
# Internet Home Alliance
# Safe Secure Comfortable Home Concept
## Final Report

June 3, 2005

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# Background and Objectives

**Project Objectives**

**Several Internet Home Alliance member companies are developing concepts around the unifying theme of a home information and control solution that will help home owners by managing and providing information about environment, energy consumption, safety, and security. As such, the member companies are interested in gaining consumer feedback regarding these concepts; specifically, members are interested in learning what the optimal configuration of features might be, gaining insight into product pricing, and sizing the market opportunity.**

**To meet these objectives, Zanthus suggested a two step research project, starting with qualitative research to explore interest and reactions to the concepts, followed by a quantitative study that will confirm or refute hypotheses, size the market within the IHA segmentation scheme, and inquire into price sensitivity and demand.**

**Research objectives in this qualitative research stage include:**

- Gauge initial reaction to the concepts, including what consumers like and dislike about them;
- Identify concept benefits, and potential barriers to adoption;
- Measure each concept's potential for consumer adoption among target consumers;
- Identify desirable bundles of features; and,
- Provide general guidance on pricing.

**The research will be used to guide development of the Safe, Secure and Comfortable products, as well as inform the development of the quantitative Web study.**

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# Methodology

**Methodology**

Two sessions were held in each of three cities – Boston, Tampa, and Portland, Oregon; a total of 48 consumers were interviewed.

An interactive audience feedback system called the Perception Analyzer, or PA, was used to collect data. The PA yields a data set that is quantitative in nature, but with a sample size of 48 and a convenience sampling method, data collected should be considered directional in nature.

Each session lasted two hours; following PA data collection, a discussion was held among the consumers to discern behavior, personal preferences, and rationales for these preferences.

A number of screening criteria were used to make certain that consumers fit the "primary target market;" criteria included:

- Age 25 to 54, half male, half female,
- Household income of $75,000 or more
- One or more children age 18 or under living at home
- Own a PC at home that is connected to working Broadband Internet access
- Rate setting up a connected home appealing, assuming cost were not an issue (measured using a 0 to 10 scale where 0 means not at all appealing, and 10 means very appealing; to qualify, one had to answer 8,9, or 10)
- Half purchased a newly constructed home within the last 12 months; the other half purchased a previously-owned home within the last 12 months
- In Boston, half must demonstrate energy conservation (e.g., use a programmable thermostat, and/or change furnace filters every two or three months)
- In Tampa, half must experience water damage in their home
- In Portland, half must demonstrate energy conservation, and half must purchase renewable energy
- Employment screen – those employed in or with household members employed in the following businesses were excluded:
  - advertising
  - market research
  - manufacturer of home electronics or controls
  - construction
  - real estate

The recruit proved more challenging than expected, so a number of exceptions were made in terms of demographics; that is, consumers who met all but one or two demographic requirements were considered on a case by case basis, with some being invited to attend a session.

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# Methodology (cont'd)

Research Process

Three concepts were reviewed – Environmental Control; Energy Monitor; and, Safety and Security Management.

Concepts were outlined in a workbook (please see the appendix, which includes a copy of the workbook); the moderator explained the concepts orally, one at a time, while consumers followed in the workbook. Once a concept was presented, consumers were directed to write down in the workbook the things they liked about the concept, as well as the price they expected the concept would cost, excluding installation. In addition to the written exercise, consumers used the PA dials to evaluate each concept along a number of metrics that help predict potential adoption. (In addition to the workbook, posters of the concepts were mounted on the wall for reference.)

Order of concept presentation was varied from session to session so as to minimize order bias.

After the three concepts were evaluated, consumers were asked to re-consider the concepts as elements of a unified product, and were told they could select as many or as few features as desired. Consumers then used the PA dials to rate features in terms of the importance to the consumer that the feature be included in the optimal product configuration: is the feature required, nice but not required, or better left out of their ideal package of features.

Once all PA data had been collected, a discussion followed in which consumers talked about what they liked and disliked about each concept; what they expected each concept to cost and how they arrived at the specified amount; and so on.

Price of each device was evaluated in context of comparable home systems – estimates were based on a very general frame of reference.

At the end of most sessions, three Invensys model thermostats were briefly evaluated, too; consumers looked at and in some cases handled the models, and then commented about them.

*Note: 48 consumers were interviewed – quantitative findings and recommendations should be considered directional in nature.*

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# Executive Summary

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# Executive Summary

**The Safe Secure Comfortable home concept is well received.**

- **Considered the wave of the future.** Many assume that systems like this will soon be built into new construction homes.
- **A convenience tool.** Centralization and ease of controlling multiple systems from one device saves time and effort.
- **Promotes home efficiency.** Should save consumers money by reducing waste.
- **Peace of mind.** Allows homeowners to worry less about their home while away – be it at work, or on vacation. Remote monitoring and control result in peace of mind.

**Most see the primary benefits of such a system as greater home and family safety (from fire, smoke, CO, break ins, water damage, etc.) and potential for cost savings (energy savings, lower insurance rates, increased home value, etc.).**

**General feeling is that integration of the three concepts is desirable – these consumers believe integration will provide a better user experience given a single user interface, and one point of contact for sales, installation, and maintenance. However, some also point out the downside – an integrated approach forces the consumer to place "all their eggs in one basket" – if the computer or the control goes down, the perception is that nothing will work.**

**Customization of the system will be key to adoption. Some want to start "small" by purchasing a touch screen that enables a few basic functions and then add on when they can afford to, or find that the system pleases them. Others want to load on as many features as they can for full home automation.**

**Most want computing power to come from a separate, standalone device. Using the home PC is problematic because they tend to incur too many problems, like careless kids, hackers, viruses.**

**Touch screen interface is acceptable.**

- Many want more than one touch screen – having more than one in a multi-level or larger sized home adds convenience. Locations suggested include one for a central area, and other in a master bedroom, second level of the home, basement, etc.
- A portable touch screen is desired by some, though some voice concerns about losing it.

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# Executive Summary

**Key concerns about the system include:**

- **Obsolescence**. For the start up cost to be justifiable, the system would need to be scalable, with reasonably priced – or free – updates.
- **Security**. Many voice concerns about tampering, being hacked, or system control or personal information falling into the "wrong hands." (Note some said they perceive as absurd the notion of a person hacking a residential HVAC control system, wondering aloud who would seek to break into a computer system to change the temperature of a house.)
- **100% up-time guarantee**. Since essential home systems and security will be connected, need a guarantee that the system will never go down.
- **Warranty and support**. Many mention that they would demand a warranty and a reliable source for support.

**Of the three concepts tested, the most preferred is Safety and Security Management – half called it their most preferred concept of the three reviewed, and the six features most often rated "required" are included in this concept.**

- Features and functionality meet basic needs of family security and prevention of home damage.
- Other concepts are considered nice to have, but perhaps less critical than safety and security of one's home and family.

**Environmental Control is the second most preferred concept. Some gravitate towards a unified approach to zonal temperature control, and the high degree of environmental customization. Others believe the feature richness of the concept is more than they want or need.**

**Energy Monitor is a close third in overall preference. This concept appears to attract consumers who seek to save money on energy bills by conserving energy. Others are less interested – they feel powerless over energy consumption or believe they can replicate this service by monitoring their power bill.**

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# Conclusions & Recommendations

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# Conclusions & Recommendations

**Overall Reactions:**

**User experience is critical: many comment that these concepts must be easy to use to be successful. Several say if a spouse has difficulty with elements of it, it will not get used. Therefore, the software applications, interfaces, and information architecture must be well-developed and tested prior to release.**

**Several prefer a portable touch screen interface that connects to a wall-mount for charging – ideally, this would be battery-powered, and connect wirelessly.**

**Consider voice activation technology - this makes it more convenient for all, but also for older consumers and the disabled.**

**The security of the entire system must be robust, and clearly communicated to buyers. Some consumers will be reluctant to have important household systems managed by a computer that is connected to the Internet, for fear of hackers or other potential intruders. Privacy of data must also be assured.**

**Processing power: offering two options (running the system from one's home PC, or from a dedicated small computer) may be unnecessary - the quantitative study will help determine this.**

- Concern of reliability, tampering by children, and viruses and hackers suggest that those who can afford these solutions will generally be willing to purchase a computer dedicated to running it.

**Communication between system processor and home PC is desired and should be enabled.**

- Most envision a small dedicated device to run the system; ideally, consumers will be able to program, control, and adjust these systems using their home PC. Consumers do expect a robust firewall to protect the dedicated computing device.

**Aesthetics: sensors and other peripherals should be unobtrusive, especially if they are to be located throughout the house. Likewise, the processor must either be located in an accessible but out of sight location, or it must be visually pleasing.**

**Guidance in energy conservation: consider developing an application that provides guidance on how to save energy based on usage in the consumer's home.**

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# Conclusions & Recommendations

**Safety and Security Management:**

**If the security module is deployed, it must be 100% on target – to do otherwise will likely be problematic for the brands involved.**

- Consider partnering with a security firm that has a reputation for excellence in the realm of security; the goal would be to build a security module that could be seamlessly plugged in to the broad concept.
- Consider offering a subscription service that adds the human element desired by some.

**Consider adding a button on the touch screen dedicated to contacting police and fire services; some referred to these as "panic buttons." Also, add an audible alarm indicating a problem that needs immediate attention.**

**If possible, detect water within walls from siding damage or roof leaks.**

**If feasible, integrate option to connect Web cameras to the system for increased home monitoring ability – in a baby's or child's room, or at the front door.**

**Some believe this concept will reduce homeowner's insurance costs – if feasible, build relationships with insurers to that end, as cost savings like these will help drive sales.**

**One believes the touch screen should be able to display cable TV on demand.**

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# Conclusions & Recommendations

**Environmental Management:**

**Comfort and convenience are the two primary benefits of the this concept – consumers envision that the concept will maintain a more comfortable environment with limited intervention.**

**Zonal Environment Control – a primary advantage compared to what is available today.**

- It allows flexibility and control of the environment in various spaces in the home based on an individual's preferences.
- It allows the home owner to save by turning off the cooling or heat in unused rooms.

**Air Quality: several say they would add mold detection and alerts as a capability – this should trigger the air purification system, too.**

**Providing weather, pollen counts, and a message center is suggested; while these are generally perceived as "nice to have," some desire them.**

- If it is a goal to increase consumer interaction with the thermostat, such "information center" functions will yield that result with some consumers.
- A few thought it would be valuable to present travel forecasts, or 10 day local forecasts; some said they were willing to pay $1 a month for more frequently updated weather information.

**The thermostat interface buttons are said to be logical, with clear labels; no one was able to suggest an additional button or control, indicating that those on the thermostat meet consumer needs.**

**Energy Monitor:**

**The primary appeal of the energy monitor is its ability to help consumers saving money; saving energy is generally secondary to saving money.**

- Consumers want to save money – make certain that this desire is well-supported by promoting conservation using Energy Monitor. Adding a guide to find other energy savings would be appreciated – some suggest a guide to efficient major appliances.
- Some see the energy monitor as a vehicle to persuade others in the household to cut their energy usage.

