Beyond DIY –The Future of Smart Homes and Older Adults

Wellbeing is What Matters

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Laurie M. Orlov
Principal Analyst, Aging and Health Technology Watch

EXECUTIVE SUMMARY

The product offerings in the Smart Home space have proliferated in recent years, but older consumers make up a small percent of adopters. Yet this population, especially baby boomers, is committed to remaining in their own homes and represents an untapped opportunity for the industry. Within five years, solutions in health and wellbeing, comfort and safety, and engagement and entertainment will emerge to meet their needs, including subscription-based services that are integrated with wearables. Remote configuration will be standard, and health insurers will be interested in smart home technology as a deterrent to hospitalization. With predictive analytics and machine learning, the home will become a participating caregiver for the oldest and frailest.

INTRODUCTION

Smart home technology is a market that over the past decade has produced a gaggle of gadgets. Most are Do-It-Yourself (DIY) installation devices that depend on a user with motivation, Internet connectivity, a willingness to read the manual, and a tolerance for trial and error. During that same decade, however, Voice First technology emerged and became mainstream across all age groups. It is particularly appealing for older adults – individuals aged 65+, especially those with limited vision or hand dexterity. This broad population of 54 million people represents a range of support needs from none to extensive; from living situations that are 100% independent to living with caregivers to group settings with substantial support services. According to a recent Parks Associates survey, 73% of US caregivers intend to buy an independent living solution for their loved one – including smart speaker/smart displays and pre-installed home sensors.

This report is based upon interviews with 29 executives from companies interested in the market for or use of smart home technologies to help serve older adults – including product developers, senior living, healthcare, home care solution providers, consultants, and integrators.

ACKNOWLEDGEMENTS

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WHO SHOULD READ THIS REPORT?

- Investors and funds that focus on smart home and older adults
- Vendors within or considering entry into smart home categories
- Architects and home remodelers
- Home automation service providers
- Home security companies
- Senior living organizations and professional home and health care companies
- Technology platform providers
- Telecommunication and cable TV providers
- Social services and non-profits with focus on older adults
- Healthcare providers and hospital systems
- Life science and pharmaceutical companies

THE SMART HOME MARKET TODAY IS DO-IT-YOURSELF

The market appears big, but for users, it may appear very small. What is a 'Smart Home?' From Oxford dictionary: "a home equipped with lighting, heating, and electronic devices that can be controlled remotely by phone or computer." But it can and will be much more. The US market opportunity for 'Smart home' products and services is estimated to be worth $52 billion by 2024, with North America (already 172.6 million homes by 2019) representing the most advanced market worldwide, according to Berg Insight. Yet of the 172.6 million homes, only 19 million were whole home systems, with 154 million having a single device, likely bought from a retailer, installed by the homeowner – the realm of consumer Do-It-Yourself (DIY).

Today's smart home technology is a swarm of DIY categories. Consider the visualization from a Boston Consulting Group's market sizing and landscape**,** nicely depicted as an ecosystem swarm of categories. The image shows the scope of the market, dominated by security systems (21%), audio-visual (15%), smart energy (13%), and HVAC-lighting (10%). And it shows its fragmentation, filled with multiple product types that do not play well together and have limited penetration (see **Figure 1**).

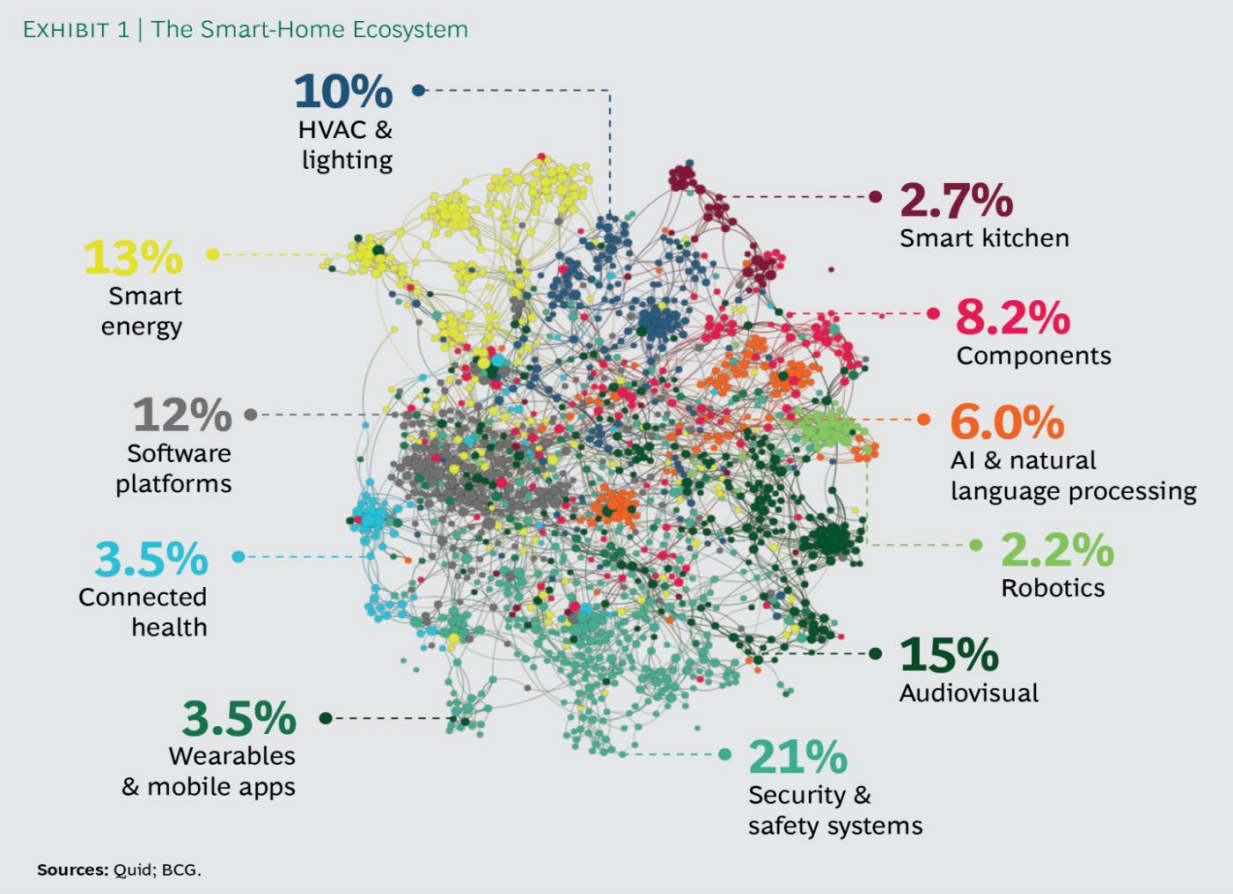

Figure 1 The Fragmented Smart Home Ecosystem [Source: BCG]

So what is a Smart Home? Should it be Connected? Gartner Research defines the Connected Home as: "Networked to enable the interconnection and interoperability of multiple devices, services and apps, ranging from communications and entertainment to healthcare, security and home automation. These services and apps are delivered over multiple interlinked and integrated devices, sensors, tools, and platforms. Connected, real-time, smart and contextual experiences are provided for the household inhabitants, and individuals are enabled to control and monitor the home remotely as well as within it."

Not just Connected, should it be Healthy? The Consumer Technology Association (CTA) Healthy Home Survey was published in time for CES 2021. It was fielded to 1500 adults in the second half of 2020 about consumer views of personal health and wellness, including categories like communication, home security, air quality, energy management, and home comfort. Of the responders, 86% expressed some concern about their home's health:

- Most consumers (63%) want to improve the health of their home, but many (41%) don't know where to start.
- According to the consumers owning them, security solutions provide the greatest peace of mind benefits, while fitness solutions (e.g., activity trackers, connected exercise equipment) provide the greatest physical health benefits.
- Over half (55%) of consumers agree that healthy home technologies can dramatically improve the health of their home, but cost is seen as a deterrent to ownership.
- 60% believe healthy home tech products are expensive gadgets, and 47% agree that healthy home tech is too expensive for their family.

