Care Provider's Guide to Smart Home Devices and Services

Seniors Independent Living Collaborative

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Introduction

The primary role of a care provider is to ensure the health, safety, security and comfort of the care recipient. This is a challenging role to play, and particularly for family care providers attending to other family and employment responsibilities and for those living at considerable distance from a parent(s) or loved one in need of care.

Fortunately, smart home automation devices can help care providers fulfill this role more effectively while increasing the care recipient's independence. Use of these devices, and the newly available smart power pricing services that complement them, can also significantly reduce monthly utility bills, helping those aging in place to do so more affordably.

This guide is intended to inform care providers about the benefits of these devices and services and to provide step-by-step instruction in their selection, purchase/enrollment and installation. The guide's contents include:

- An overview of caregiving demographics, needs, assistance and challenges.
- Descriptions of smart devices and services that benefit providers and recipients.
- Tips for explaining smart device and service benefits to older adults.
- Guidance on assessing device needs, selecting and arranging installation; and
- Answers to frequently asked questions and a glossary of related terms.

The development of this guide was funded by the Illinois Science & Energy Innovation Foundation (ISEIF). The smart power pricing programs/services described in this document are those provided by Ameren Illinois and ComEd, the state's largest electric utilities.

Caregiving in Illinois

Senior Population Growth

The U.S. Census Bureau estimates that one in five Americans (72.8 million) will be 65 or older by 2030. The fastest growing segment of the country's population will be those 85 years of age and older - the population most in need of caregiving due to physical, cognitive, and other functional limitations. In Illinois, 22.3 percent will be 60 or older by 2030 with an increase of more than 28 percent from 2012, making it the fastest growing segment of the state's population.[1] Today, 2.3 million - 17.7 percent of the state's population – is over 60; more than 1.1 million (8.8%) are over 70; and more than 470,000 (3.7%) are over 80.

Care Recipient Profile

Care recipients likely live with the care provider or within a very close distance (within 20 minutes of the care provider's home). Roughly half of care recipients live in their own home (48%). The typical care recipient is female (65%) and 69 years of age. Nearly half (47%) of care providers provide care to someone 75 years old or older. Those care recipients requiring extensive care are more likely to live with their care provider.[2]

In Illinois, just over 604,000 adults over age 60 are living alone. Nearly 208,000 adults over age 60 live in poverty and nearly 218,000 have limited English speaking ability. Throughout the state, adults over 65 living with disabilities total just over 575,000 and just over 257,000 adults over 65 live independently with difficulty.[3]

The typical care recipient is in need of care due to a long-term physical condition. The top three problems reported are:

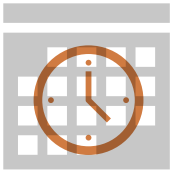
- "old age".
- Alzheimer's disease or another type of dementia, and
- surgery/wounds.

Other common conditions include: cancer, mobility, and mental/emotional health issues.

Care recipients often need assistance with one or more activities of daily living (ADLs), including bathing and dressing, as well as multiple instrumental activities of daily living (IADLs), such as paying bills, shopping and using transportation. Care recipients also need emotional support and assistance in maintaining a safe, secure and healthy home environment, and in communicating their care needs to other family members and healthcare providers.[5]

Care Provider Profile

During 2019, approximately 43.5 million Americans provided unpaid care to an adult or child and 34.2 million provided unpaid care to an adult age 50 or older. In Illinois, approximately 19.5% of the adult population aided a friend or family member each month, according to the most recent Behavioral Risk Factor Surveillance System report.



On average, care providers spend just over 24 hours a week providing care to their loved one; however, nearly 25% of care providers provide 41 or more hours of care a week. Caregiving is particularly time-intensive for those caring for a spouse/partner.

Factors influencing the amount of caregiving time can include the chronic or acute nature of care recipient's condition, stage and/or severity of condition, presence or absence of other care providers, and geographic distance between care provider and care recipient. Alzheimer's disease and other types of dementia continue to require the highest number of caregiving hours in Illinois. A wide variety of tasks often performed by care providers includes housework, communication with health care professionals, and navigating complex medical/nursing tasks.