**Consumers suggest the concept developer work with power companies to subsidize Energy Monitor costs; consumers believe the concept will enable conservation of energy, allowing power companies to postpone new power plant construction. If feasible, build relationships with energy companies to facilitate this worthy goal.**

**Trending: month to month and year over year comparisons are desired by some; software should enable this, be it as an export file to Excel, or a simple proprietary software module.**

**Some are concerned that energy companies will use Energy Monitor data to drive power consumption, or increase rates based on usage; consumers need assurance that their usage data specifics will remain private.**

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# Overall Reaction to the SSC Home Concept

**This research indicates that the SSC home concept is a compelling one, considered worthy of investigation and likely the "wave of the future."**

- *"In ten years, I think new homes will be built with this automatically installed."*

**As a solution for their current home, it will streamline existing systems. However, most don't currently have a compelling need to replace those systems.**

- *"It's not a necessity. It's a luxury. I already have these things in my home and they work just fine."*
- *"Everything here is already out on the market. All you've done is taken it and combined it into one little box."*

**Some see the value of a central, integrated system as improving their quality of life by adding convenience and comfort.**

- *"We're looking for anything we can do to make our lives more convenient."*
- *"If I could have that thing running at peak for 20 minutes before I got home, and I knew that when I got in the house there would be no pollen, no dust, just a beautiful bubble that I walked into - I'd be the happiest guy on earth."*

**Most see the primary benefits of such a system as increased home and family safety (from fire, smoke, CO, break-ins, water damage, etc.) and potential for cost savings (energy savings, lower insurance rates, home value, etc.)**

**Single point of contact for multiple systems is attractive for many. However, some point out that an integrated approach makes them more vulnerable to several systems going down at once.**

**There are many questions about how the system would actually operate.**

- Downtime is intolerable. If critical systems such as fire, smoke alarms, temperature are linked together. Specifically in Tampa, 12 to 24 hour power backup was mentioned as insufficient-power outages are all too frequent and often long in duration.
  - *"What if you lose power to your home - does the system go off?"*
- Ease of use. Integrated system is assumed to be more complicated than standalone, particularly with computer integration, and potentially confusing to some household members. A couple suggested a training video.
  - *"I can use different gadgets, but my wife can't. If I'm on a business trip, I would need for her to be able to operate it."*
  - *"We're trying to simplify our lives - any new system would need to be intuitive and not require much effort."*
- Control. Who would have access to the system – one or two users? Kids? Would users need a passcode? What if an unwanted intruder tampered with the system?
- Service and support, warranties. Where would it come from and who would be providing it? Who would be contacted if the system broke down?
  - *"I want to talk to a tech who speaks English and won't put me on hold."*
  - *"Please don't put me in phone-tree jail."*

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# Overall Reaction to the SSC Home Concept

**For older home owners, installation costs are of particular concern, considered potentially prohibitive.**

- *"I think a lot of people are going to get scared away because they will think installation is going to be huge."*
- *"If you're talking about tying into electrical panels and throwing sensors in your walls, that would take someone a lot of time."*

**Most agree that they would want to be able to buy a scaleable system, and pick and choose features to suit their needs and budgets.**

- *"I wouldn't need all of the features. Further, I'm not sure I could afford them all. It would be nice if I could just buy a basic system and then add on over time, as I can afford to."*

**Some say they would want assurance that the system would be upgradeable.**

- *"I wouldn't want to have to replace it every 2-3 years."*
- *"I assume that I'd be able to download updates."*

**Some suggested other household components that would integrate with the system:**

- Television interface – some liked the idea of presenting the user interface on TV so they make adjust the system without going to the PC or touch screen.
- Water consumption monitoring – would detect when water usage goes over the norm, perhaps alerting the homeowner of waste, or leaks that otherwise might go undetected.
- Lawn sprinkler – some thought this might control their lawn sprinkler.
- Coffee maker – several thought turning on the morning coffee would be nice. This points to the possibility that such a device could add convenience to the consumer's life by controlling appliances beyond the HVAC system.

**Voice control activation mentioned by a couple as useful.**

- *"I would like to be able to walk into a room and change the temperature simply by saying, 'temperature 75 degrees.'"*

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# Overall Reaction to the SSC Home Concept Computing Preference

**Most (75%) prefer a dedicated small computer to run the systems**

- *"Seems like a closed device would be much safer."*
- *"A turnkey system would be much simpler. I would know exactly who to call if I needed to get it fixed."*

**Most of these consumers also want that computer to communicate with their PC, but at the same time remain secure from tampering by hackers and their children.**

- Most have children who are said to be careless about how they use the PC; they are said to open emails and attachments with viruses – this makes parents reluctant to rely on the shared home PC to run critical home systems.
  - *"I wouldn't want to use my own personal computer because I share it with my teenager and it can get really messed up."*
- Some say security is a key concern – they do not want home systems compromised by hackers, viruses, etc. "
  - *"If you have to leave your computer on all the time, that makes you more vulnerable to being hacked into."*
  - *"The major concern of privacy and also a threat, particularly if it's connected to my computer, or somehow connected to a network. The more centralized my home systems are, the more open to attach. Then the more of a threat that there is to my privacy. "*
- Many like the idea of having data shared with the home PC so they can review energy usage, and adjust or manage the other systems.
  - *"I'm a data and charts person. I could see trending the data or something like that."*

**The concept is considered a money-saver and may even increase value of the home.**

- *"I think it's very attractive as a resale feature."*
- *"I could probably save money on homeowner's insurance."*

**Though not factored into costs shown, many assumed that some sort of subscription would be involved, particularly for the remote safety and security monitoring.**

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# Overall Reaction to the SSC Home Concept
# Touch Screen Evaluation

Touch screen is viewed as an acceptable interface for the system – easy to use and convenient.

Several want more than one touch screen – those with large houses or multiple levels indicate the convenience of more than one touch screen is very desirable.

- *"I'd keep one right in our bedroom so that I would be alerted to any changes or problems during the night."*

Most say they would locate the touch screen in a central location – kitchen, living room or entry way.

Entry way location most appropriate if system includes safety and security features.

Some prefer a detachable wireless touch screen so they can carry it from room to room, though others say they already have too many gadgets or worry that a portable device would get lost.

- *"I'd want it to have a paging function so I could find it if I misplaced it."*

One size touch screen does not fit all - some prefer small and inconspicuous. Some prefer larger screens that are easier to read, even without glasses.

The text size on the display should be on the large enough to be easily read – the aging baby boomer population will require that.

The user interface must be simple and intuitive – most want the system to be usable by their spouse and/or friends such that there is not a single "system manager" who must resolve all difficulties.

Several say they would want it to be out of sight, or at minimum unobtrusive – they don't want to notice sensors, motion detectors, Web cameras, or wires. Even the touch screen could be tucked away.

- *"I have an armoire to hide my TV. I would probably want to stick this in a closet."*

Most say the message center and screen saver are secondary applications – nice by not necessary.

- *"[The message center] seems kind of useless to me. I have a cell phone, PDA, voicemail and email. This would be yet another place to check for messages - I might miss them. Maybe it would work if you could integrate voicemail with the message center."*

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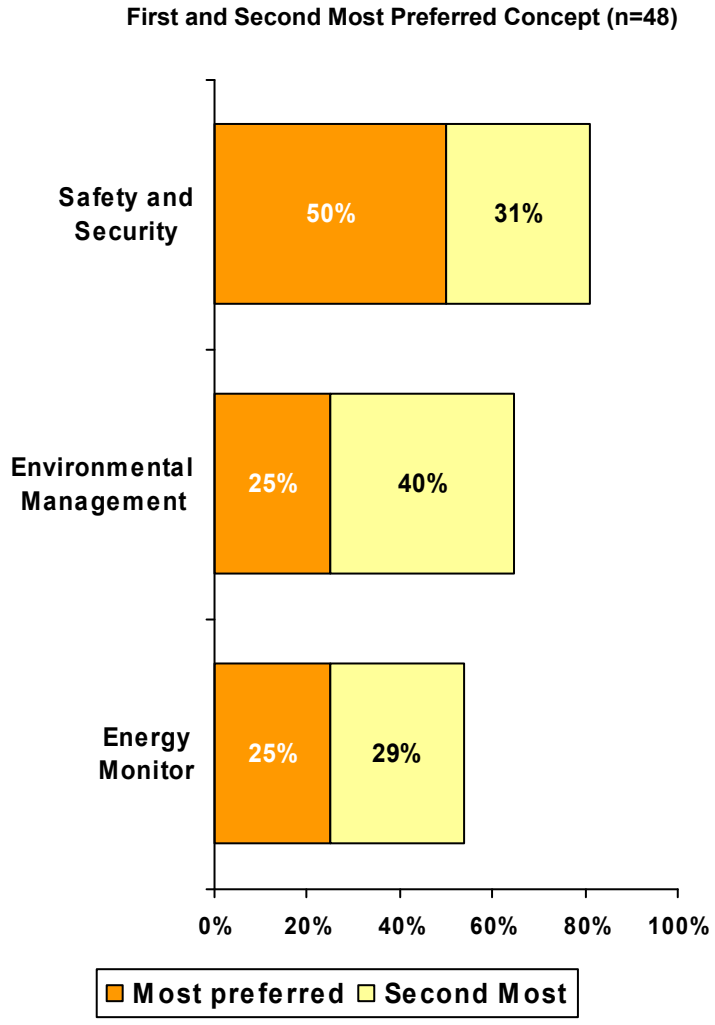
# Overall Reaction to the SSC Home Concept
## Concept Preference




- Consistent with other research conducted for the Internet Home Alliance, consumers prefer a concept that directly impacts their perceptions of safety and security.
- Environmental Control is the second most preferred concept. Some gravitate towards a unified approach to zonal temperature control, and the high degree of environmental customization. Others believe the feature richness of the concept is much more than they want or need.
- Energy Monitor is a close third in overall preference. This concept appears to attract consumers who seek to conserve energy and thus save money on energy bills. Others are not interested in the process - they feel powerless over energy consumption or believe they can replicate this service by monitoring their power bill.