Not just Healthy, should it be Intelligent? Gartner later asserts that there is a migration underway from the Connected Home to the more useful Intelligent Home: "The intelligent home learns the behaviors and preferences of people, and in some cases pets, in the home. It adapts to and anticipates their needs. It is a home that utilizes data gathered from a selection of devices and sensors around the home, but also from wearables and even connected cars. It anticipates the needs of the users in the home and responds accordingly. It is a fully autonomous home that acts on your behalf."

Not a fragmented market, should it be delivered by dominant platforms? After a history of small company arrivals and departures, the smart home technology market has now attracted the biggest players. In the past, consumer abandonment or distrust may have forced a retreat and re-entry – as with Samsung Smart Things – a noticeable inconvenience to consumers. Some say that the current top 10 device/appliance players include Amazon and Google, but also Apple, LG, Sony, Siemens and GE. But switch to other sources and you will find another list (still including Amazon, Google, and Apple), but also including Arlo (camera) and Tuya Smart, a smart home platform and example of AiOT – the Artificial Intelligence of Things.

"The fragmentation today is a result of an incomplete consolidation in the market. Winners are being crowned (Amazon and Google) and the losers are still wandering around the store shelves like zombies." – Stephen Eyre, VP **Calix Partner Community**

Not dependent on consumer tech skills and integrators? Despite predictions of sizable growth, one forecast observes that it is a 'tedious task to link systems developed by different manufacturers or vendors, limiting functionality and unreliable service, apart from incompatibility issues.' DIY-capable consumers can select offerings through Lowe's Livable Home (2021), newly partnered with AARP. But with smart/IoT health tools added to a patient's health data ecosystem, interoperability will become a growing challenge.

Smart Home market predictions emphasize convenience and entertainment. Market growth for smart homes is predicted to be significant, though adoption is mostly one device at a time – the DIY Smart Home. Following Covid-19, security and remote monitoring, temperature management, voice technology and entertainment became more important. And an increase in stove fires has renewed interest in smarter stoves, for example, which may make them mandatory in new construction of multiple dwelling units (MDUs). Market interest in home air quality monitoring also increased during Covid-19. And rising energy costs are driving interest in energy conservation technologies for home energy management.

By 2025, the DIY Smart Home Market will be led by smart appliances. According to the Consumer Technology Association (CTA) 2020-2025 Smart Home forecast, smart appliances represent 45% of the projected smart home market in 2021, growing to 54% by 2025. CTA cites Smart Displays (like the Echo Show, for example), as making up 72% of the combined market (versus the smart speaker itself). The rest is comprised of home robots, vacuum cleaners, floor washers, and lawnmowers. The CTA forecast looked at DIY Home Security – cameras, door locks, doorbells, security systems – and DIY Energy Management including thermostats, switches, dimmers, outlets, timers, and smart light bulbs (see **Figure 2, Figure 3)**.

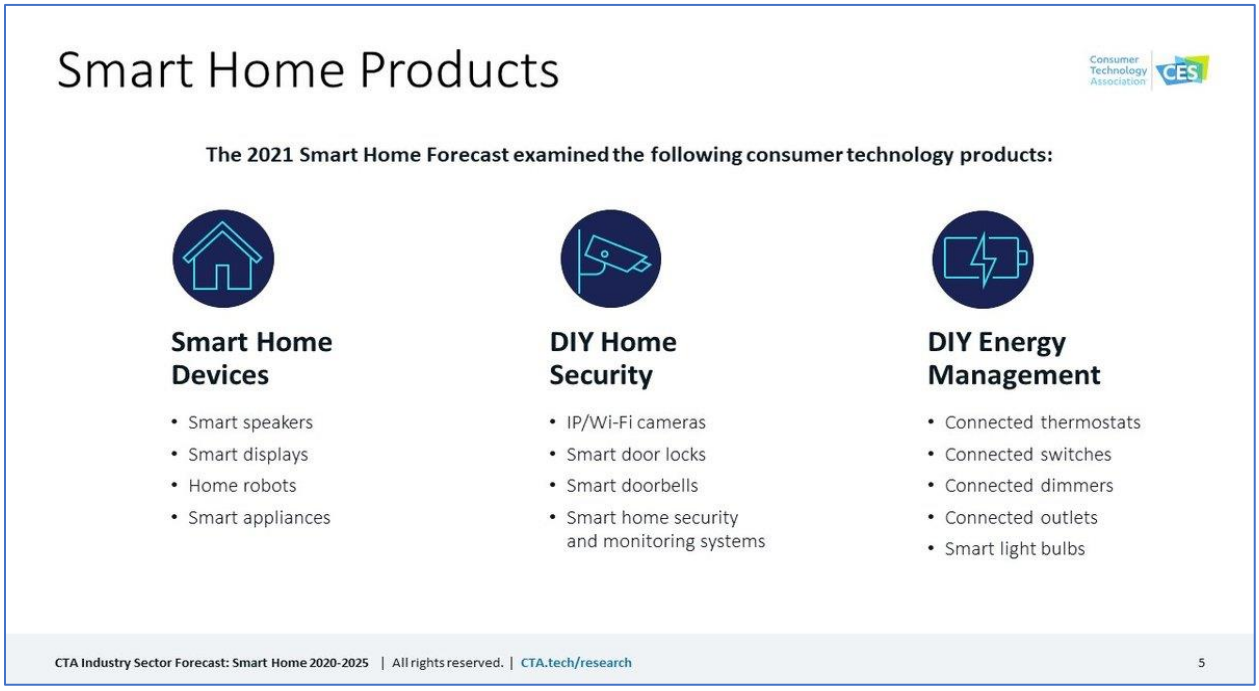

Figure 2 Smart Home Products in CTA 2021 Smart Home Forecast [Source: CTA]

Figure 3 Multiple views of smart home technologies today

Smart home tech is useful, but not yet reaching older adults

The smart home market may have reached the Gartner 'trough of disillusionment.' The term applies to markets that emerge too early. This is an apt description of the smart home market over the last decade. And older adults are not yet buying smart home technology according to AARP, even though they live in homes that are not designed for aging, especially for aging alone. That is likely because:

- **Technology is rigid and limited to tasks.** With today's offerings, users can issue the command "Turn on the lights," or ask to change the temperature or see who is at the door. Perhaps users can chain a few commands together into a sequence of steps as a morning routine – turn on lights, raise temperature, open blinds. Or do these things at set

times of the day – for example, turn down the heat during so-called 'working hours.' But even the smartest home tech may be blissfully unaware of obvious exceptions to routine.

"I sometimes work at home. My Nest Thermostat detects motion and knows I am there – but still resets the temperature down to the previously set departure time." – Dr. Joseph Kvedar, Vice President Connected Health**, Partners Healthcare**

- **Smart home technology today requires expertise to set up.** Without integration assistance, smart home technology depends primarily on tech-knowledgeable consumers or service providers (home security, cable providers, systems integrators). Left to the DIY consumer, the result may be a dangerous tangle of hubs and connections (see **Figure 4).** And the consumer may become fed up with the reliability of software from primarily hardware vendors. Or they may worry about the degree of privacy protection in an era of motivated hackers. And well-publicized issues of outages may also make them nervous.

- **Today's older adult housing makes little use of smart home technology.** Homes were built when there were a small number of older adults in the population – or they were built with the younger end of the population range in mind. But by 2034, there will be more people over age 65 than under 18. This has created unanticipated needs, building shortcomings, and initiatives like NAHB's Certified Aging in Place program to help builders and remodelers adjust to a changing population. But little of today's housing, including 55+ communities, accounts for the future benefits of smart home technology or its possible use by an aging population.