Challenges of Caregiving

It bears repeating, caregiving can be very challenging and at times, overwhelming, and particularly so for the untrained family care provider and those providing care from a distance. Care providers are challenged by the fact that older adults living alone could be facing fair to poor health, poor vision or diets, difficulties with basic and instrumental activities of daily living, and worsening memory and mood, and social isolation. Further, older adults living alone are at risk of debilitating falls and other injuries in the home environment.[6]

As a result of addressing these challenges daily, care providers are prone to increased levels of emotional and physical stress and financial strain. While smart home devices and services will not eliminate all challenges, they can lessen them, and in so doing, increase an older adult's independence and reduce the burden of caregiving.

Smart Device & Service Benefits

The smart home devices and services that provide the greatest benefit to care providers are those that: improve personal and home health; reduce home hazards; enhance independence and increase cost savings for the care recipient. This chapter describes these benefits and provides a representative sampling of the available smart devices and services.

Improved Personal & Home Health

Personal Health

Ensuring the personal health and well-being of a care recipient is arguably the top priority of the care provider. It is also the one task that can be a matter of life and death when a fall or serious accident occurs in the home or should care recipients have a condition that makes them prone to wandering from the home.

Smart devices on the market today can enable a family or outside care provider to monitor the physical health of a care recipient, as well as their location, physical activities, and routines and deviations from them that may be cause for alarm. These smart devices include those that provide emergency alerts and track, analyze and report health conditions and activities.

Emergency Alert Devices

Most of these devices entail the use of wearable emergency alert transmitters embedded in watches, bracelets, necklaces and garments that enable the user to request assistance from a family member or an emergency services dispatcher in the event of a fall or other life-threatening event.

Some of these devices also monitor physical health attributes such as heart and respiration rates, provide medication reminders, and feature fall detection sensors and distress alerts that operate independently of the user.

Health & Activity Tracking Systems

These devices combine health attribute monitoring and activity sensors in sophisticated tracking systems that establish a care recipient's daily activities, routines, and sleep patterns as a baseline. Once established, the sensors and tracking software can then identify and report any significant deviations from the baseline activities, routines, and patterns to family or outside care providers.

These systems often utilize a combination of wearable sensors and an array of heat, sound, light and motion sensors mounted throughout the home where the essential activities of daily living take place, such as the kitchen, bathroom and entryways. The systems are designed to operate independently of the user, but most also include a voice activation feature allowing care recipients to manually call for assistance when needed.

Home Health

As a person ages, the ability to tolerate thermal extremes and to regulate and maintain safe body temperature is reduced. The use of certain prescription medications and some diseases can also influence body temperature and its regulation. Therefore, maintaining safe home temperature and humidity levels is vitally important to the health of older adults aging in place.

Healthy air quality is also vitally important to maintain as older adults aging in place can be especially vulnerable to indoor air pollutants. Smart devices that can assist care providers in their efforts to maintain a healthy home are described below.

Smart Thermostats

Smart thermostat devices maintain safe heating, ventilation, humidity and air-conditioning (AC) levels by utilizing temperature/climate sensors and controls without relying on the intervention of the home's occupant. Automated space conditioning with a smart thermostat connected to mobile technologies also allow for remote control of a space conditioning system from any location. In this way, smart thermostats deliver enhanced safety, comfort, convenience, and energy bill cost savings.

Common smart thermostat features include:

- Occupancy detection to activate/deactivate the system as appropriate.
- Ability to monitor outdoor air and to adjust indoor temperatures accordingly.
- Controls to respond to and maintain manually adjusted room temperature.
- Optimal humidity and air-conditioning control; and
- Economizer capabilities to use cool outdoor air as an AC chiller source.

Smart Air Quality Sensors/Smart Air Purifiers

As stated, indoor air quality plays a key role in producing a healthy home environment. Older adults are increasingly vulnerable to a variety of indoor air pollutants, especially those challenged by compromised immune systems, lung disease, or asthma. Common pollutants found in the home can include mold spores, dust mites, skin cells, textile fibers, viruses, plant pollens, off-gassing paints, and cleaning products. Those with respiratory challenges are particularly susceptible to these pollutants and more so during winter months when opportunities for fresh air exchanges are limited.

