

smart

The Key to Unlocking systems Smart Home research Ecosystems



Executive Summary

- The growth of the Smart Home market is being stifled by the messy aggregation of network protocols, software incompatibility, and winner-take-all attitudes by the main players.
- The current Smart Home landscape reflects a "hub and spoke" or dictator-like relationship where "spoke" devices are increasingly at the mercy of Amazon, Google, and other smart speaker platforms.
- These hardware and software challenges have increased cost and complexity for both smart home suppliers and consumers, restricting innovation for suppliers and creating a frustrating user experience.
- Therefore, to unleash the full future potential of the Smart Home, the following maneuvers are likely needed:
 - a Increased attention to driving network protocol standardization
 - b Increased priority placed on software interoperability by tech suppliers
 - Movement of architectures from dictator to a localized ecosystem
 - d Increased distributed edge computing to increase reliability and user experience satisfaction
- If players address these challenges, the Smart Home market has the potential to reach \$66.5 billion in 2023 and a 20.9% growth rate.

Current Landscape Endangers the Future of Smart Home

If tech suppliers don't shift toward pervasive interoperability, user experience will continue to collapse for everyone

Hardware Software Ecosystem **Compliance with Network Device Interoperability Data Integration Protocols** Ecosystem collaboration is Devices must not only communicate Separate protocols for Z-wave, Zigbee, with each other but must also have necessary to allow devices to and Wi-Fi prevent devices from working communicate, share data, and shared data and semantic together. control disparate devices and interoperability to facilitate. This will systems to improve user allow for better analytics to improve **Multiple Connectivity Models** user experience and provide data experience. monetization opportunities. The dispersion of devices across Z-**User Experience** Wave, Zigbee, and Wi-Fi creates a **API Challenges** mess of multiple control points for Erratic smart home functionality consumers where a multiprotocol results from a mess of siloed Suppliers must align on APIs to strategy would rescue user experience. devices and outages due to streamline user experience and reduce over-reliance on centralized barriers to adopting new devices. compute power. Third party **Transitioning from Centralized to** "platform of platforms" and **Edge Computing Security** service providers step in as a Centralized computing slows As providers continue to leverage temporary solution, pocketing functionality and makes devices consumer data, privacy and security smart home value and raising captive to the dictator home hub and remain a massive barrier for consumer prices for consumers. its server. adoption.

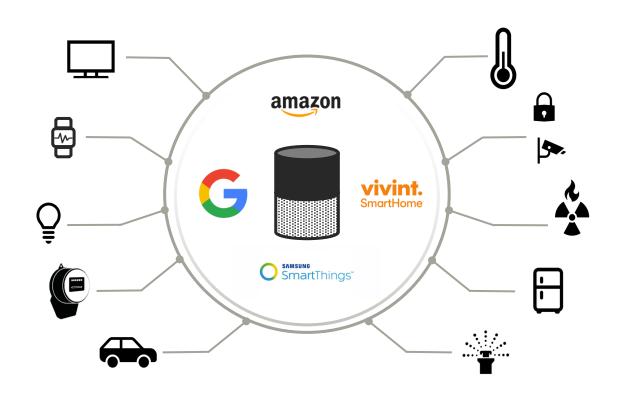
Smart Speaker Platforms Dominate the Home

Ancillary devices are forced into reliance on home hubs for the keys to user experience, namely connectivity, compute power, and NLP capabilities



Dictator Smart Home Architecture Dampens Market Growth

The hub-and-spoke model employed by Amazon, Google, and other smart speaker platforms restrains both entry by new "spokes" and adoption by consumers