"We do a lot of preparing for 'now' and not 'now and tomorrow.' There are so many manufacturers and design schemes – interoperability isn't where it should be."
– Rodney Harrell, Vice President, Family, Home, and Community, **AARP**

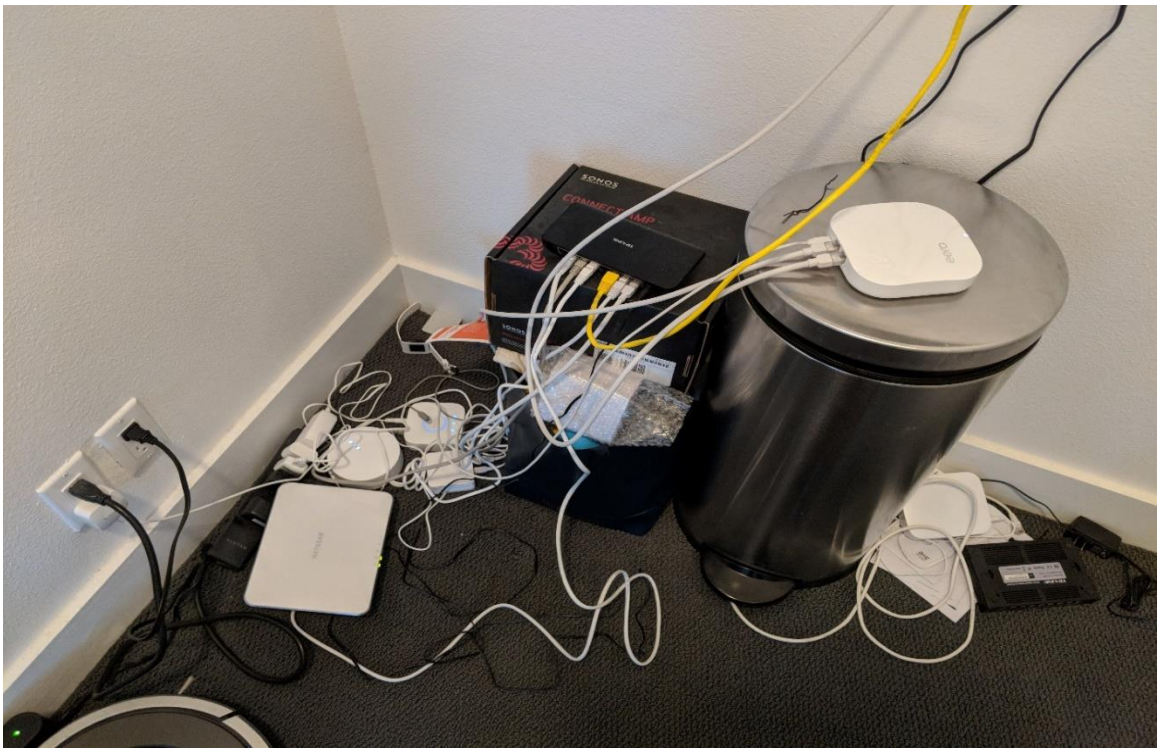

Figure 4 Today's DIY tangle of hubs and connections

- **Smart home technology does not help with health or wellbeing.** The smart home offerings today do not integrate with wearables like fall detectors or chronic disease monitors. Although technology to collect and analyze data is more sophisticated, in-home generated information – such as patterns of motion, periods of inactivity or incidence of repeated falls – is unlikely to be entered into an electronic medical record or to be used by clinicians. Even firms that have multiple disparate technologies for gait analysis and healthcare services – like Amazon, Best Buy, or Google – do not produce data sets that can be easily interpreted by professionals.

- **Older surveyed consumers are not yet interested or confident.** AARP's 2022 Tech Trends of the 50+ notes that only 21% of those aged 70+ own a smart home device. One reason for lack of adoption may be due to perceived lack of benefit. But another factor may be low confidence in the use of technology, especially at the upper age range – only 10% of those aged 70+ indicated confidence in tech use. AARP's 2021 Digital Literacy survey notes the confidence barrier, and that those more confident with technology are more likely to use either smart home or wearables (see **Figure 5a**, **5b)**:

  "Consumers don't fully understand what is available and how a healthy home can impact clinical outcomes. My concern is that at-home healthcare tools will require some level of training, and people who need the tools are unlikely to get them." – Rene Quashie, VP Digital Health, **Consumer Technology Association**

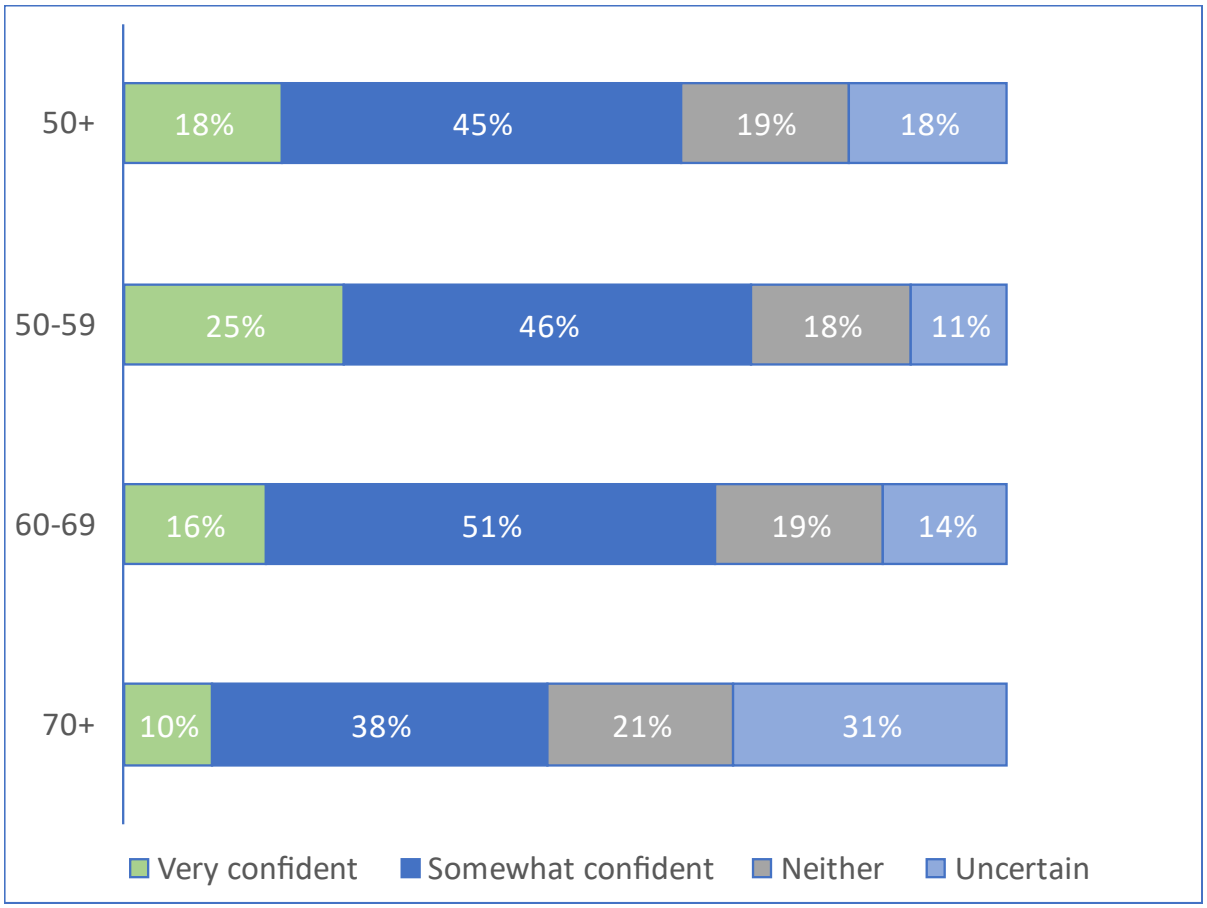

Figure 5a Confidence in using technology, by age [Source: AARP 2021 Digital Literacy]