Smart air quality sensors can identify air pollutants and smart air purifiers can address them, thereby improving the personal health of an older person aging in place and making the environment more comfortable for all visiting the home. These Wi-Fi enabled devices allow a care provider to monitor and control air quality from any location inside or outside of the home. Integrated air cleaning systems provide allergy relief and reduce odors through the use of advanced filtering systems that remove allergens, pet dander, and dust while generating a soothing noise that masks disruptive sounds for a peaceful night's sleep.

Reduced Home Hazards

Ensuring a safe and secure environment is of upmost importance to all care providers. Fortunately, a diverse array of smart devices is now available to help accomplish this essential task. These include smart devices for safe lighting; hazards monitoring; and personal security.

Safe Lighting

Accidental falls are the leading cause of injury-related deaths in the United States among adults over 65 and one in three older adults are likely to fall at least once each year.

Beyond certain health conditions and medications that impair balance, the principle cause of most falls is environmental. Besides trip hazards such as loose rugs, extension cords, and slippery surfaces, the top environmental condition contributing to a fall is insufficient lighting and access to light switches. Smart lighting can address this condition and a variety of options are available to fit the specific needs of the homeowner.

Occupancy Sensing Lighting

Ceiling mounted occupancy sensors use technology to automatically turn lights on when motion is detected.

Advanced Lighting Controls

Enhanced lighting controls assist all home occupants and are especially beneficial for those with vision impairment or hearing loss. Smart lighting controls can be programmed to support the needs of individuals, such as visual or audio cues when appliances have completed cycles or visitors arrive at the door. And, smart lighting controls are designed to increase energy efficiency and lower costs by adapting light intensity according to various parameters (natural light, occupancy, etc.).

Wireless LED Interior Lighting

Use of Wi-Fi enabled LED lights allow a homeowner to remotely operate lighting on a smart phone. In addition, many of these lighting systems include smart sensors that automatically illuminate at night and turn off during the day and activate only when an interior space is occupied.

Smart Dimmers

Smart dimmer switches enable homeowners to dim and control interior lighting remotely through voice commands and mobile software applications. These applications also allow the homeowner to schedule the operation of lighting based on established daily routines.

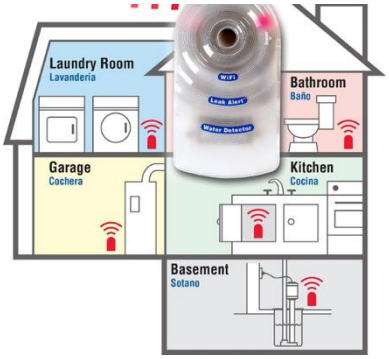
Hazards Monitoring

In addition to trip hazards and poor lighting, the existence of smoke or carbon monoxide and water leaks are always a major concern for any homeowner and especially so for older adults aging in place. However, smart devices are now on the market that can alert the homeowner, care provider or emergency services dispatcher of the existence of any toxic substance in the air or of a leak in progress and enable them to control that alert device on their smart phone or tablet. These devices are described briefly below.

Smart Smoke & Carbon Monoxide Detectors

Smart smoke alarms and carbon monoxide detectors have built-in sensors and can be monitored and silenced from a smart phone, thereby eliminating the risk of a fall from a ladder. These devices can be tested remotely or programmed to perform automatically scheduled tests.

Smart Leak Detectors



Smart Wi-Fi connected leak detectors can send alerts when even the slightest amount of moisture is detected and direct one to the source of the leak. These technologies continuously monitor potential leaks around sinks, dishwashers, appliances, refrigerators, washing machines, sump pumps, water heaters, hot tubs, water filtration units, and more.

Personal Security

All care providers should be concerned about the personal security of the care recipient and particularly so if the older adult is aging at home alone. Smart devices designed to enhance the personal security of homeowners include smart cameras and monitors, doorbells, and door locks.