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# Key Findings

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# Reaction to Safety and Security Management

**The Safety and Security Management concept was the most appealing concept of those tested – the top choice for half of all participants. It also generated the most discussion. (See appendix slides 49-51 for concept description, as shown to respondents.)**

**Benefits focused on a few key areas:**

- Family safety. *"I'm a mom with young kids, and keeping my family safe is my primary concern."*
- Home safety. *"I like the assurance of knowing if a window or garage door is open."*
- Potential cost savings. *"As soon as a pipe bursts and someone is alerted, you could save a lot of money and headache."*

**Some security alarm owners say they are accustomed to having a panic button and an audible alarm – they consider these essential parts of a security system. Note that these specific elements were not part of the Safety and Security Management concept.**

**Discussion centered around notions of remote notification/monitoring and detection of water leakage.**

**Many say that detection of water leakage/home damage is something they don't have with current systems, but would be very useful.**

- *"The drip under the bathroom sink that has now ruined your vanity and bubbled up the tile and ruined the floor joists. Now you are looking at thousands of dollars of work just from a little drip you never knew was going on."*

**Enthusiasm about water detection is not limited to those with older homes. Water damage is typically expensive to fix, can be hidden from sight, and can happen for many reasons.**

- *"I heard my [new construction] neighbor scream as she walked into her kitchen. A water pipe had burst and was spraying all over her new kitchen. If I hadn't been there to turn off her water supply, I don't know what she would have done."*

**Remote monitoring of home systems is a particularly compelling selling point for the Safety and Security Management concept.**

- Monitor home environment while away.
  - *"This worries about your home so you don't have to."*
  - *"It's like having a house-sitter."*
  - *"One of my fears is if I go away on a seven to ten day vacation and something goes wrong when I'm away. With this system, I wouldn't have to worry."*
- Control emergency situations, such as smoke, fire, break-in, carbon monoxide leaks directly.
  - Homeowner always notified first, whereas with alarm system, notified after the police or fire have been dispatched
  - Assumed that the programmable phone tree list would let the user specify what numbers the system would dial for different situations.
- Allows home owners to make remote changes to environment – temperature, appliance on/off.

**Remote notification is valuable, though the method of contact desired is varied – most mention cell phone as most convenient – ubiquitous and always on.**

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# Reaction to Safety and Security Management

**There is a perception that the basic system as described goes part of the way – but not necessarily all the way – towards replacing existing security services.**

- There is no explicit mention of police or fire being contacted in the event of an emergency, which concerns some consumers. When they are informed that these numbers can be programmed into the interface, and that the system is designed to allow conditional responses (on discovery of fire, call fire department number (and not police department, unless specified), some are mollified. Others are not.
- Several say that without a human involved, the system may make inappropriate decisions, or that emergency services may treat automated messages differently compared to those from a human. Some consumers relate personal experiences where an incident occurred, and an operator called them to confirm an emergency – some prefer this interaction.

**However, the system offers benefits that some don't currently have with their alarm system.**

- Fire alarm – some say this is a must – the alarm must contact the local fire agency, and alert those in the house.
  - While consumers like the option to have alerts sent to their cell phone, a neighbor, or the touch screen, they expect the fire department to be notified first.
  - Burned toast results in call to fire department – existing in-home smoke detectors might go off, but do not result in a call to the fire department. *"I'd need the ability to override the calls to the fire or police departments."*
- Burglar alarm – it should contact police, and alert those in the house – some want lights to turn on, a siren to sound, etc.
  - If a window or door is opened and the system interprets it as a break-in, there is concern that police would be mistakenly called.
  - The description leads some to believe this is similar to ADT or like services; these consumers seem to believe that the security component is not all it should be, but have difficulty articulating what they would add.
- Some suggest that integration with strategically-placed home monitoring cameras would be desirable – for break-ins or appliance malfunction.

# Reaction to Safety and Security Management

**The remote notification decision tree must be exceptionally well-developed, and account for myriad conditions: the system will be expected to interpret a wide variety of data, and take appropriate actions – this is especially important in the realm of the Safety and Security of one's family and property.**

- Must allow customers to easily and efficiently pre-program the system to accommodate a wide variety of eventualities:
  - Will burned toast result in the fire department responding? Can the home owner over-ride fire department notification?
  - Will the system be able to discern a spilled beverage in the basement carpet or a drippy pipe, from a bona fide leak or flood? How will it respond to each – can the consumer set responses for each eventuality, and if they can, will they? Will it be easy to do?
  - Will the system be able to discern a window or door open on purpose, vs. a break-in?

**Some consumers prefer to be alerted, and make decisions based on their observation of actual conditions.**

**Concerns about inappropriate automatic shutoff of systems were voiced, suggesting the need for human intervention:**

- Freezer – spoiled food that might run into thousands of dollars
- Heat during the winter – resulting in inadvertent heat shutdown, frozen pipes.
- Clothes washer during wash cycle when clean clothes are needed for work.

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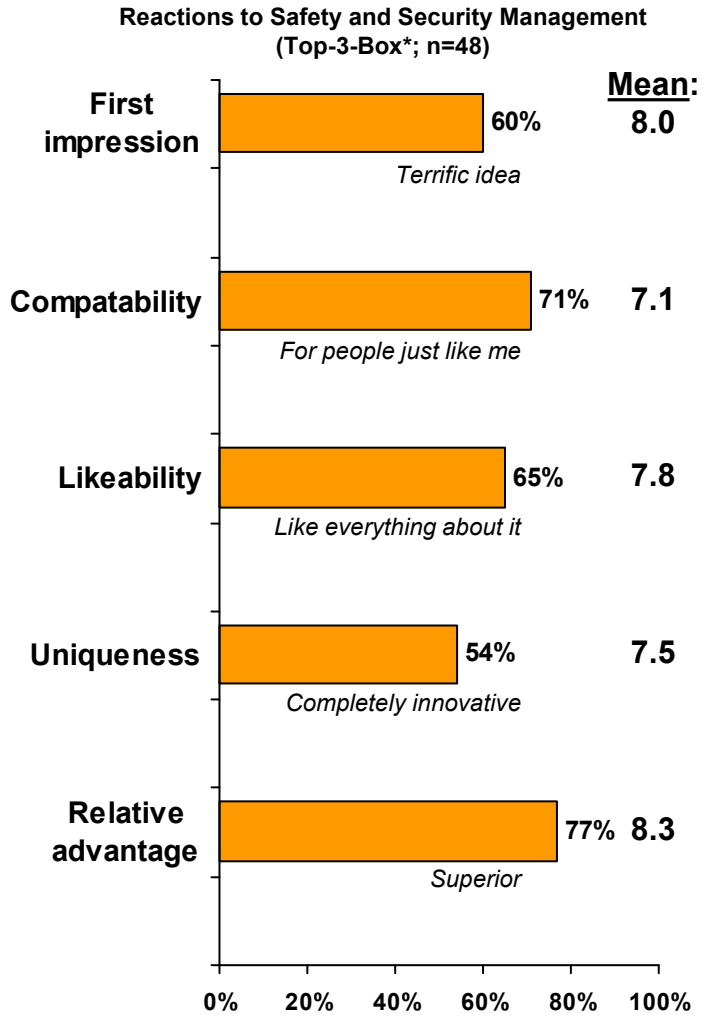
# Safety and Security Management
# Adoption Metrics




Each question based on a 10 point scale where 10 represents the listed attribute, and 0 is the antithesis.

**These metrics are designed to measure a number of criteria that can indicate potential product adoption.**

**This concept is generally perceived as likeable, superior to existing alternatives, and compatible with most of the consumers interviewed, though it is less likely to be perceived as innovative.**

- Note that women are significantly more likely than men to say they "like everything about" this concept, and that it is "innovative." Differences by gender across the other metrics are subtle, and not statistically significant. The implication is that both genders perceive the concept to have value (it is about even in first impressions, perceptions of compatibility, and relative advantage).

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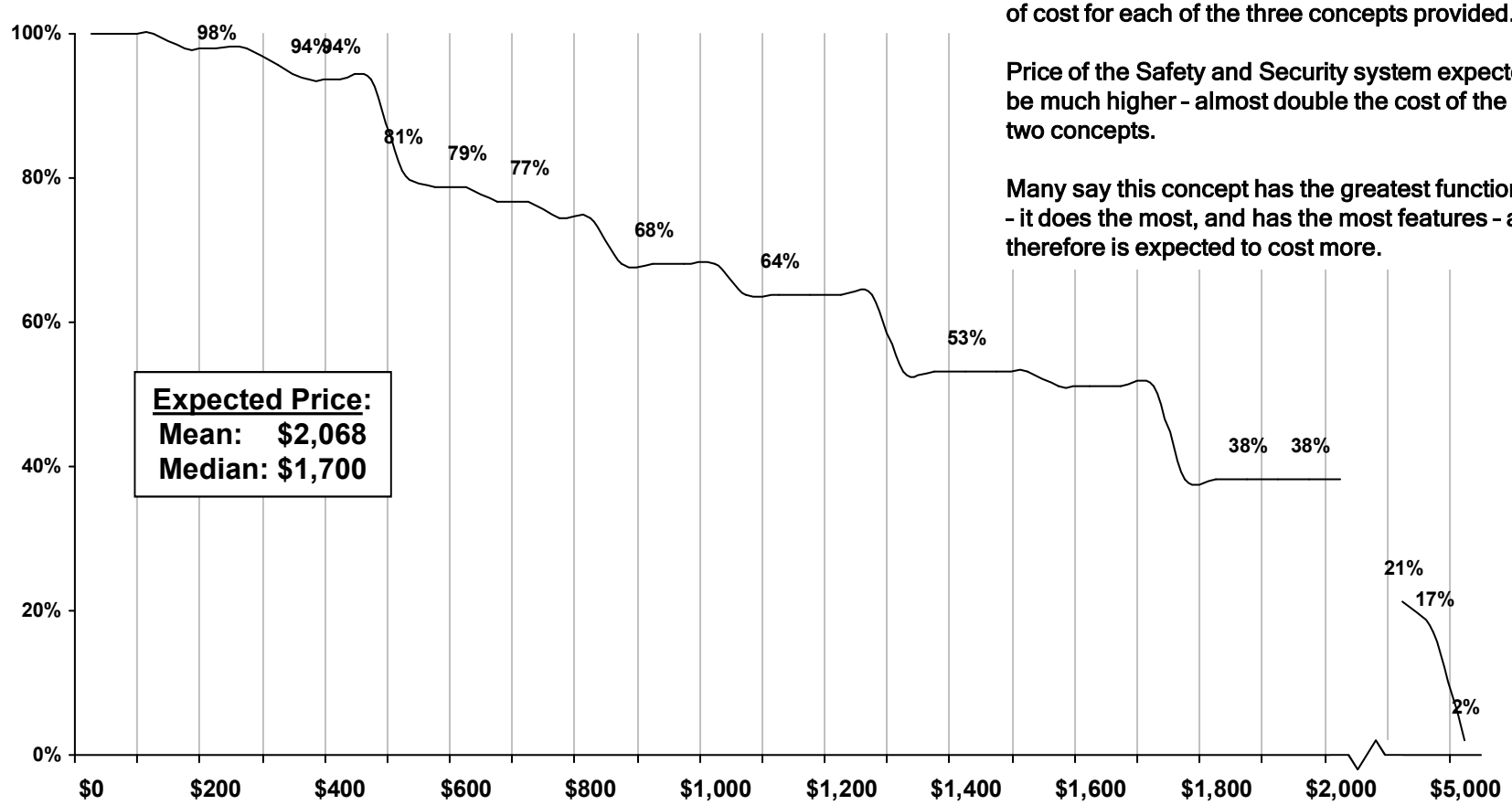
# Safety and Security Management
## Estimate of Expected Price (excluding installation)

**Expected Price For This Concept (n=47)**




Participants were asked to write down their estimate of cost for each of the three concepts provided.