"Today the smart home industry is building tools for this and that, but nobody is building the toolbox of best tools and how to use them." – Jake Rothstein, CEO, **UpsideHōM**

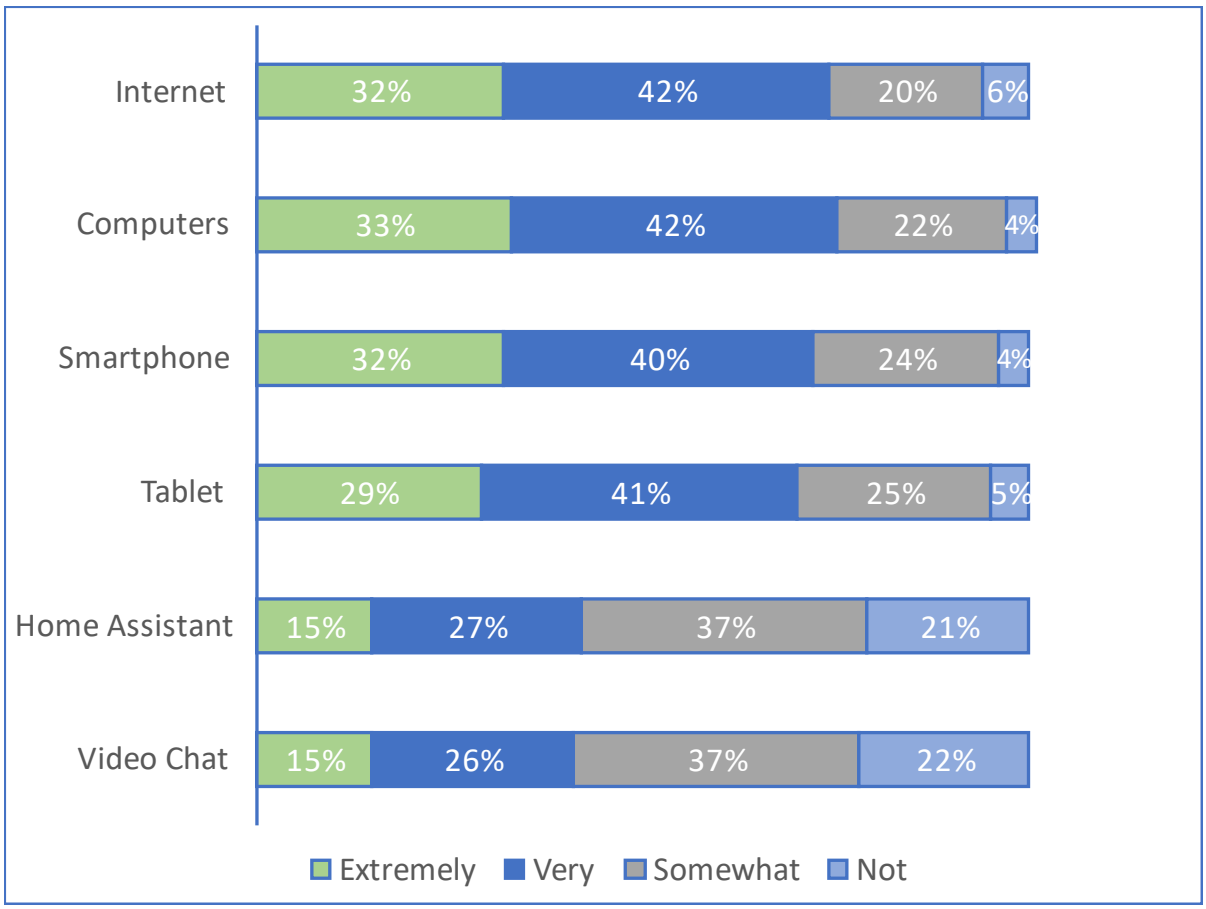

Figure 5b Comfort level using various devices [Source: AARP 2021 Digital Literacy]

- **Home care offerings do not include smart home technologies.** Despite the labor shortage that is impacting the professional home care industry, technology in the home, especially smart home technology, is not part of the home care solution set today. Yet with appropriate use of sensors, cameras, and voice interactions, families and home care providers could improve the wellbeing of older adults, many of whom are alone at home for long periods of time.

  "No one has tried to marry home care and smart homes. Yet adult children can approach this for their parents via home care agencies which could add smart home as a service for their clients." – Luka Bajic, Principal, **RubiWorks**

OLDER ADULTS NEED SERVICES, NOT GADGETS

The current DIY smart home technology market is inadequate for older adults. Adoption surveys confirm that older adults are not yet taking advantage of this market – and in fact may be quite skeptical about its value for them. To boost adoption among this segment, future solutions will need to encompass three overlapping categories of tech-enabled service offerings that enable greater independence at home (see **Figure 6**):

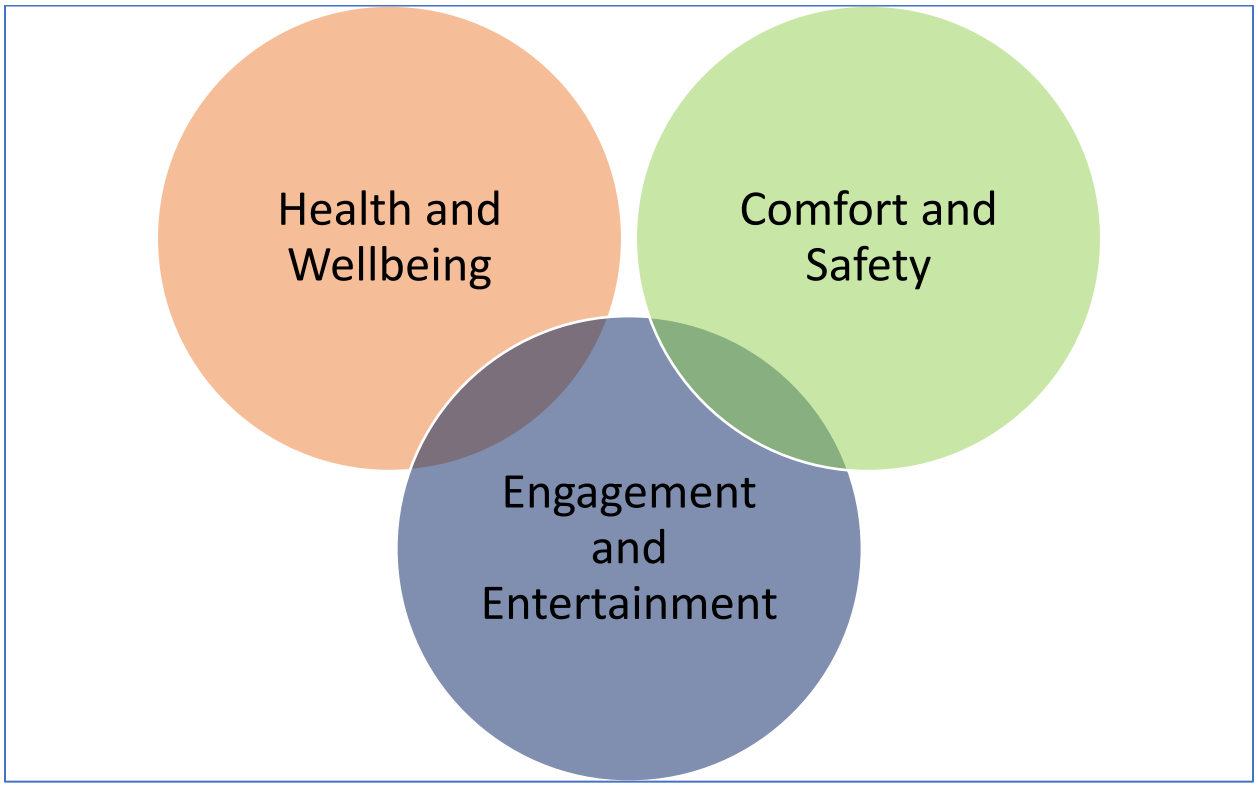

Figure 6 The Overlapping smart home categories that benefit older adults

- **Health and Wellbeing.** Today, older adults are just beginning to use wearables for tracking health status and conditions. They are beginning to benefit from apps that monitor weight and medication compliance, sensors that can detect falls, sleep patterns and motion from room to room. Future smart home offerings will integrate these technologies with each other and with hubs that aggregate data. With a focus on the home as a hub for health and wellbeing, tech providers should be aware of state-of-the-art offerings that provide access to urgent care at home, as well as the opportunity for chronic care management.