Smart Cameras and Monitors

Smart wireless security cameras allow a homeowner to monitor interior or exterior space remotely through a smart phone or tablet. Many of these monitoring systems have the capability to record video continuously or for set periods of time, or only when motion is detected. Some have audio communication capabilities that allow a homeowner to listen to the camera's environment and talk to anyone inside or outside of the home. Night vision allows viewing of interior and exterior spaces in complete darkness. Many cameras self-adjust to existing lighting conditions to deliver excellent picture quality even in the glare of bright sunlight. The camera mounts allow units to tilt and pan or remain in a fixed position and most allow the user to zoom in and out to see close details or a wide area.

Smart Doorbells

Smart doorbell/entrance monitor systems allow homeowners to monitor and to record visitors from any location via smart phones, tablets and computers. Motion detection sensors, alarms, and two-way audio features are available on many of these devices.

Smart Door Locks

Opening one's home to visiting family members and friends is a means of staying connected. Smart locks can be used to automatically or remotely lock doors, while allowing home occupants to share virtual keys with guests. Smart monitors and locks give individuals the ability to unlock and monitor their doors from remote locations and, if desired, grant people access without having to give them physical house keys.

A phone, keypad, or a traditional key can also be used to unlock the door. Smart door locks can be used remotely via Wi-Fi with a central control device known as a "Hub" that

allows different technologies to work together and to be operated remotely by voice or smart phone signal.

Enhanced Independence

Care providers should have an interest in facilitating the care recipient's independence to the maximum extent possible, both for the sake of the recipient's dignity and to lessen the burden of caregiving. Smart control devices can help the care provider achieve these objectives while simultaneously enhancing the care recipient's comfort and convenience. These devices include smart appliances, outlets, hubs, digital assistants and whole home controllers.

Smart Appliances

Appliances such as smart refrigerators can help track grocery purchases and facilitate re-ordering directly from a control panel located on the door. Door-mounted screens allow the homeowner to adjust the temperatures in their refrigerator, view interior and exterior camera images, and view the inside of the refrigerator from a smartphone to see what is needed while at the grocery store.

Other smart appliances, such as washers, dryers, dishwashers and ovens can also be programmed, remotely controlled, and set to operate at night or on weekends to take advantage of lower electricity pricing. There are also smart cook-tops/ranges that feature timers, motion detectors and automatic shut-down controls to reduce the hazard associated with use by individuals with memory related impairments.

Smart Outlets

Smart outlets can control anything that has an electrical plug. Whether lamps, fans, humidifiers, air purifiers, electronics, or home water fountains, smart outlets can operate them remotely from any location using a smart phone or tablet. Many of these devices can also be programmed for automation operation.

Digital Hubs

A smart hub is a central control device that connects all smart devices in the home and allows communication among them. For example, homeowners can use a hub to remotely control electric outlets, thermostats, lighting, entertainment, and security through voice activation or smartphone apps. Several applications are also available to allow social connection between family members and friends and provide easy access to a range of social networking platforms.

Digital Home Assistants

Digital home assistants are arguably the most beneficial smart devices for a care provider interested in promoting the care recipient's independence. These hands-free, voice-controlled devices utilize voice-to-text interpretation technologies that enable them to respond to voice commands and to control practically all other smart devices in a home.

Given this extraordinary capability, they are among the most valuable devices to consider for those caring for older adults with mobility and visual limitations. They are commonly used to play music, make telephone calls, send and receive messages, provide information, read the news aloud, function as calendar reminders and alarm clocks, read audiobooks aloud, and control the television and other entertainment systems. Some of digital assistants also feature video screens.

Smart Whole Home Controllers

Care providers seeking to give care recipients the highest degree of independence and freedom from concern about their homes operating systems should investigate the use of whole home controllers. These devices utilize a unified software interface on a touchscreen or mobile application that allows the user to control all other devices managing the safety, security, space and air quality conditioning, lighting and entertainment systems at once.

These systems overcome the challenge of having to learn the operating characteristics and commands of many different software applications that manage each of the individual devices. Most of these whole home controllers also feature voice command operation enabling use by those with motor skill and/or visual limitations.

Increased Cost Savings

Today, many older adults choosing to age in place are confronted with the dual challenges of doing so on fixed incomes and under the pressure of annual increases in the cost of living. These challenges are compounded by periodic home maintenance expenses, rising property taxes, and the increasing cost of prescription drugs, healthcare insurance, and medical services. Considered together, they constitute a significant set of financial challenges for many older adults.

