programs, based on a range of incentives.

In addition, in-depth respondent demographic information is cross-referenced against all survey questions, to indicate how responses vary by consumer segment, highlighting applicable target markets for a range of different systems and services.

HOME NETWORKING AND RESIDENTIAL GATEWAYS – WORLD – 2013 (PUBLISHED APRIL '13)

As broadband has become increasingly prevalent in households throughout the world, and Wi-Fi has penetrated an ever wider range of devices, the home network has become commonplace in consumers' homes, driven by the ease of set-up and the demand for Internet connectivity within a range of consumer electronic devices. The next phase of this evolution is being driven by IPTV and multi-room DVR solutions, creating new challenges - and opportunities - for a wide range of stakeholders, including IC vendors, CPE manufacturers and service providers.

A wide range of providers are already using no-new-wire networking technologies to enable improved services for their customers, including AT&T (HomePNA), Verizon (MoCA) and France Telecom (HomePlug). This trend is expected to become even more widespread over the next five years, as multi-room and IP television services increase in popularity. In conjunction with this, the 802.11 standard will see a move from 802.11n to 802.11ac, which promises greater bandwidth and better range.

IMS Research has been analyzing the market for home networks and residential gateways since 2002. Now in its seventh edition, this report provides an extensive guide to IMS Research's latest market data and forecasts, covering broadband subscribers, IPTV households, WAN technologies, CPE equipment, no-new-wires solutions, and vendor landscape analysis, including market share estimates.

TELEHEALTH – AN ANALYSIS OF DEMAND DYNAMICS – WORLD – 2012 (PUBLISHED NOVEMBER '12)

This report provides a global overview of the market size and growth over the past two years - 2011 to 2012, and assesses whether market growth matched industry expectations globally and identifies the drivers and inhibitors to growth.

The results of discussions with healthcare providers and payers particularly in the United States are used to guide InMedica's projections of telehealth growth, in terms of market segments and business models with most growth potential. In-depth country profiles are then presented for key countries and geographic regions, including an overview of the healthcare systems, residential telecommunications, telehealth payers and total addressable markets. The estimated telehealth market size and growth by segment in each country is also presented and discussed. The report sets out to provide ground breaking analysis of the telehealth market. It provides actionable insights to guide investment decisions of suppliers, providers and other stakeholders in the telehealth market.

PV INTEGRATED MARKET TRACKER – QUARTERLY – Q3 '13 (PUBLISHED SEPTEMBER '13)
This tracker focuses on the markets for polysilicon, solar wafers, PV cells and modules, and PV installations. It delivers independent analysis, accurate and fresh market data and informed forecasts. Each quarter, update market data is captured company by company and is used to build up a total market picture. This data includes changes to country/segment installations, production capacity, production, shipments, inventories, prices, megawatts installed and revenues. IHS also updates its forecast for a five-year forward window based on this latest quarterly data.

AUTOMOTIVE INFOTAINMENT MARKET TRACKER – H1 '13 (PUBLISHED SEPTEMBER '13)
This market tracker is published biannually with market share data published annually. The accompanying database contains all the major parameters currently tracked by the Automotive Infotainment Service and is intended to provide a single repository for all data, such that the latest versions of each spreadsheet are available in one place. The database is delivered in pivot table format, which allows system views of the whole infotainment market, as well as break-downs by centralized head unit and a range of distributed electronic control units (ECUs) with detailed system sub-functions.

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