  "Our in-home ER diversion model allows patients to stay home, out of a brick-and-mortar setting, receiving care comfortably, at a lower cost than the ER. Our team's capabilities include a moderately complex lab, suturing, IV fluids and medications." – Melanie Plaksin, VP of Experience, **DispatchHealth**

- **Comfort and Safety.** Today consumers can benefit from the use of smart thermostats, in-home cameras, home security systems (with alarms), radar, smart stoves with shutoff, smart fall detection, refrigerators that note when items need replenishing, moisture detection that can note when faucets are left on. Today, those who place these technologies in the home must make sure that the older adult is aware of them and how they work, who they notify and why. Moving forward, these capabilities should be part of a wellbeing subscription service from a trusted provider.

  "We see a caring platform as a service – including fall detection – that has multi-sensor capability built into the home infrastructure." – Chia-Lin Simmons, CEO, **NXT-ID**

- **Engagement and Entertainment.** Today, voice tech has already improved user experience for older adults, helping to reduce social isolation, thus blurring the overlap with health and wellbeing. Older adults are benefiting from smart speakers, smart displays, smart TVs, and voice-controlled smart plugs. Smart routines are already being designed that combine multiple tasks (for example, lighting, temperature, shades, "Play my special music!") for the benefit of the individual user. With appropriate permission-based software, provider systems could analyze patterns and offer insights about the physical and mental wellbeing of an individual living alone in their home – and with predictive analytics, identify changes that may be worrisome.

  "Voice is a gateway for older adults to develop an interest and resilience in adopting new technologies." – Ryan Elza, VP Innovation and Technology, **Volunteers of America National Services**

What is the Wellbeing Future of Smart Home Tech?

Older adults can benefit greatly from the right applications, pricing, marketing, training, and go-to-market channels like Best Buy Health or Lowe's Livable Home (2021), newly partnered with AARP. These and other services will enable them to remain independent and longer at home. Appropriate solutions offered as subscriptions will be packaged by providers, spanning continuums of technology, people, and tech-enabled services to support needs as they change over time (see **Figure 7)**.

Tech capabilities may migrate from Passive to Proactive. Supported by a growing volume of data about the in-home environment and the user, smart home vendors will add proactive capabilities to solution suites. Consider for example, the proactive voice assistant from Whirlpool, integrated with Google Assistant, that will notify appliance owners of status of laundry cycles. Proactive voice has become a feature of several eldercare offerings and will be a standard feature within the next five years of smart home capabilities targeting older adults.

Older adults may move from Independent to Frail. AARP surveys consistently indicate that adults aged 50+ (77%) want to remain in their home as they age (sometimes described as 'aging in place.') This preference persists despite having to modify the home as needs change, including accessibility modifications or when needs arise for emergency response systems, voice-enabled technology for individuals with low vision, or adding security cameras. Over time, these smart-home-as-a-service offerings will adapt as analytics from a consumer's data indicate.

Tech-enabled services move beyond Convenience to promoting Wellbeing. As individuals age in their own homes, their technology needs will likely shift from a focus on convenience (smart appliances and smart speakers) to a focus on maintaining overall wellbeing – including safety, social engagement, personal health status and positive changes – like more exercise or fewer falls.

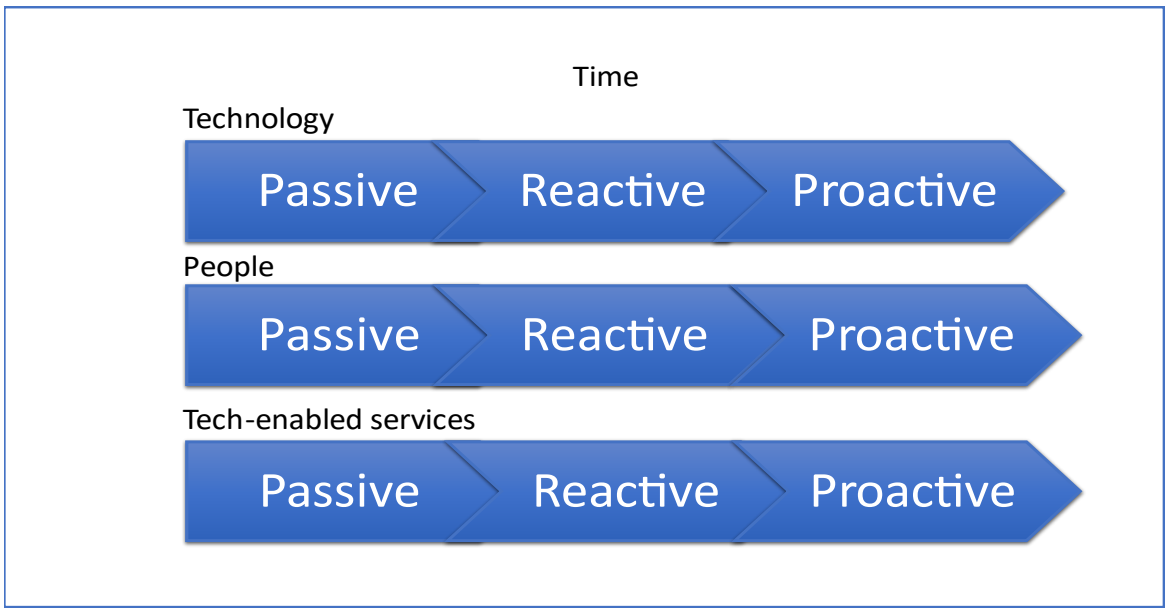

Figure 7 Solutions will offer appropriate technology based on changing needs

"A revolution is happening that will benefit older adults – combining networked sensors on the wall using radar, sonar, and Wi-Fi with online caregiving apps and intuitive, proactive UIs." – Stuart Patterson**,** Co-Founder, **LifePod**

Older Adults Will Benefit from Intelligent Homes

The next generation of tech capabilities that matter will be intelligent and configured to learn about the individual, both inside and beyond the home. The results?

Sensors will evolve to the next generation – for safety and monitoring from afar. Sensor-based home monitoring has been offered in the care of seniors for more than a decade. But with the next generation of sensing technology, monitoring offerings at home and in senior care can benefit from a combination of in-home cameras, voice-enabled wellness diagnostics, contactless radar sensing, facial recognition, and remote health monitoring.

"A 'home as a caregiver' service can offer levels of service as appropriate for senior living. Existing devices like switches will have sensors, and the software will enable different features that help improve quality of life for residents and reduce costs for the community." – Ash Saxena, CEO, **Caspar.AI**

Patterns will be detected that can improve health and wellbeing. AI and machine learning are mainstream in multiple domains, with an increasing acceptance in healthcare. Multiple tech firms are now deploying pattern analysis and machine learning in the care of older adults, enabling comparison of patterns to user baseline profiles; identifying trendlines in behavior; and supporting appropriate alerting of caregivers in the event that pattern changes indicate alarm or identify improvements in wellbeing – such as increased activity, exercise, or family engagement.