Fortunately, the massive initiative to modernize the State of Illinois' electricity grid is now complete and with it comes a whole new set of smart power pricing programs/services that can benefit all consumers, especially older adults aging in place. This section describes these programs and provides guidance to care providers on how to enroll their care recipients so they can benefit from these valuable services.

The Smart Grid and Related Utility Programs

The implementation of the smart grid and the cost saving programs offered by the electrical utility companies provide opportunities to reduce monthly cost of living while increasing the homeowner's comfort, convenience, safety, security, and control.

Ameren Illinois and ComEd have now completed their modernization of the electricity delivery system that powers most of the State of Illinois' homes and businesses with what is known as the Smart Grid. The system uses computers, automation, and control technologies to establish a two-way digital communication system between the electricity utility and its customers.

Every hour, the system sends the utility the energy consumption data for each customer, which allows them to bill their customers for the variable cost of energy during their actual hours of use. Hourly energy costs are always higher during weekday/peak demand hours and higher still when weather extremes drive customer demand up to heat or cool homes and businesses. During the evening hours and on weekends, customer demand drops, and energy costs are the lowest.

The new system now allows customers to save money on their monthly energy bills by choosing to shift the operation of their heavy energy consuming appliances such as washers, dryers, and dishwashers to the lower cost evening or weekend hours. In addition to customer cost savings, the system also allows a utility to quickly find and fix

power outages and to regulate the flow of energy among users, which increases the reliability of the entire electricity delivery grid ensuring that all customers have the energy they need when they need it.

Ameren Illinois and ComEd, the largest electricity utilities in Illinois, operate several programs that provide their customers opportunities to manage their energy consumption and to reduce their monthly energy bills. These include:

- Real-Time or Hourly Pricing Programs.
- Peak Time Savings or Rewards Programs.
- Connected Device or Home Area Network Programs.
- Online Customer Accounts.
- Traditional Energy Efficiency Programs.

Real-Time or Hourly Pricing Programs

These programs allow homeowners to purchase electricity at prices that vary by the hour based on the wholesale market price for electricity at each hour. Electricity prices are highest during peak hours of demand which are roughly from 10 a.m. to 9 p.m. during weekdays. Electricity prices then drop with demand at night and on weekends and are the lowest between the hours of 9 p.m. and 10 a.m. Customers who switch from fixed-rate pricing and enroll in these variable rate programs can save as much as 15% on their monthly electricity bills by operating major appliances such as washers, dryers, and dishwashers during off-peak hours when hourly prices are the lowest.

Customers enrolled in these programs also receive pricing alerts that notify them when hourly prices are expected to be higher than usual due to predicted excessive weather events.

Important Note: Although these programs provide a homeowner that is aging in place real opportunities to save, they are not recommended for individuals who are dependent on the continuous operation of electronic medical devices. Peak time use of these devices would cost more than a fixed-rate pricing program for continuous use.

Peak Time Savings or Rewards Programs

These programs allow enrolled homeowners to receive a credit on their energy bill for voluntarily reducing electricity usage during certain peak hours during the summer when energy consumption is predicted to be exceptionally high. These particular time periods or “Events” typically fall between 9 a.m. and 5 p.m. between the months of June and September when air conditioning is in high demand.

Enrolled customers are notified the day before a predicted event by phone, email, or text (their choice). If they reduce their energy usage below their previously recorded usage during a similar period on a non-event day (the baseline), they will receive a credit. These credits are calculated at a rate of $1 per kilowatt hour of energy reduced from the baseline for that time.

Connected Device or Home Area Network Programs

These programs are designed to enable homeowners to wirelessly connect certain smart devices to the utility smart meter and to use them to access detailed electricity consumption and pricing information to perform their function. Most of the devices that are equipped with the wireless communication protocol or language that allows them to communicate with the smart meter are in-home displays, gateways (a technology that collects data from a smart meter and sends it to a display), and smart thermostats.