Price of the Safety and Security system expected to be much higher - almost double the cost of the other two concepts.

Many say this concept has the greatest functionality - it does the most, and has the most features - and therefore is expected to cost more.

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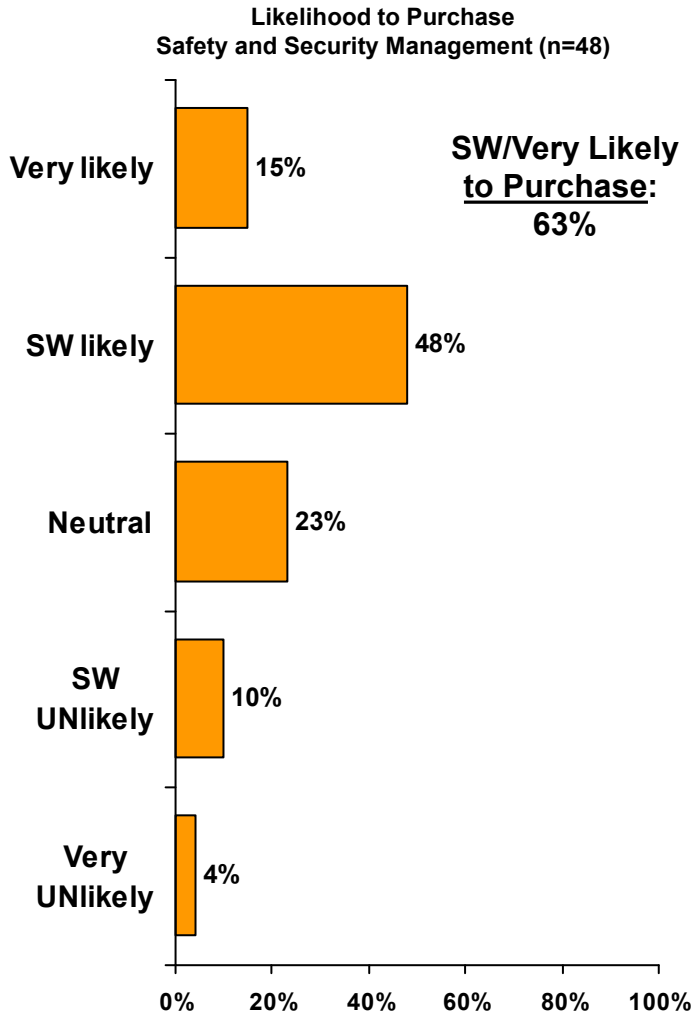
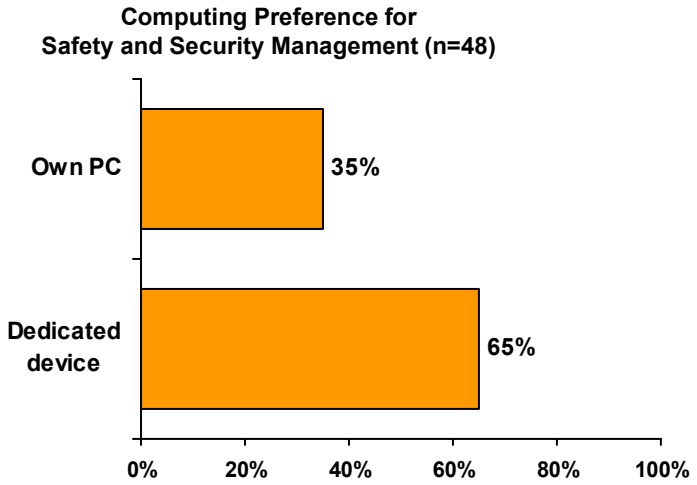
# Safety and Security Management
## Likelihood to Purchase




Likelihood to purchase the Safety and Security Management concept at one's expected price is strong – almost two-thirds indicate a likelihood to purchase.

Most prefer to use a dedicated device to manage this concept.

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# Key Findings

- Background & Methodology
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  - Overall Reaction to the Safe Secure Comfortable (SSC) Home Concept
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  - Reaction to Energy Monitor
  - SSC Home Features Preference
  - Reaction to Thermostat
  - Sample Profile
- Appendix

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# Reaction to Environmental Control

**The environmental control was the most preferred concept for one quarter of participants. (See appendix slides 52, 53 for concept description, as shown to respondents.)**

- Those who preferred it were attracted to its programmable home comfort functions. *"I like the idea of knowing that the temperature will be set to my preference when I come home."*
- Some with allergies mention that a centralized dehumidifier/air purifier control is appealing. *"I have terrible allergies, particularly in the morning. It would be nice if I could program the system to turn up the heat and turn on the air purifier shortly before I get up."*

**Several mention the system is appealing because it may mediate situations when one person in the household is hot while the other is cold.**

- With room and zone controls, each person could be comfortable without disturbing the other.
- Several also mention that unused rooms can go with less heat or cooling, allowing the consumer to save money and energy.
- Only a few express awareness that the HVAC system must be able to accommodate this functionality.

**Several worry that open control of temperature could be problematic with children in the home who might abuse the system – they desire a pass code for each user.**

- No one mentioned that this is currently an issue in their home, suggesting such thermostat control issues may be less important.

**Messaging center is not a compelling feature for most.**

- Not needed. *"We communicate just fine. I don't need a message center."*
- Substitute devices are sufficient. *"I wouldn't want to have to check phone voicemail, cell phone voicemail and then this. I'd forget."*

**The defined programmable functions (e.g., Home-Awake; Home-Asleep; Away; Vacation) met virtually everyone's needs.**

- The labels were clear, recognizable, and understood.
- No buttons considered missing.

**Most believe just putting it in a centralized location would not result in more frequent use.**

- *"It's basically a thermostat plus."*

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# Reaction to Environmental Control

**Weather and pollen counts are generally said to be "nice to have," but such information is easily available elsewhere. Few see why they'd need to pay $1 for a subscription information service.**

- *"I have weather.com bookmarked on my homepage. I check it every morning when I read the paper online."*

**When considered in conjunction with the other concepts presented, some point out that the temperature control would be especially appealing if it could be controlled remotely from a remote PC, PDA, or cell phone.**

- *"The ability to control your thermostat was probably the most intriguing to me, particularly controlling your thermostat from outside your home, to prepare for when you re-enter your home."*

**One person suggested an interesting variation – a GPS-triggered system.**

- *"When you're within 30 minutes of your home, the GPS would sense you and send you a text message with current home temperature and ask if you'd like to adjust it. Maybe even ask you if you'd like to turn the lights on."*

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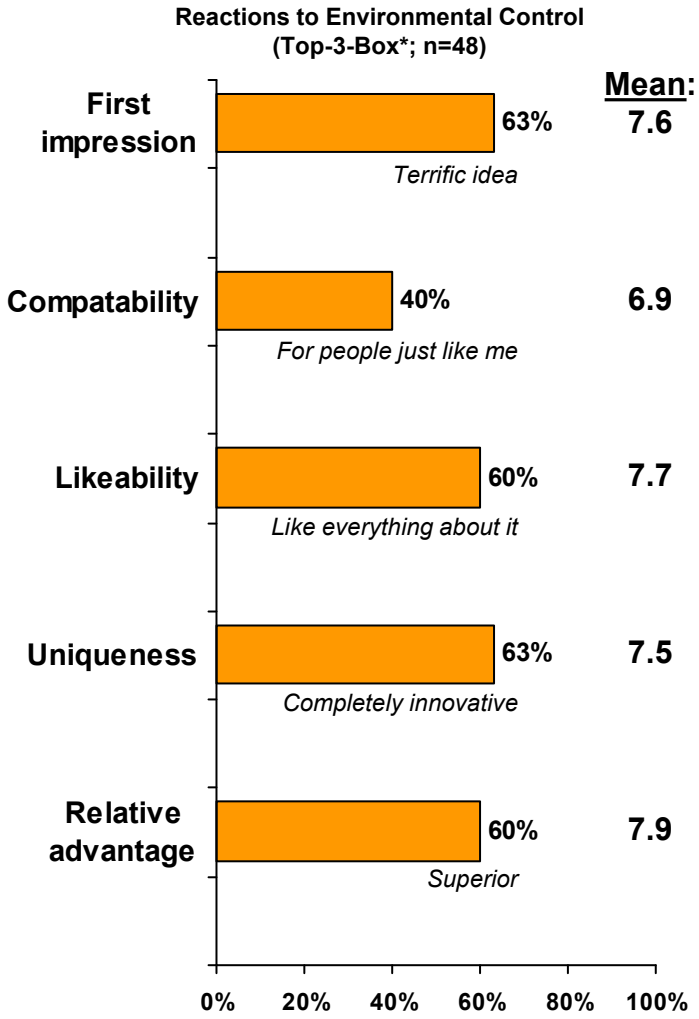
# Environmental Control
# Adoption Metrics




This concept is generally perceived as likeable, innovative, and superior to existing alternatives, though it is less likely to be perceived as compatible for these consumers.

Each question based on a 10 point scale where 10 represents the listed attribute, and 0 is the antithesis.