"Wi-Fi sensing can alert about breathing, where they are in the home, sitting, standing, or walking. Tech must tell a story to understand a pattern of behavior over time and present that to people who care." – Lainey Muller, Director, Wellness**, Alarm.com**

Home ecosystem platforms may overcome incompatibility of devices. Ideally in-home integration of products could be based on standardized interfaces. Short of that, devices will coalesce along platform lines that enable devices to connect more seamlessly. It's feasible that products may work together more seamlessly (fewer hubs required) with the collaboration and cooperation of big brands and the emerging Matter standard, presumably beginning to make a difference in 2022.

"Radar is so accurate – it has the ability to detect its environment, understand gestures, movement of people in the environment – identifying issues and notifying accordingly." – Ben Hirsch, VP Marketing, **Vayyar**

FUTURE TECH WILL BE PREVENTIVE, PREDICTIVE, ADAPTIVE

While smart home technologies are incorporated in some senior-focused offerings today, adoption is limited, and the market is still fragmented. As smart home offerings evolve, they will need to support necessary integration with on-body wearables like watches, bands, sensors, or rings – enabling monitoring both inside and outside the home. And characteristics of offerings will need to make a difference in the lives of older adults (see **Figure 8**).

	From	To
Controls	Apps	Suites
Personalization	For a single app	Overall experience
Capability breadth	Task efficiency	Care and wellbeing
User Interface	Voice-enabled hardware	Voice-enabled across entire suite
Wearables	Separate	Integrated with smart home data
Machine learning, predictive analytics	Limited to tasks	Behavior-driven learning over time
Emphasis	Assistive technology	Technology offers appropriate assistance
Privacy/autonomy/trust	Limited	Required
Design target	Integrators, DIY users	Design for all, configure for specific purpose
Design timeframe	Design for young	Design for a lifetime
Payment model	Device purchased; service subscription; consumer pays	Capability subscription as a service; covered by Medicare Advantage
Standards	Multiple	Integrated

Figure 8 Smart Home characteristics change over the next five years

> *"Tech in the home should help us live a simpler, healthier, happier life, connected with friends and family. Predictive analytics can have a positive influence on behavior."* – Scott Moody, CEO, **K4Connect**

- **An in-home team of tech-enabled services.** Older adults are rightly skeptical about technology designed to monitor them – equating monitoring with spying on them and invading their privacy. Instead, tech offerings need to be perceived as an in-home team of services, unobtrusively managing features to make the home a comfortable place, delivering meaningful data, and protecting the privacy and autonomy of the individual. Vendors should collaborate with trusted intermediaries embedded in the community.

"Smart home (or 'Active Home' as I call it) would be brought in through your media provider. It would be a central 'hub' device that would assist in all aspects of your life/home and operate autonomously in the background, becoming part of your monthly Internet bill." – Dennis Fountaine, Founder, **Gadget Labs**

- **Home infrastructure as a service.** Because so much in-home tech is acquired piecemeal, the obsolescence of the pieces is known only to a vigilant owner or tech service provider. Instead, if suites of integrated technologies were offered with a service plan, the device map would be known and monitored for its own health and wellbeing and appropriate replacement dates.

- **Home as a participating caregiver.** 'One size fits all' has been the characteristic of many individual smart home technologies. Moving forward, this won't work for older adults. Instead there will be multi-tiered solutions, customized remotely, adjusted as a person becomes frailer. Smart home technology will be enabled for caregiving, used by home care companies to help compensate for labor shortages and warn of in-home issues during those times when the care recipient is alone.

"We want to make sure that the tech is available when needed but fades into background when it isn't." – Nicolas Maynard, Senior Manager, Alexa for Everyone, **Amazon**

- **Mixed modalities – wearable and in-home.** A smarter home is inadequate to support overall wellbeing. And wearables do not leverage any information from the home itself, such as smart cooktops that could help prevent in-home fires.

"Seventy percent of fires are caused with cooktops. In the future, smart cooktops will be standard in multi-dwelling buildings. They will detect motion and know the temperature of the cooktop as well as the cabinet door above." – David Cathey, Chief Revenue Officer, **Green Marbles**

- **Applied machine learning and predictive analytics.** Instead of 'walling off' the smart home infrastructure from wearables, forward-thinking vendors will create processes to transform both home and wearable data into insights. This could be particularly useful in senior living environments where residents may be a fall risk, such as alone in their rooms before putting on a wearable, but also when out for a walk. And detecting and monitoring slower gait can help avert a fall or identify an illness.

"Gait is a key indicator of wellbeing – studies shows a direct relationship between slowing gait and increased mortality." Tracy Mitzner, Senior Research Scientist, **Georgia Tech**

- **In-home robotics.** The labor shortage of in-home and senior living care workers, already a crisis, is likely to worsen. Forecasts predict that in-home robots of some type are likely to be adopted within the next five years. With the addition of mass market retailer Amazon's Astro home robot, the personal in-home robot got a boost in market visibility, if not endorsement. For consumers, the most successful robot assistant to date has been a smart vacuum cleaner -- but stay tuned for smart tables and other 'your wish is my command' in-home robots.

  "Within five years, virtual humans will be the use case, designed with great privacy for use within the sanctity of the home." – Mark Gray, CEO, ***Constant Companion***

- **Remote configuration.** Setting up in-home platforms to control smart home devices has been daunting for the uninitiated. Note the steps for Google Nest or to connect a smart home device to Amazon Echo. Instead, older adults need smart home offerings to be configured remotely, with intelligent defaults based on existing in-home tech, and tuned for the occupant's tech proficiency (see **Figure 9**).

  "The smart home can confound the untrained resident. The biggest thing I hear from any client – I don't know where that dinging is coming from – they don't remember any of the passwords. Where are the passwords?" – Andrea Cohen, Founder & Vice Chair **HouseWorks**

- **Insurance-reimbursable.** Home insurers clearly want the owner to have firesafe stovetops and in-home fire and moisture detection. They are offering discounts between 5 and 20% based on the device and its ability to reduce risk – such as Ting, a device that can detect electrical fires, or iGuardStove that automatically shuts off the stove when unattended.