Both Ameren Illinois and ComEd operate a connected device service and maintain a list of smart devices that are compatible with their smart meters on their websites. This list should be consulted before purchasing a product that is designed to use smart meter data.

Online Customer Accounts

Ameren Illinois and ComEd also offer homeowners private online accounts where they can:

- Track their hourly, daily, and monthly energy consumption.
- Establish a home energy profile and customize an energy efficiency plan.
- Set-up phone, text, and email alerts of price changes and weather events.
- Investigate a variety of energy efficiency strategies and tools; and
- Enroll in the programs described above.

Traditional Energy Efficiency Programs

In addition to these smart pricing and connected device services, Ameren Illinois and ComEd offer a variety of traditional energy efficiency programs that can save homeowners money. These include home energy assessments, energy efficiency product rebates and discounts, free used appliance pick-up and recycling services, free weatherization services, and income-eligible programs offering no-cost energy efficient products and installation services.

How to Enroll:

Click on the link provided below for your electric utility to enroll in these programs:

Ameren Illinois – Power Smart Pricing

https://www.powersmartpricing.org/?utm_source=marketing&utm_medium=ameren_website&utm_campaign=smarter_options&utm_content=link

ComEd – Ways to Save

https://www.comed.com/WaysToSave/ForYourHome/Pages/ManageMyEnergy.aspx

Communicating the Benefits to Older Adults

Care recipient “buy-in” is critical to realize and take advantage of the benefits of smart devices and services. Achieving buy-in may be a challenge, as most people are skeptical of untried approaches and tools relating to the way they lead their everyday lives. However, recent research conducted by the authors of this guide indicate that both care providers and those aging in place are likely to be more open-minded about new approaches and tools once they understand their value in immediate terms and are led patiently through the learning process. Toward this end, this chapter provides a few tips on effectively communicating the value of smart devices to older adults aging in place.

Tip #1. Emphasize the “Stay-at-Home” Value of Smart Home Automation

Most older adults want to remain in their homes for as long as possible. An argument can be made that smart devices and services can help the older adult homeowner do that by prolonging their need for assisted living accommodations or other arrangements that would reduce their independence.

Tip #2. Describe the Practical Day-to-Day Value of Smart Home Automation

For the smart home device to serve the purpose for which it is designed, care recipients must understand the benefits to become fully engaged in its use. The implementation of the smart grid and the cost saving programs offered by Illinois’ utility companies provide opportunities for the care recipients to reduce monthly cost of living while increasing their comfort, convenience, safety, security, and control. The presentation of benefits must emphasize this value proposition - increased independence, improved quality of life, and reduced cost of living.

Tip #3. Explain the Ease of Use of & Enrollment in Smart Devices & Services

Smart device ease of use and the simplicity of enrolling in utility smart pricing programs must be made clear to encourage enrollment. Accessibility is important for everyone, but this is especially true for the older person. Selecting devices specifically designed for seniors, rather than the general population, will be helpful as these devices are often simpler to operate, thus reducing the learning curve.

Tip #4. Build Understanding by Establishing the Big Picture First

In order to be effective in presenting these benefits to care recipients, care providers should begin with the big-picture value of these devices and then descend into greater detail as it is apparent that the former is understood. It is also recommended that the subject matter be presented at a slow, relaxed pace with time for plenty of questions. The list of Frequently Asked Questions (FAQ) in Appendix A will help the care provider answer these questions.

Tip #5. Review the Available Resources Before Presenting

As previously mentioned, several concerns will arise during the initial discussion with the care recipient about the benefits of smart devices and services. These will include those related to the cost of purchasing and installing devices, privacy, complexity of operation and whether the devices will reliably perform their intended function. Most of these concerns will be raised as questions for which answers can be found in a list of "Frequently Asked Questions" (FAQs). In addition to the FAQ review, care providers are encouraged to read through the Glossary of Terms contained in Appendix B to enhance their ability to both understand and explain the benefits of smart devices and services to the care recipient.

Device Assessment, Selection & Installation

This chapter describes a step-by-step process for care providers to follow to assess the care recipient's smart device needs, to select devices on the market that meet those needs and to arrange for their installation in the home.