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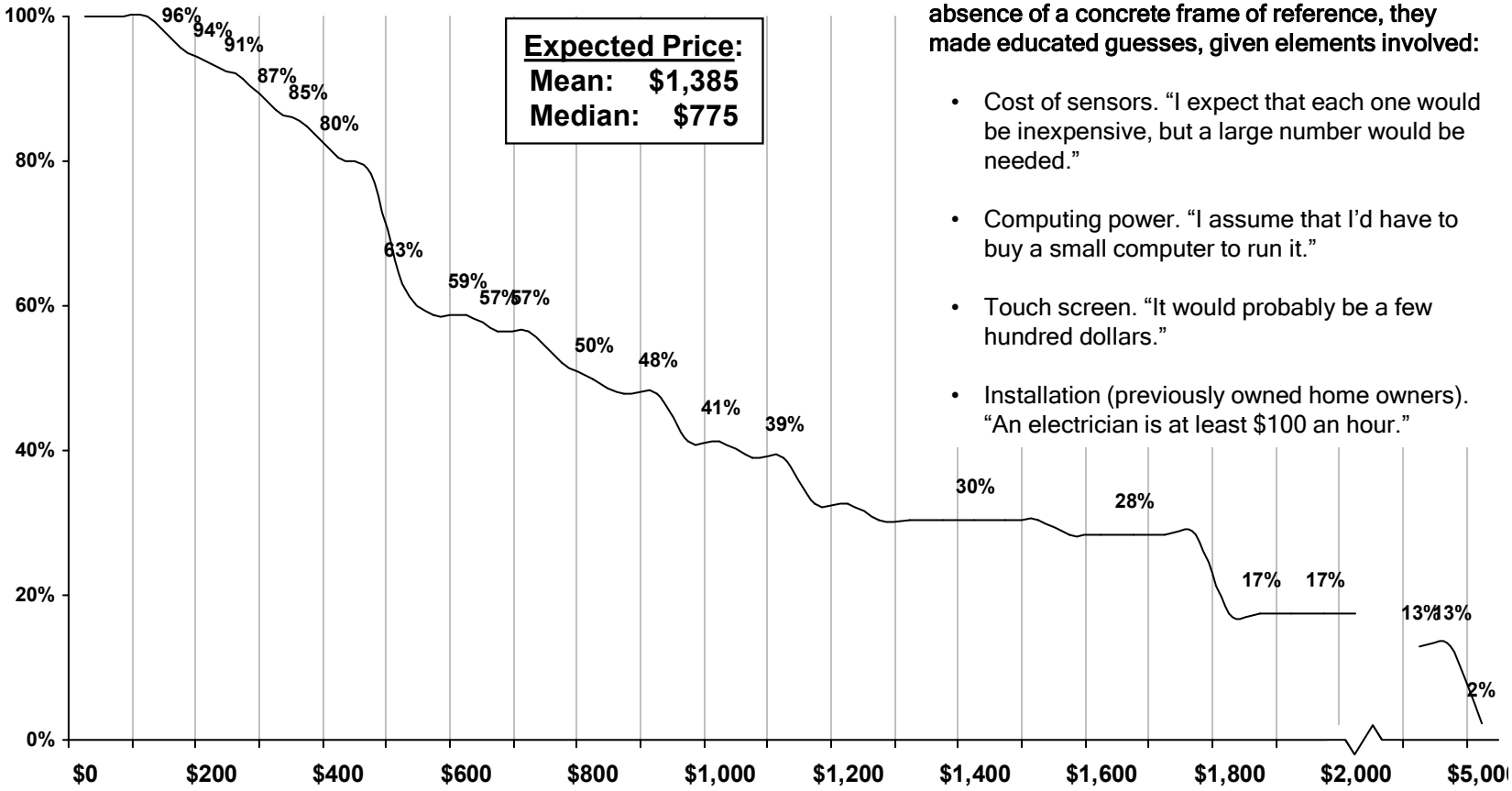
# Environmental Control
# Estimate of Expected Price (Excluding installation)

**Price Expected For This Concept (n=46)**




**Participants were asked to write down their estimate of cost for each of the three concepts provided. In absence of a concrete frame of reference, they made educated guesses, given elements involved:**

- Cost of sensors. "I expect that each one would be inexpensive, but a large number would be needed."
- Computing power. "I assume that I'd have to buy a small computer to run it."
- Touch screen. "It would probably be a few hundred dollars."
- Installation (previously owned home owners). "An electrician is at least $100 an hour."

- **Some thought this concept added little to a typical programmable thermostat, while others liked the ability to control it remotely, or liked the zonal temperature control.**

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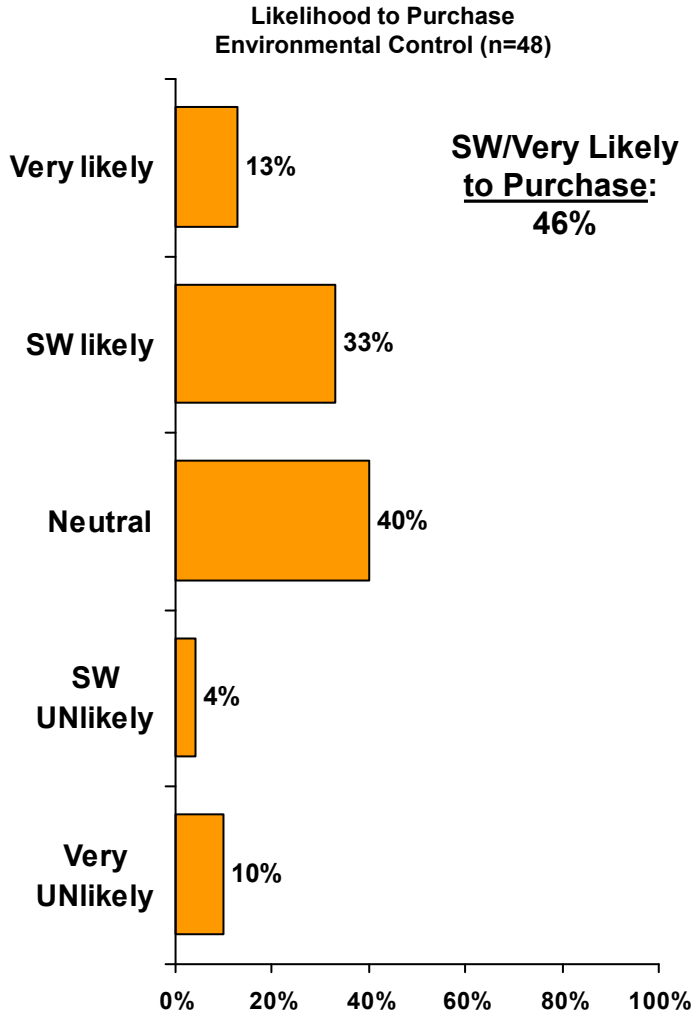
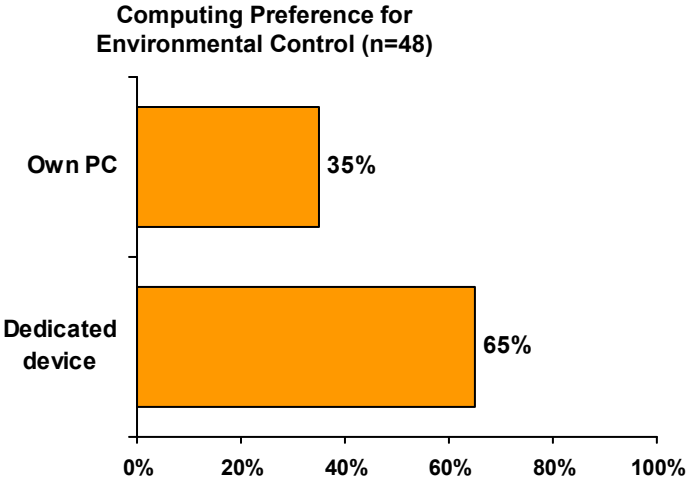
# Environmental Control
# Likelihood to Purchase




Likelihood to purchase is promising – almost half express some likelihood to purchase the Environmental Control if offered at their expected price.

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# Key Findings

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# Reaction to Energy Monitor

**A quarter of participants chose the energy monitor as their favorite concept. (See appendix slides 54, 55 for concept description, as shown to respondents.)**

**Though some are genuinely interested in helping the environment, most admit that the appeal of the energy monitor translates to saving money.**

- *"If you can lower your energy costs, you can use that money for something else."*
- *"I'm always interested in figuring out ways to save money. This looks like a way to do that."*

**Some see energy monitor as a way to present evidence to household members regarding energy consumption as a way of modifying behavior to save energy and money.**

- *"I'm hoping that it would get my wife to turn off the lights when she leaves a room."*

**Central location of the touch screen with energy "gauge" may act as a reminder of need of need to change behavior.**

- *" I have a gauge in my car that tells me instant gas mileage. When I look at it and I'm only getting two miles to the gallon–I really back off on my gas pedal, so it goes to 18 again. I see this in a similar light. If it was in front of me, I'd do something about it."*

**Others say the energy monitor is not for them.**

- Not realistic. *"It might be nice in theory, but I honestly don't think I'd do fewer loads of laundry or use fewer lights."*
- Power bills provide sufficient monitoring. *"I review the chart that is on my power bill that compares usage from month to month. I'm competitive by nature, so I always see if I can do better each month in conserving energy."*
- Savings potential is not sufficient to warrant the investment: *"My energy bills are like one percent of my monthly bills so really the savings from an energy perspective would probably be minimal."*

**That said, the energy monitor provides a solution that provides more detailed data about where energy is being used most, and is therefore perceived as being superior to just reviewing the power bill (74% said it is superior to what they are using now).**

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# Reaction to Energy Monitor

**Some comment that the energy monitor would be useful to them for a short period of time (a month or two) – they would learn where energy is used and wasted, and consequently modify behavior. After this, they believe the concept would not be needed.**

- *" We left our outside Christmas lights on for a month and then were surprised by a $300 electric bill. This might have prevented that."*
- *"I think this would be a good thing to have on a short term, but I didn't need to sit there and monitor my energy every day and every hour."*

**Parents see it as a way to monitor their children's usage of lights, TV, and/or computer.**

- A variation was offered – partly in jest, but perhaps there is something to this – a couple of parents suggested that this could be used to set a time limit on TV or computer for their children, such that if the time allotment was exceeded, the power would be shut off to that appliance. Perhaps, short of that, the system could notify the user via messaging technology that their usage period was up, with an alert to the parent.

**A couple of consumers mentioned concern that data collected by the energy monitor would be shared with others, possibly to increase utility bills.**

- *"I don't want the power company to know how much energy I use. They might try to raise my rates."*
- *"Then there is a threat to my privacy. Is my energy usage… Is everything that I do in my home going to be tracked by a company, who is then going to sell me something based on my behavior?"*

**Some suggest that the energy monitor would be most useful through collaboration with local agencies, related companies.**

- The energy monitor should be in communication with the power company so that potential savings from reducing or time shifting energy consumption can be communicated by the energy monitor.
- There is a desire to know potential savings if one switched to an Energy Star appliance. If possible, the energy monitor might include a diagnostic questionnaire that would recommend energy saving appliances with the resulting power savings translated to dollars and cents.
- Several thought their power company might offset the cost of the energy monitor because energy conservation translates into the need for fewer new power plants.

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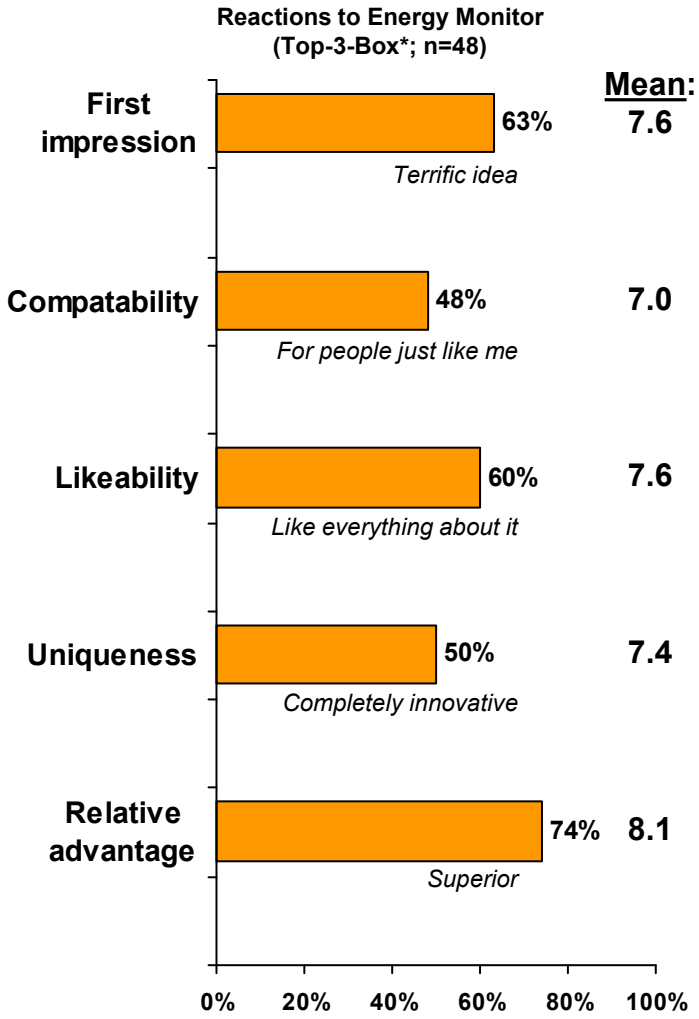
# Energy Monitor
# Adoption Metrics




Energy Monitor is perceived as superior to what consumers currently use to fill this needs, but only about half say it is innovative, or designed for them.