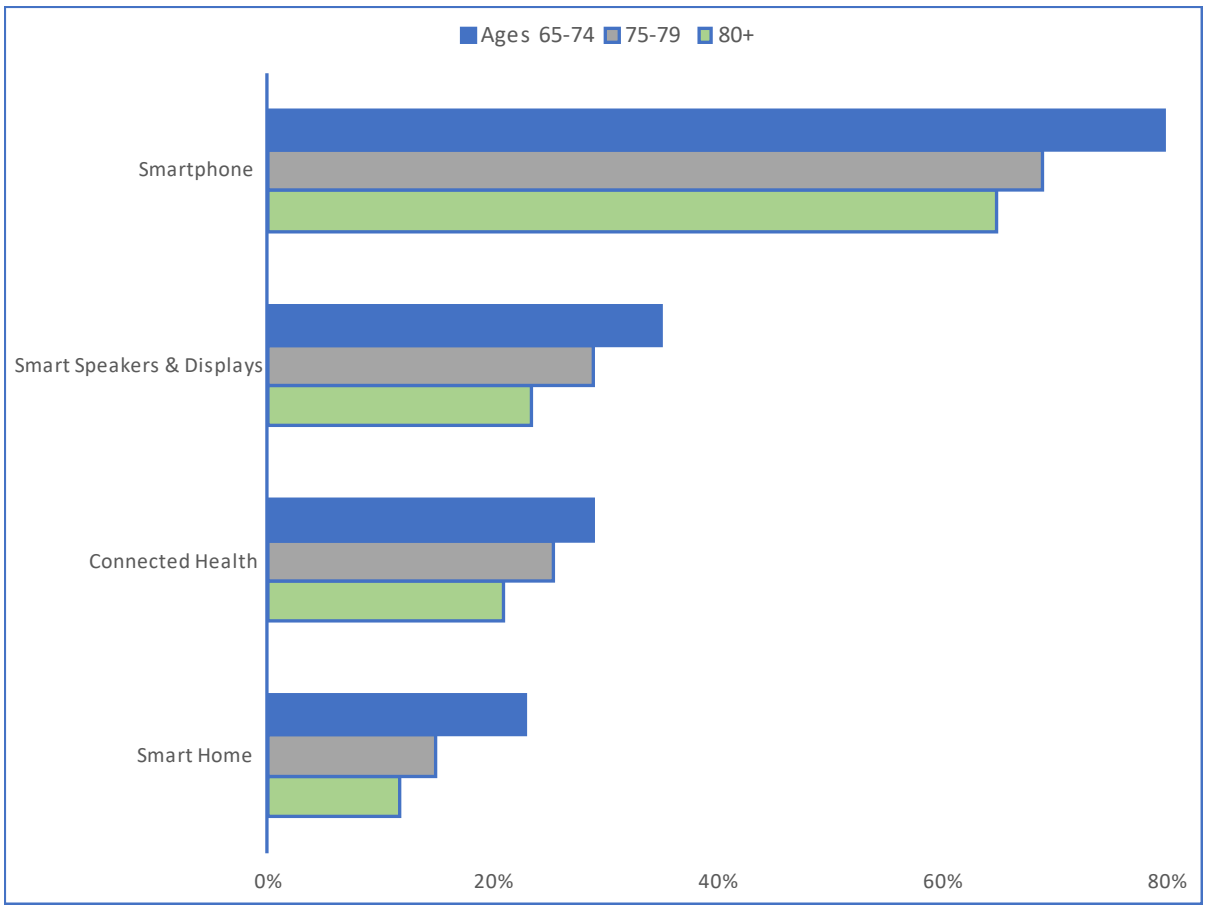

Figure 9 Tech adoption by age of older adults **[Source: Parks Associates 2021]**

What smart home tech should offer in the next five years

Aging baby boomers overall are a wealthy demographic – and they want to age in their own homes as long as possible. Many of them are solo agers, living alone without family or support systems nearby. As they enter their 70s and beyond, many will seek additional support offered by service providers they already know – such as broadband services, home remodelers, and home care. The new offerings will be able to:

- **Detect agility changes based on motion/gait.** By integrating with gait analysis from wearables like the Apple Watch or Amazon Halo, smart home offerings will be able to offer alerts to caregivers, but also offer guidance and suggestions to residents – to get outside more often, get some exercise, or slow down. Likewise, lack of motion in the home of those living alone will be more easily detected and possible problems avoided.

- **Recognize motion patterns outside the home.** Older adults living alone, especially in rural areas, will increasingly seek home exterior solutions that include smart cameras, smart doorbells, and external sensors. As data accumulates, new predictive analytic software for smarter alerts will boost the utility and uptake. Vendors may offer technology with visual as well as audible alerts for the 50% of those aged 75+ that have disabling hearing loss.

- **Voice indicators of ill health.** There is growing research suggesting that the human voice provides indications of mental and physical health status. Within a few years, voice-enabled technology in the home as well as wearables will be able to examine tone and volume of speech to suggest that an individual may be suffering from anxiety and could benefit from a call from a care provider or family member.

  "The reality for most people is a variable-speed progression of the locus of control from the individual to the caregiver/healthcare provider -- that needs to be reflected in solutions." – Michael Skaff, CIO, **Jewish Senior Living Group**

- **Discounts for wellness technology.** Medicare Advantage plans will see the utility of smarter homes as a means of reducing hospitalizations and readmissions from risks like falls. Insurers will continue to form partnerships with wellness offerings (such as CVS Health or Papa Health) and in-home urgent care services such as DispatchHealth.

  "The smart home as a participating caregiver could disrupt traditional home care as we know it -- scaling to national companies, whether tech, CVS/Walgreens, or national health plans." – Jane Sarasohn-Kahn, **THINK-Health and Health Populi blog**

- **Monitored usage of online tools.** Older adults are frequently the victims of scams, with an estimated $1 billion in losses during 2020 alone. Many of these scams originate online via email or social networking. Tools that are useful for monitoring the online activity of teens and children, like Bark, may be configured to monitor online activity of older adults – with appropriate permissions – to help keep them safe.

What do market trends mean for service providers?

With a fragmented market of devices today, it's no surprise that consumers purchase these devices through a plethora of sales and distribution channels, including heating and cooling contractors who offer smart thermostats, or electric utilities that offer smart management of certain in-home devices during peak usage periods. With the ballooning market of smart appliances like stoves, TVs, and refrigerators, the consumer smart home space will likely fragment further. But at the same time solution providers will rise to the challenge and offer suites of capability on platforms like those from Apple, Amazon, or Google or others, delivered to older adults at multiple levels of independence and/or need. What will this trend mean to:

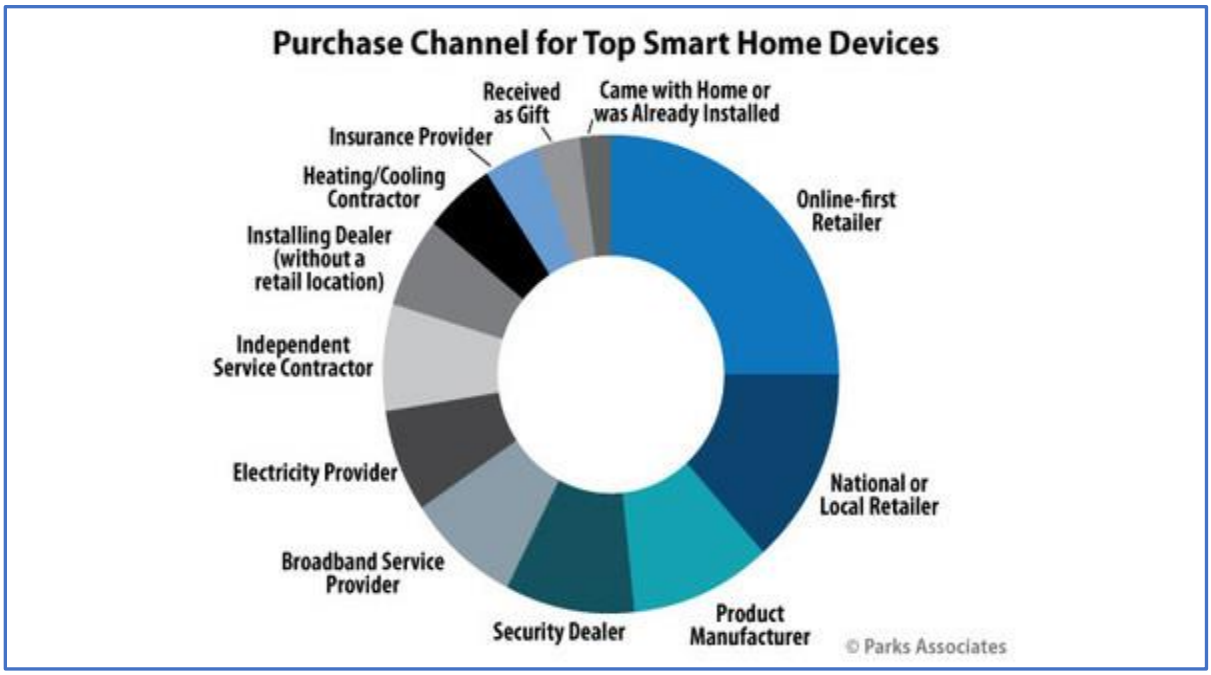

Figure 10 – fragmented service channels today [Source: Parks Associates]

- **Cable television service providers**? A wide variety of infrastructure providers, often geographically restricted, deliver the last 10 feet of connectivity into the home. Cable television providers have a sizable base of subscribers who could benefit from multiple smart home features, particularly home safety and security, that could produce additional revenue, as long as they are partnered with an appropriate responder network.