Conducting A Smart Device Needs Assessment

The first step in the process is to assess current and future smart device needs using the questions and considerations below as a guide. Specific age-in-place challenges should be identified for both care provider and care recipient, and consideration be given to the devices that will address them. Consider a room-by-room approach to conducting this needs assessment.

1. What challenges or limitations are anticipated in the next 2-4 years and 5+ years?

2. Is there a problem or set of problems that you wish to solve by adding smart devices? (e.g., reduction in indoor air pollutants, maintenance of safe indoor temperature, reduction of specific hazards in the home)?

3. What is your short- and long-range budget for purchasing and maintaining smart home devices?

Selecting Smart Devices

Both the care provider and recipient should work together to rank order devices by needs and preferences and other considerations suggested by the questions below.

1. Will the device(s) meet both the care provider's and recipient's needs?

2. Once installed, will the devices be easy to operate?

3. Are there additional costs for necessary home adaptations/modifications and supplies to accommodate use of the device(s)?

4. Will this device be compatible with other control devices in the home?

5. As the needs change, will additional devices work with the main communication hub?

6. Are there device rebates available?

7. Has the device earned favorable reviews and ratings from other consumers?

8. Is the device aesthetically appealing and does it fit with the current home décor?

9. What is the projected life expectancy of the device? What is the warranty?

10. Is the price within budget? Is this a one-time cost or will there be future costs to maintain and/or upgrade?

A key resource to consult during the selection and purchase process is the Smart Self Reliance website (www.smartselfreliance.org). Of particular value is the clickable list of smart device categories that allows the user to learn about the features of the most popular devices on the market as of January 2020. To go directly to the category list, click here: https://smartselfreliance.org/smart-devices/

Arranging Smart Device Installation

Once the needed or desired smart device is identified and purchased, selecting a qualified installer is essential. In addition to placing the device in the home, the installer will work with the care provider and care recipient to activate it and provide guidance on its maintenance and use.

The Illinois Science and Energy Innovation Foundation (ISEIF) has sponsored development of an online training and certification program for contractors who install smart devices for older adults. It is known as the *I-STAR Senior Specialist Training Program*. The objective of the training is to sensitize home improvement contractors and equipment installers to the specific needs and preferences of senior homeowners to ensure the successful installation, programming and operation of smart devices in their homes. Contractors/installers who successfully complete the training course and pass the final exam, receive a certificate and are listed on the Smart Self Reliance website.

The I-STAR Senior Specialist Training Program is operated by the Indoor Climate Research and Training Group at the University of Illinois at Urbana-Champaign. For more information about the program visit:

https://icrt.appliedresearch.illinois.edu/training/i-star-senior-specialist-training/

Once you have located a certified I-STAR installer, the questions below will assist you in interviewing the individual to make sure they are familiar with the device you have selected. Questions to ask include the following:

1. What type(s) of smart devices do you install?
2. What is your experience installing these types of devices?
3. Can you provide references for your recent work?
4. What is the cost of installation?
5. What guarantees and/or warranties are offered on the installation?
6. What follow-up technical assistance do you provide?
7. Will you teach us to use the technology?

For More Information Visit:

Seniors Independent Living Collaborative

www.silcresearch.org

Smart Self Reliance Clearinghouse

www.smartselfreliance.org

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Appendix A - Frequently Asked Question

What is the Internet of Things?

The Internet of Things **(IoT)** is a broad term that refers to everyday devices like lights, thermostats, and locks that can connect to the Internet and to each other. These connected devices can exchange data and work together, automating tasks that used to be manually performed. By 2020, it is predicted that there will be anywhere between 26 billion to 200 billion devices connected to the Internet.

What Is a smart home?

A smart home is more than a collection of smart devices, and it's more than a "connected" home. One could live in a house with many smart devices that are connected to the Internet, but that wouldn't make the home a smart home. If those devices are connected to each other and working in concert to automate a number of the home's processes, we're closer to a definition of smart home most people can agree with.

What are smart devices, and how much do they cost?