Each question based on a 10 point scale where 10 represents the listed attribute, and 0 is the antithesis.

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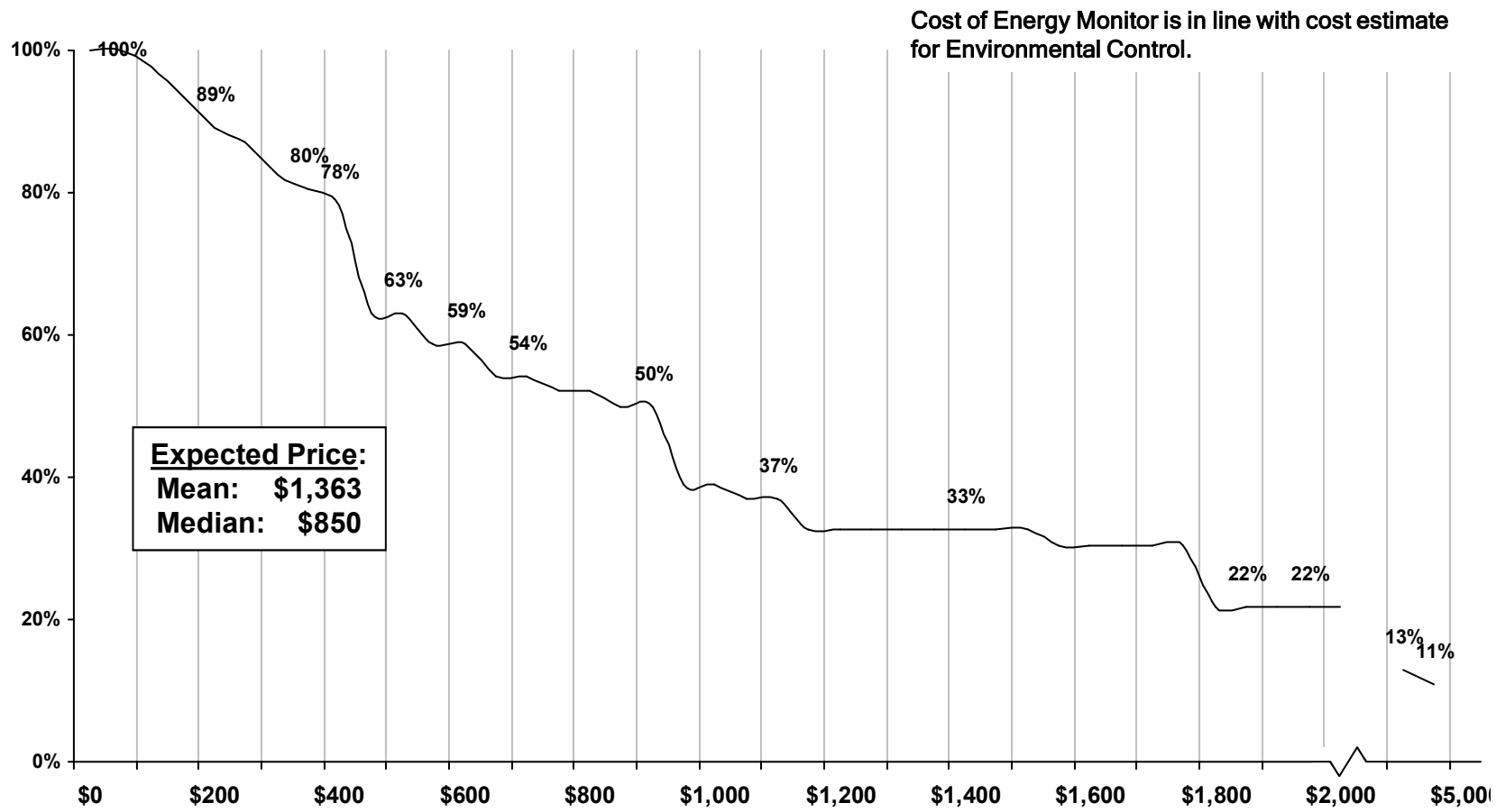
# Energy Monitor
## Estimate of Expected Price (excluding installation)

**Price Expected For This Concept (n=46)**




- Consumers generally seemed to think this concept would be easy to install, and of short term value.

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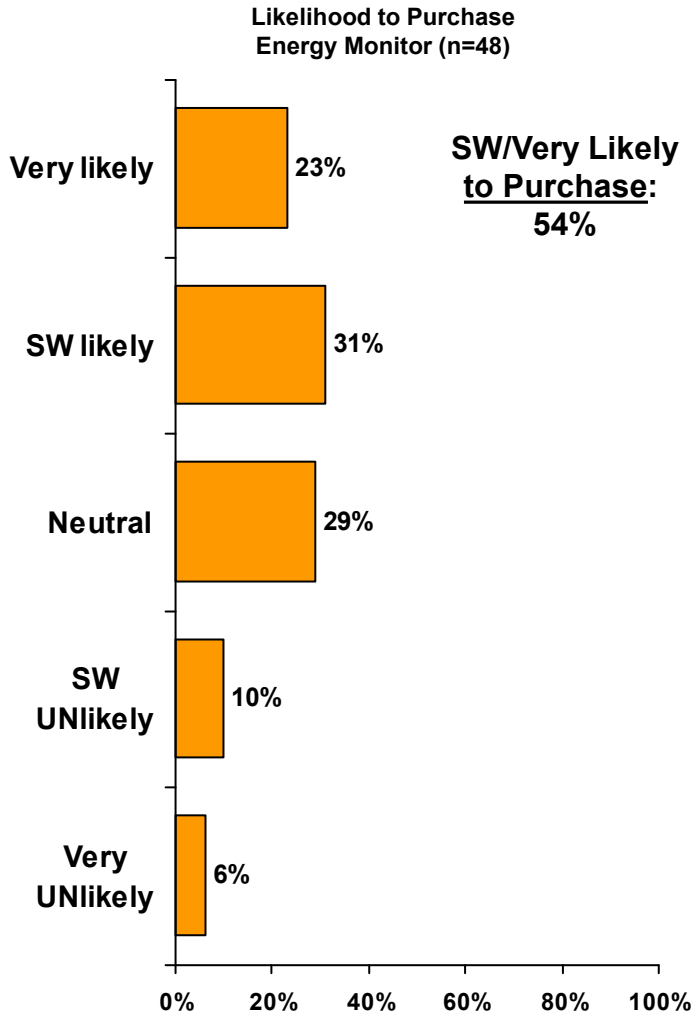
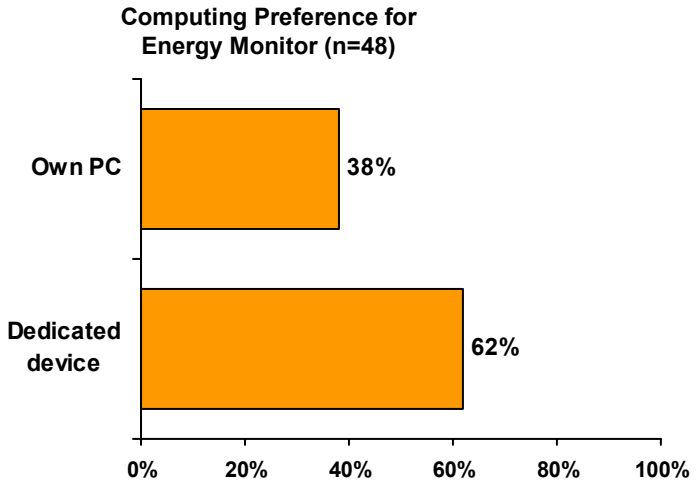
# Energy Monitor
# Likelihood to Purchase




About half indicate some likelihood to purchase Energy Monitor.

As with the other concepts, most anticipate running it using a dedicated device.

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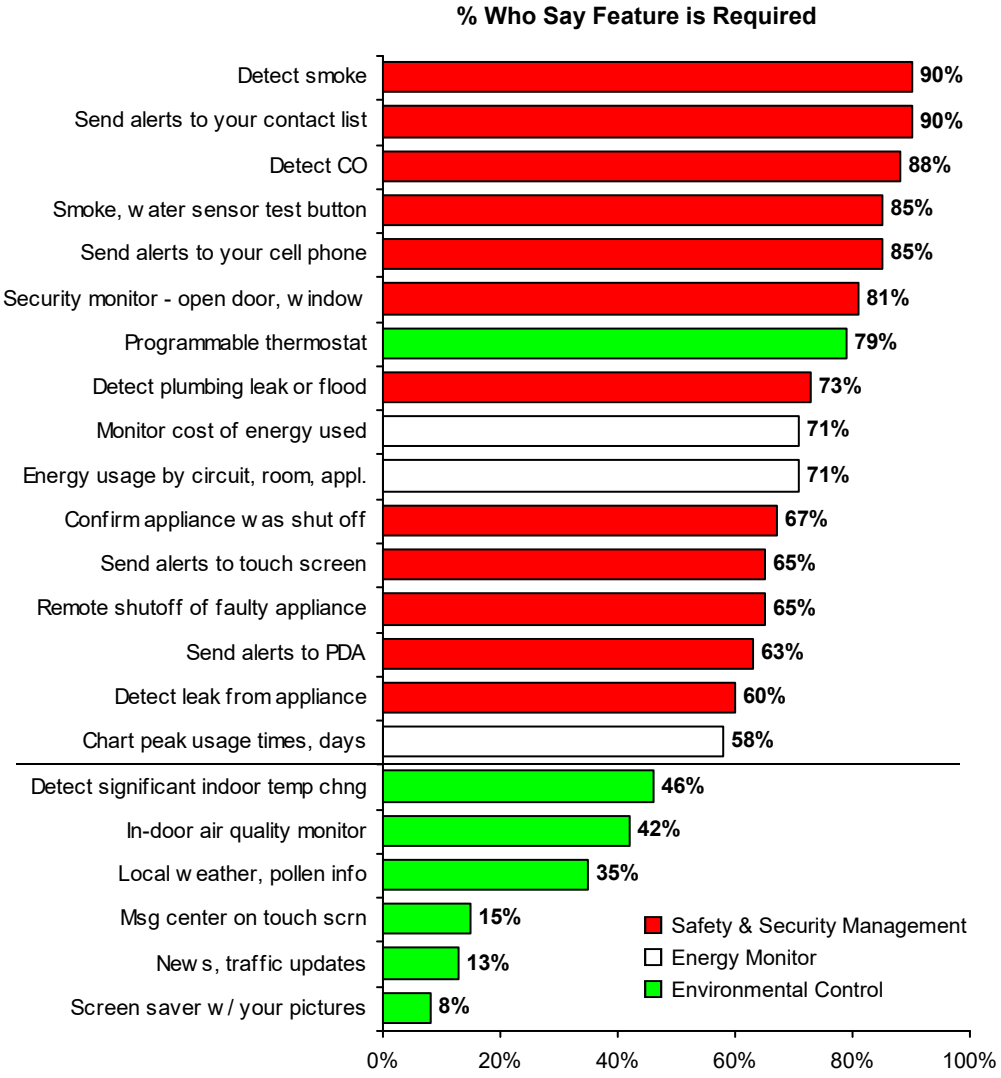
# SSC Home Features Preference
## Required Features