  "Start with safety, better quality of life, on demand services, making family engagement easier – offering security in and out of the home, fraud protection, entertainment, and tech support." – George Valentine, Executive Director, **Cox Communications**

- **Broadband service providers?** Providers of home broadband would be the logical deliverers of smart home technology. Given the right partnerships, they could offer solutions based on developing a more nuanced user profile. In some geographies, that could entail more healthcare-related partnerships (like senior living) for their oldest customers – while in other areas it could mean more in-home safety offerings for older adults living alone in isolated locations.

  "The smart home market is really moving fast – accelerated by voice tech. If you have Wi-Fi, you already have a set of data about the home. But cameras that get to know you will join your in-home ecosystem, from knowing about your wellbeing to unlocking the door if you need help." – Paul Barter, Consultant, **PaulBarter&Associates**

- **Systems integrators?** System integrators like Direct Supply or CDW Healthcare are well-established providers of multiple technologies for the senior living industry. Moving ahead post-Covid-19, however, a growing number of integrators will see the business opportunity in the older adult private home market – including adding home care company sales to their market expansion strategies.

  "Knowing what devices and tech is in the home means you can suggest, for example, your network is now 7 years old – would you like to upgrade for greater safety and speed?" – Derek Goldstein, CEO, **Casaplex**

- **Security/alarm providers?** Home alarm companies like SimpliSafe, ADT, and Alarm.com today already view the aging population, especially those who live alone, as a business opportunity, whether purchased directly or by adult children on behalf of their parents. Moving forward, more offerings, including those from Amazon, Apple, and Google, will add safety and remote monitoring partnerships and features based on their deepening data understanding of user interests and preferences.

  "Channels that work best are those that have consultative models, like residential security. Thinking about services and hand-holding is important." – Jennifer Kent**,** VP Research**, Parks Associates**

- **Senior-focused product and retail companies?** Retailers and dealers that sell remote monitoring technology to caregivers of older adults will boost smart home initiatives. Amazon's Alexa Together partnership with Vayyar's radar-based offering is a recent example. Although today smart home and caregiving tech is currently marketed separately, firms like Walmart and Best Buy will see an uptick in demand for integrated smart home technology solutions to better serve older adults.

  "Trending issues could be identified via a dexterity test on a tablet or motion patterns indicating fall risk." – David Inns, President, Active Aging, **Best Buy Health**

- **Home care companies? Non-players today, but…** The future of home care has long been predicted to leverage technology to provide more effective care, especially when the care provider is not in the home. The labor shortage faced by senior living companies as well as home care companies has only sharpened the requirement. Following the acquisition of Home Instead by Honor Technology Inc, expect the home care industry in the future to deploy technology that can help detect patterns in the home when care providers are not there.

  "Technology that could both help reduce the cost and improve the quality of home care would be the most useful." -- Seth Sternberg, CEO, **Honor**

- **'Family on demand'?** In addition to the firms whose primary role includes helping individuals with technology in their home, other firms may be more suitable for helping older adults along multiple dimensions. Today, the Papa.com 'Family on Demand' service, now reimbursed by insurers and offered nationally, includes driving older adults to appointments and also helping their clients with setup and use of smart home technology.

  "Tech in the home should be self-updating, but our team of Pals could help train the user on how to use it once installed or updated." – Andrew Parker, CEO, **Papa**

- **Insurers – the wellbeing of the home?** Homeowner insurance companies recognize the obvious benefit of smart home technology to detect changes in the home. They may offer free devices, installation or premium discounts. For example, State Farm offers a free Ting electrical fire sensor and USAA partners with ADT for remote monitoring and discounts monthly premiums.

- **Insurers and 'payviders' – the wellbeing of the person?** Health insurance like Medicare Advantage could reimburse for technology that can sense change in the homeowner – without a visit from a nurse required to verify. Hospital system Payviders, (those that are both payers and care providers) could incorporate smart home tech into diabetes or heart failure condition management.

- **Housing developers?** Smart home tech is increasingly being considered in senior care environments. But it is also making its way into new housing development. Baptist Health in Florida is offering a telehealth kit with every house sold by the developer, CC Homes. And UpsideHōM is offering 55-plus apartments in multiple communities that include smart home features in its membership model.

  "Today the smart home industry is building tools, but nobody is building the toolbox of best tools and how to use them. With a toolbox, you could improve outcomes without having to visit the person to know that her needs are changing" – Jake Rothstein, CEO, **UpsideHōM**

INTERVIEWEES FOR THIS REPORT

AARP Livable Communities
Alarm.com
Amazon.com
Best Buy Health
Calix
Casaplex
Caspar.ai
Center for Connected Health
Consumer Technology Association
Constant Companion
Cox Communications
Dispatch Health
Engram Labs
Georgia Tech
Green Marbles
Honor/Home Instead
House-Works
Jewish Senior Living Homes
K4Connect
LifePod
NXT-ID
Papa
Parks Associates
PaulBarter.com
RubiWorks
THINK-Health
UpsideHōM
Vayyar
Volunteers of America National Services

Appendix 1 Terminology Referenced in this Report

Gartner Research Connected Home (Source: Gartner Glossary):

A **connected home** is networked to enable the interconnection and interoperability of multiple devices, services and apps, ranging from communications and entertainment to healthcare, security and home automation. These services and apps are delivered over multiple interlinked and integrated devices, sensors, tools and platforms. Connected, real-time, smart and contextual experiences are provided for the household inhabitants, and individuals are enabled to control and monitor the home remotely as well as within it.

The technologies behind the **connected home** can be grouped in the following categories:

- **Networking:** Familiar home networking technologies (high bandwidth/high power consumption), such as Multimedia over Coax Alliance (MoCA), Ethernet, Wi-Fi, Bluetooth, as well as 3G and Long Term Evolution (LTE), are complemented with low-power consumption networking standards for devices and sensors that require low bandwidth and consume very little power, such as thermostats **
- **Media and Entertainment:** This category, which covers integrated entertainment systems within the household and includes accessing and sharing digital content across different devices, has proved to be the most prolific and contains some of the most mature technologies in the connected home.
- **Home Security/Monitoring and Home Automation:** The technologies in this category cover a variety of services that focus on monitoring and protecting the home as well as the remote and automated control of doors, windows, blinds and locks, heating/air conditioning, lighting and home appliances, and more.
- **Energy Management:** This category is tightly linked to smart cities and government initiatives, yet consumer services and devices/apps are being introduced at mass-market prices that allow people to track, control and monitor their gas/electricity consumption.
- **Healthcare, Fitness and Wellness:** Solutions and services around healthcare have proven slow to take off, because they have to be positioned within a health plan and sold to hospitals and health insurance companies. The fitness and wellness segment has strong and quickly developed ecosystems that range from devices to sports wares to apps, which integrate seamlessly with each other to create a strong customer experience.

** Plus ISM bands, Zigbee, Z-Wave

Appendix 2 Resources

Advancing Health and Wellness via the Smart Home, June, 2021

Artificial Intelligence of Things (AiOT), August, 2020

Bankrate: Smart Home Insurance Discounts, June, 2021

Thread, Matter and CHIP Glossary, May 2021

Matter Standard Explained, BGR, September, 2021

The Foundation for Connected Things, Build With Matter, 2021

User Perception of Smart Home IoT Privacy, October, 2018