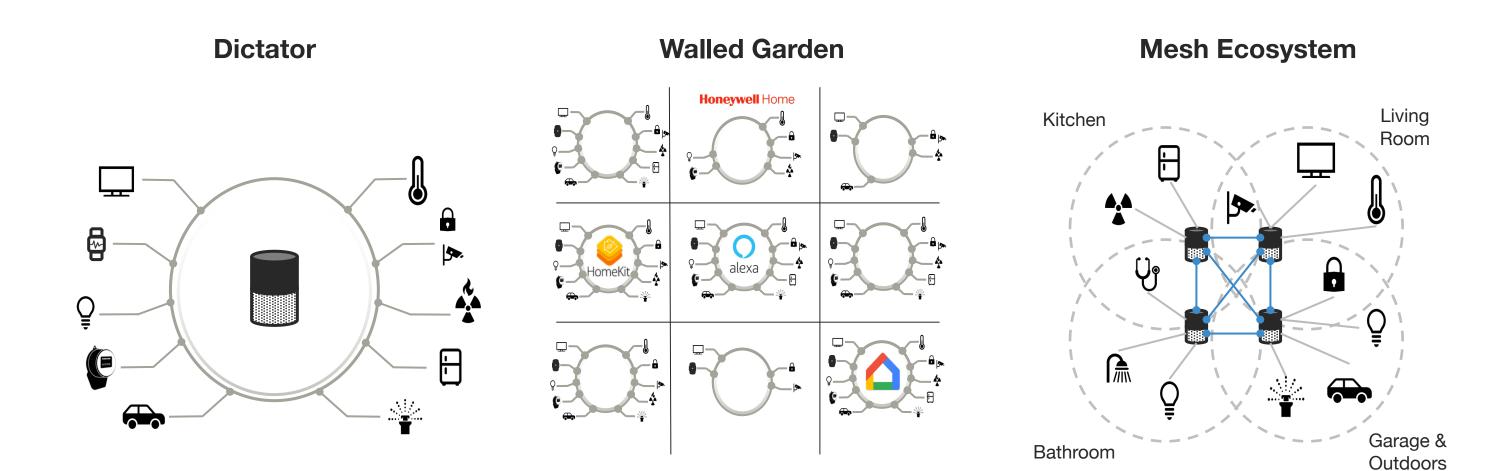


The Dictator Model involves one Smart Home hub through which all devices are controlled. Devices cannot communicate with each other without the help of the dictator or hub, and hubs from different providers or in different systems (eg: the kitchen vs. the bathroom) do not communicate with each other

ر ا	Impacts on Device Suppliers		Impacts on User Experience
1	Barriers to Entry	1	Device Cost
1	Hardware Costs	1	Complexity
1	Developer Costs	1	Adoption
1	Bargaining Power	1	Ease of Use
•	Specification Influence	•	Ease of Installation

A Shift Towards a Local Ecosystem Saves Cost and Improves UX

The transition to mesh will allow for better, cheaper, more reliable products that are easier to install and maintain



Case Study: Kohler Creates A Bathroom Ecosystem

Kohler has created a local ecosystem of devices that serve the consumer in tandem but are still able to communicate with other systems in the home through partnerships with Smart Home hubs

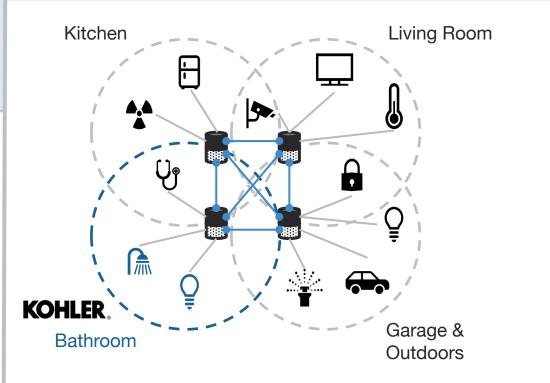


An incumbent equipment manufacturer for bathroom and other home products successfully tackles the Dictator model

"Kohler Konnect" Product Suite

- Verdera Voice Lighted Mirror: Allows users to adjust lighting, play news/music, start coffee while getting ready for the day
- **DTV + Shower:** Voice control shower controls temperature, sets timed showers to save water
- Numi Intelligent Toilet: voice control heating seat and floor panel where feet rest

Kohler's Role In The Future Smart Home:

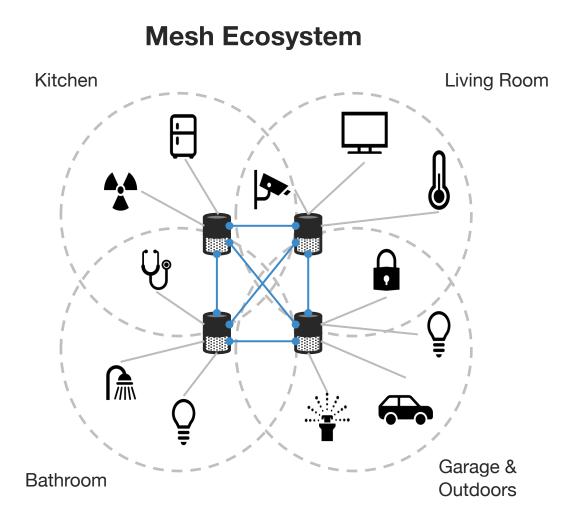


Takeaways

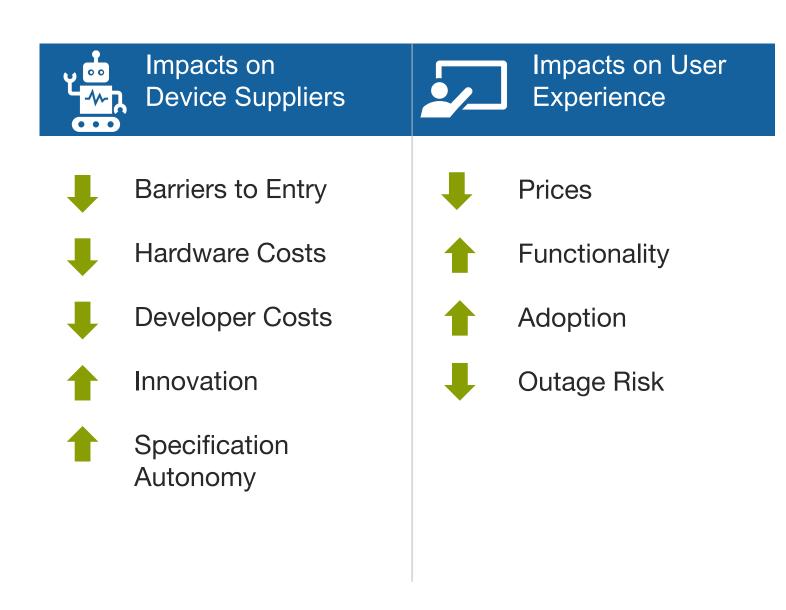
Companies are able to establish a localized ecosystem in their domain (Kohler - the bathroom) while also establishing connection to the entire Smart Home

Mesh Ecosystems Cultivate Supplier Innovation and Engage Users

A more localized, intentional ecosystem where systems connected to different hubs in different rooms can all communicate will improve user experience and innovation by new entrants



A Mesh Ecosystem involves hubs in different systems (eg: the bathroom vs. the kitchen) and/or from different providers that are able to communicate with each other and with associated Smart Home devices.



Case Study: Yonomi Powers Better User Experience

Third party integrators like Yonomi are providing a band-aid solution until suppliers create a mesh ecosystem



Yonomi offers an agnostic platform that allows connected devices and services to communicate and work together.

Products

- Yonomi App: Allows users to create automated routines for all Smart Home devices
- Yonomi One: Allows businesses to design apps and services that integrate with the Smart Home ecosystem
- Yonomi ThinCloud: A turnkey Backend as a Service allowing providers to build and scale Smart Home devices.

The Yonomi Ecosystem

























Benefits to Suppliers:



Lower cloud costs



Faster time to market



Scalable device network



Increased innovation



Increased adoption



Better User Experience

Benefits to Consumers:



Lower service prices



Single control point



Improved functionality

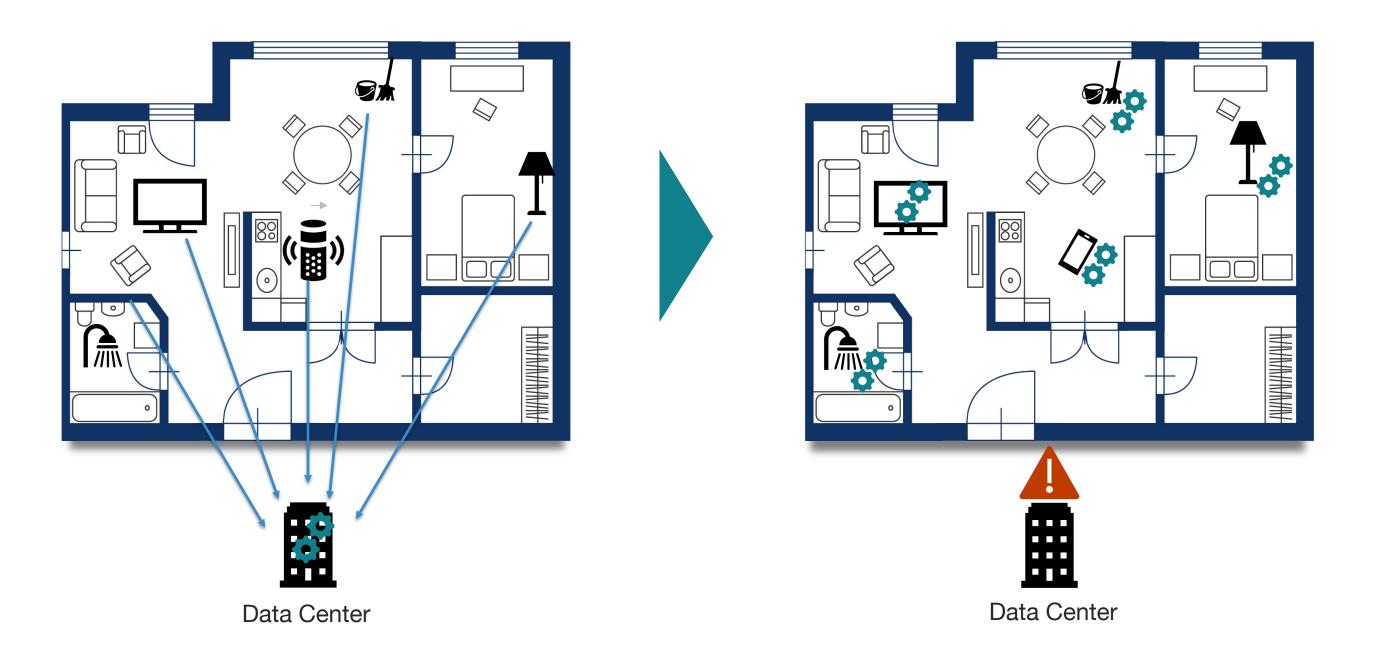
Takeaways

 Third-party aggregators can help providers deliver on the promise of a streamlined, connected Smart Home



Edge Compute Can Improve Reliability and User Experience

Devices that have Edge Capabilities are Able to Service Users Even During Loss of Connectivity



Case Study: AWS Outage Causes Smart Home Downtime

A major server outage diminished consumer confidence by demonstrating the risks a connected home rooted in over-reliance on cloud compute and processing



In February 2017, AWS's S3 cloud storage service underwent a major outage, leading to malfunction of IFTTT and Smart Home devices that ran on the server.

Scope of Problem

- Although the most critical downtime due to the AWS outage occurred outside of the home, Smart Home downtime caused a drop-off in consumer confidence in these devices
- While AWS typically performs better than many other cloud servers, the outage uncovered the dangers of the existing concentration of dependencies inherent in the dictator model and over-reliance on cloud compute

Key Takeaways

- Shift to the Edge: Now that more critical devices related to security, HVAC, and medical monitoring are being connected, the ability to run offline and at the edge is more important than ever
- Shift to Mesh Ecosystem: Although AWS servers offer excellent, top-of-the-line service most of the time, the centralized, winnertake-all model needs to be called into question

Consumer Experience Challenges:

- Ō **Lighting:** Consumers with connected lighting experienced outages for over 3 hours
- **Entertainment:** Smart TVs, speakers, and other entertainment devices running on AWS failed to work
- Websites: Sites that ran on AWS experienced downtime (eg: Slack, Github, the Guardian, etc.), leaving users without access and shrinking revenue for ecommerce sites
- Thermostat: Thermostats that ran on AWS stopped working and left consumers in the cold
- Security Locks and Cameras: Security devices that ran on AWS locked users out of their homes and led to security camera downtime, putting homes in danger

How to Rescue Crumbling User Experience

Companies should strive to improve the ecosystem, technology, and go-to-market channels to drive optimized user experience and increase overall market potential

Hardware



 Network providers (Zigbee, Z-Wave, Wi-Fi) should align on standardized protocols to ease challenges for tech suppliers and improve user experience



 Tech suppliers should strive for multiprotocol strategies to build devices compatible with several network types



Suppliers must develop edge computing machines

Ecosystem



OEMs and tech suppliers should partner with software and service providers to drive indirect device sales and interoperability. This will allow suppliers to leverage devices as Smart Home control points.



- Service providers should foster complex systems of local mesh networks.
- Service providers should partner with real estate developers for long standing contracts and to install devices in new homes.
- Software providers should build a platform of platforms to simplify user experience and improve security. OEMs should strive to create localized ecosystems

Software



 Suppliers must future proof products as much as possible by removing contingencies on hardware, where over-the-air updates to software can be the core foundation for maintaining relevance of a product's capabilities.



 Given advancement of user maturity, suppliers must refine consumer data insights and solution R&D to best respond and predict behavior.



 Players must invest in blockchain and security to instill confidence in consumers

Smart Home Has the Potential to Reach \$73 billion by 2023

If players are able to tackle these hardware, ecosystem and software challenges, they will achieve "Smart Home Victory" and unlock the full opportunity