**Consumers were asked to consider the three concepts as an entire package of products, and were asked to say which among twenty-two features were absolutely required for them to purchase the package, which features were nice, but not required, and which features were better left out.**

**Overall, most of the consumers will require multiple features**

**The most frequently selected are included in the Safety and Security Management concept. Notice that a majority require 16 of the 22 features; conversely, few say any of the features are better left out.**

**This suggests that even those features that are less frequently "required" are perceived as nice to have value-added features.**

***Required Features*:**

**The top six "required" features are from the Safety and Security Management concept.**

**The six least frequently "required" features are from the Environmental Management concept.**

***Features Better Left Out:***

**Features most frequently rated "better left out" include:**

- News and traffic alerts displayed on the touch screen (38%)
- Screen saver with pictures selected by the home owner (31%)

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# SSC Home Features Preference
# Potential Feature Bundles

**A software package called BundOpt was used to determine potential reach of two feature sets:**

| Potential Bundle 1 | | Potential Bundle 2 | |
|---|---|---|---|
| **Features:** | **If this set of features is offered:** | **Features:** | **If this set of features is offered:** |
| Programmable Thermostat | 100% require 4 of these 6 features | Programmable Thermostat | 100% require 7 of these 11 features |
| Monitor Energy Usage by Circuit, Room, Appliance | 94% require 5 of these 6 features | Monitor Energy Usage by Circuit, Room, Appliance | 98% require 9 of these 11 features |
| Monitor Cost of Energy Used | 88% require all 6 features | Monitor Cost of Energy Used | 92% require 10 of these 11 features |
| Smoke Detector | | Smoke Detector | 85% require all 11 features |
| CO Detector | | CO Detector | |
| Detect Plumbing Leak or Flood | | Detect Plumbing Leak or Flood | |
| | | Alerts sent to my wireless | |
| | | Alerts sent to my contact list | |
| | | Remote shutoff of faulty appliance | |
| | | Security monitor | |
| | | Test button | |

**Very desirable feature sets can be created that include most "required" features:**

- Potential Bundle 1: all the consumers in this sample can find four of their required features in this set of six features.
- Potential Bundle 2: 98% of the consumers in the sample can find nine of their required features in this set of 11.

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# Reaction to Thermostat

Three models were evaluated by consumers – each had promoters, and some had detractors. By their comments, consumers imply that available real estate should be used for the largest possible display. Therefore, perhaps the "ideal" thermostat would be a portable, small device with the largest possible screen size relative to the size of the device, a combination of Models L and N.

Portability – some strongly gravitated to the notion that they could take a thermostat with them to the couch to read or watch TV – it is said to add convenience to a traditional device.

- Those who liked this functionality said a portable thermostat would need a locating pager so that it could be found when misplaced.
- Some questioned why one would want or need a portable thermostat.

Small and sleek thermostat (model L): those who preferred this model liked its compact size. It was generally perceived as the least obtrusive of the designs, a small box with little unused real estate.

- Many commented that the display was small, making the labels hard to read. *"If you put the large type of the larger model on the smaller form factor, that would be perfect."*

Larger wall-mounted thermostat (model N): some liked it because it has a large screen, with large type, making it easier to read. This will become increasingly valuable to aging baby boomers.

The largest model (model G) challenged consumers a bit.

- Some commented on the small screen size relative to the large overall size, saying there was a large amount of unused surface area relative to the display size.
- Some noted the form factor is not shaped for holding comfortably in one's hand.

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# Sample Profile

| Segment | % |
|---|---|
| **Total n=48** | **100%** |
| **City** | |
| Boston | 29% |
| Tampa | 42% |
| Portland | 29% |
| **Home Type** | |
| New Construction | 48% |
| Previously-owned | 52% |
| **Demographics** | |
| **Gender** | |
| Male | 54% |
| Female | 46% |
| **Age** | |
| 25-34 | 40% |
| 35-44 | 37% |
| 45-54 | 19% |
| 55+ | 4% |
| **Income** | |
| Up to $75,000 | 31% |
| $75,000 up to $100,000 | 29% |
| $100,000 or more | 40% |
| **Education** | |
| HS or equivalent | 4% |
| Some college | 25% |
| College degree | 48% |
| Some grad school | 4% |
| Grad degree | 19% |
| **Children in HH - age 12 or less** | |
| None | 31% |
| One | 35% |
| Two | 25% |
| Three or more | 8% |
| **Children in HH - age 13 to 18** | |
| None | 67% |
| One | 21% |
| Two | 13% |

| Segment | % |
|---|---|
| **Total n=48** | **100%** |
| **Household Characteristics** | |
| **Water Damage (ever experienced)** | |
| Yes | 77% |
| No | 33% |
| **Manage and Control Energy Use (current home)** | |
| Yes | 81% |
| No | 19% |
| **Select heat system (current home)** | |
| Yes | 50% |
| No | 50% |
| **Select cooling system (current home)** | |
| Yes | 56% |
| No | 44% |
| **Select water heater (current home)** | |
| Yes | 35% |
| No | 65% |
| **Use air quality system (current home)** | |
| Yes | 31% |
| No | 69% |
| **Install systems for fire, smoke, CO** | |
| Yes | 67% |
| No | 33% |
| **Home Security System** | |
| Yes | 44% |
| No | 56% |

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# Appendix

The following slides were shown as posters and as handouts in the groups.

Appendix

# Overview

- Manages your home environment:

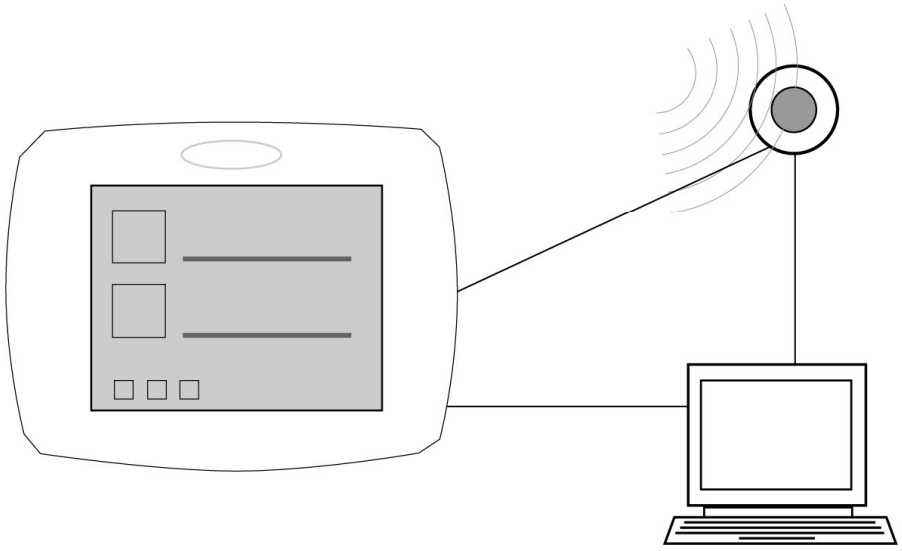
  — Comfort — Safety — Security —
- Related but distinct concepts – independent, but can work together.
- Early stage of development – not final products.
- For new or older homes.
- Wired or wireless connectivity.
- Integrate with a home network if desired.
- Built-in redundancy.

- Air Quality = indoor humidity, pollen, dust, odor

Appendix

# Overview

- Each concept requires a wall-mounted touch screen display, sensors and computing power.
  - Computer options:
    - Your home PC, OR
    - A dedicated Windows CE device
- Remote notification and control



Appendix

# Safety and Security Management

- Senses potential problems in the home:
  - Smoke – automatically shut off HVAC
  - Carbon monoxide (CO)
  - Water leakage – detect floods, leaky plumbing; automatic shut off of leaking appliance
  - In-door temperature change – automatic temperature adjust
  - Freezer power failure – automatic shut off
- Provides home security features including:
  - Alert if garage door left open unexpectedly
  - Alert if home entryway or window open
  - Turn on lights for perceived occupancy if problem

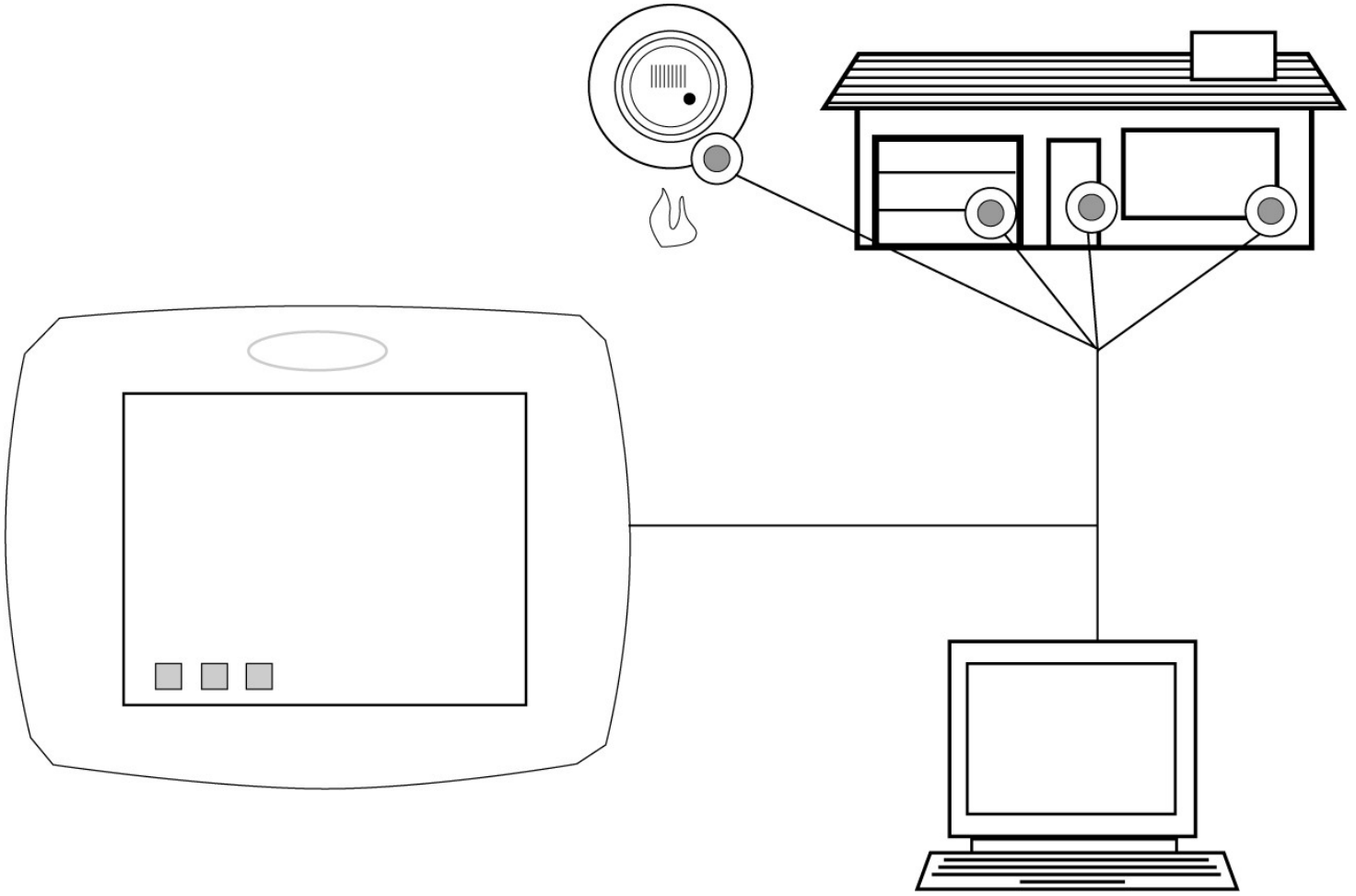
Appendix

# Safety and Security Management

- Requires two types of devices.
  - Sensors placed on doors, windows, ceilings, and under appliances that use water.
    - Detect: CO, smoke, leaking water, significant indoor temperature change
    - Turn off appropriate system
    - Notify home owner (or someone else, if you like)
- Touch screen display - anywhere in the home.
  - Touch screen, sensors and PC/Windows CE device communicate wirelessly or via structured wiring.
  - Notification system assumes contact with other devices.
  - Can notify home owner (and other designees) of problems.
  - Keeps trying until someone is reached.
  - Can automatically shut down devices if they are causing a problem.

Appendix

# Safety and Security Management



Appendix

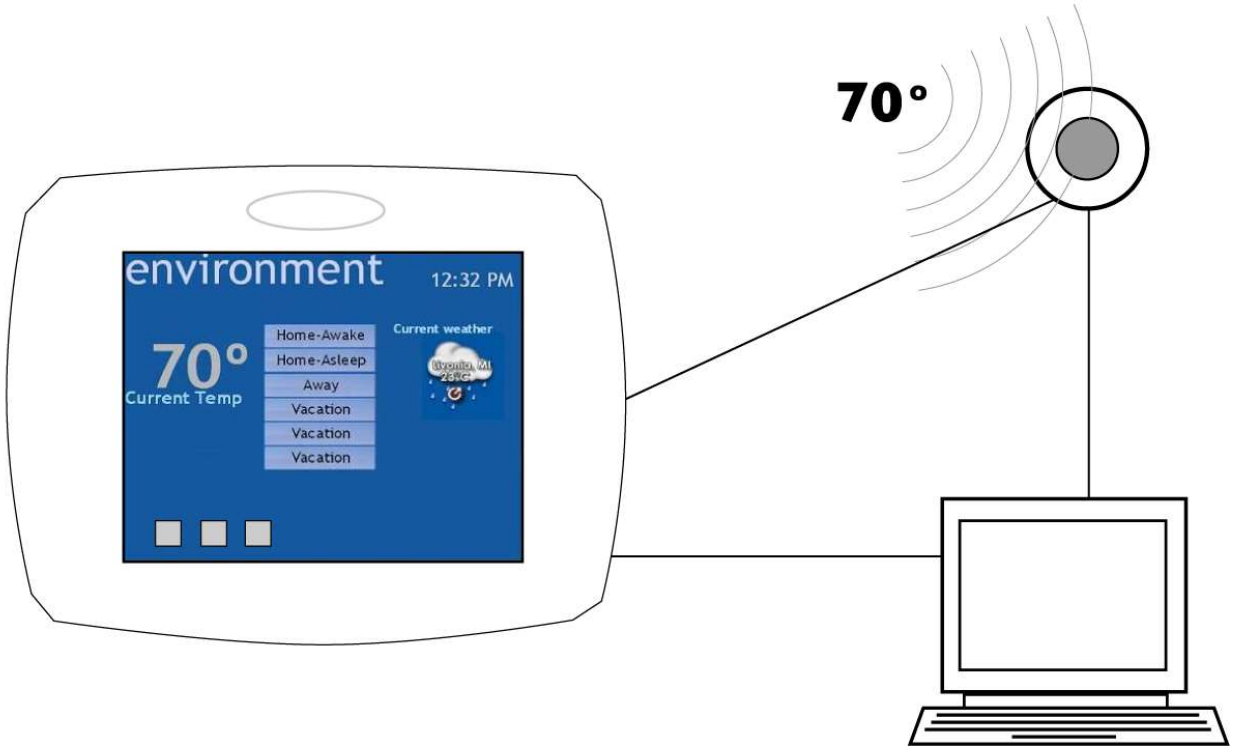
# Environmental Control

- Pre-program or manually change home air environment to your desired level of comfort.
  - Programmable thermostat
    - ‘Home-Awake’, ‘Home-Asleep’, ‘Away’, ‘Vacation’, ‘Sleep,’ set for individual rooms or zones of the house.
    - Intelligent sensor can adjust for occupancy in certain zones at different times of the day, change in outside temperature.
  - Home air quality – turns on air purifier or dehumidifier automatically if air quality is below your desired level.
  - Receives and displays updates – local temperature and weather, pollen counts.
  - Stores brief voice or text messages.

Appendix

# Environmental Control

- Requires two types of devices.
  - Touch screen display - anywhere in the home.
    - Review indoor air quality and temperature; program and change settings.
    - Monitor information about environment.
    - Communicates wirelessly or through structured wiring with PC/Windows CE device and sensors.
  - Sensor (thermostat) - simple thermostat placed on an internal wall.



Appendix

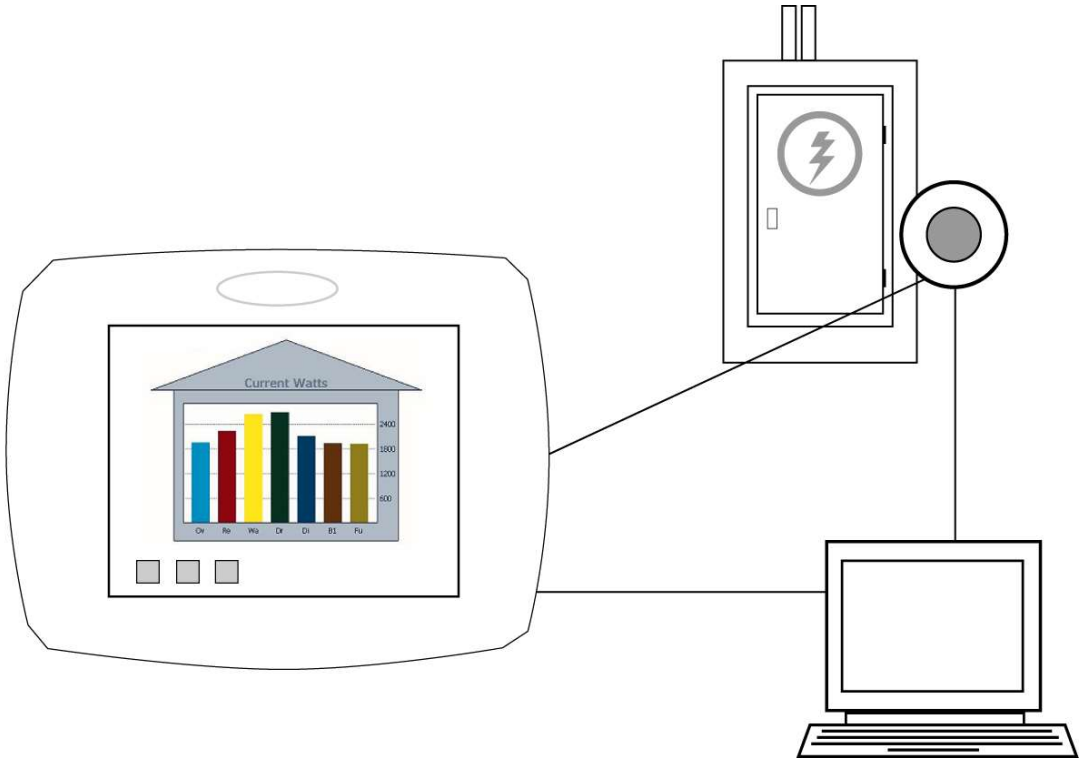
# Energy Monitor

- Monitors energy consumption by areas or appliances in your home – e.g., TV or game room, hot water heater, room air conditioner or central air / heat, swimming pool, or hot tub.
  - Shows energy usage data by circuit or appliance.
  - Charts peak times, days of usage.
  - Diagnostic identifies areas of wasted energy.
  - Calculates costs of energy used.

Appendix

# Energy Monitor

- Connected directly into circuit box.
- Communicates wirelessly or via structured wiring with touch screen, sensors and PC/Windows CE device.



Appendix

# Review

| | Environmental Control | Energy Monitor | Safety and Security Management |
|---|---|---|---|
| Functions: | •Heat and Air Conditioning<br>•Air Purifier/dehumidifier<br>•Local weather updates<br>•Pollen info<br>•Message center | •Monitors energy consumption<br>•Converts energy usage into dollars and cents | • Smoke detector<br>–Alert homeowner<br>• CO detector:<br>–Shut off furnace<br>–Alert home owner<br>• Water leaks<br>–Shut off water<br>–Shut off appliance<br>–Alert home owner |
| Sensor Locations: | •Internal walls | •Circuit box | • Doors, windows, ceilings, low area in home, under appliances that use water, etc. |
| Computing Power: | • Windows CE device OR your PC<br>• Will communicate with your PC if you like | | |
| Display: | • Touch screen | | |

Appendix

# Concept L

Appendix

# Concept L

Appendix

# Concept G

Appendix

# Concept G

Appendix

# Concept G

Appendix

# Concept N

Appendix

# Concept N