The lights, thermostats, and more that comprise the Internet of Things are called smart devices. A by-no-means complete list of smart devices includes:

- **Thermostats** - allow you to control your home's temperature remotely and see your usage for heating and cooling. Price range: approximately $200-$250.
- **Locks** - allow you to control who has access to your home and see when they access your home, even if you're not on site. Price range: most sell for approximately $200.
- **Lights** - can be adjusted from your smart phone for comfort and brightness and can be set on a schedule. Price range: wide; anywhere from $50 to $200.
- **Plugs** - allow you to control "dumb" objects, as well as monitor energy consumption of anything plugged into them. Price range: most are about $50.
- **Cameras** - can alert you to intruders, record video, and set off a siren. Price range: between $100 and $200.
- **Smoke and CO Alarms** - will alert you (on your smart phone) to increased levels of carbon monoxide or the presence of smoke. Price range: about $100.

What is a smart hub?

A smart hub is the central device that allows all the different products (lights, locks, thermostats and more) to work together in a smart home. You need not have a hub in a home to use smart devices, but you need one if you want to truly automate the behavior of the various smart devices in your home.

What are the benefits of smart hubs?

Smart hubs simplify the setup and use of multiple smart devices, creating a unified experience throughout your home. A hub not only places all your devices within one app, it can chain together events that keep the residents of your home happier, healthier, and safer. For instance, you can have your hub turn on the AC and certain lights when you're at home and turn them off – and turn on other lights – when you're away.

How do smart hubs work?

Smart hubs work by incorporating several device protocols – such as Bluetooth, Wi-Fi, Zigbee, and others – into one product, so that these devices that usually cannot talk to each other have a place to communicate. From there, consumers can use one app, instead of many, to control multiple devices at once, without being constrained to one brand or protocol. Smart hubs are an extra investment outside of the devices themselves and are not required for most products. However, they are inexpensive and often simplify the smart home experience.

What are the benefits of a smart home?

The top benefits of a smart home are convenience, energy efficiency, and security. According to a 2015 survey conducted by Coldwell Banker and CNET:

- 57% of smart device owners say their devices save them time;
- 45% of smart device owners report their devices save them money; and
- 72% of smart device owners state their devices make them feel safer.

Many consumers install smart devices to be able to control their lighting with their voice, or to adjust the temperature level of their home from an app on their phone. Some install devices that will open their garage door automatically as they pull onto their street or unlock their front door as they approach their house.

The goal is to make to make common household tasks more streamlined or automated. Other consumers enjoy the energy savings of being able to automatically disable the costly heating and cooling of their homes when they are away. There is even an entire smart home device category for home energy monitors, which can show real-time energy usage.

Knowing your home's energy profile can help you identify ways to save money. Motion detectors, smoke and CO detectors, and security cameras can work in concert to alert homeowners that something is amiss in their home. From there, you have the option to alert safety officials in your area. This technology exists today and is continuing to be improved all the time.

What are the financial benefits of using smart home technology?

- **Devices**: Smart thermostats can easily pay for themselves over time. In a 2015 white paper, Nest claims that use of their smart thermostat results in average savings up to 10-12 percent on heating bills and 15 percent on cooling bills. Other manufacturers claim similar benefits.

- **Insurance**: Many insurance companies offer reduced rates for homes that have smart locks, smoke alarms, and security cameras. We've seen discounts of up to 15 percent.

- **Rebates**: Gas and electric companies often pay rebates to users of smart thermostats. These rebates can exceed $100 and will cover almost half the price of a new smart thermostat.

Who owns the data, and how is smart home device data used?

The type of data collected will vary by device. For security devices, they may be collecting real-time video feeds; for door locks, it may be who arrives and when.

- **Who owns the data?** In general, you, the consumer will own the data. However, each vendor can vary, so it is up to the consumer to make sure they have ownership of their data.

- **How is smart device data used?** The data collected by vendors can be used in a multitude of ways, from simple analytics to advanced algorithm improvements. These results are generally used by smart device companies to improve product development and provide additional services to their customers. You should also read the vendor's privacy policy to see what they are legally allowed to do with the data. They may allow themselves to sell your data to third parties, so read carefully.

What are the connectivity options for a smart home?

There are many options when it comes to device connectivity, but they can generally be put into three different categories:

- **Wi-Fi**. These devices connect directly to your router or gateway and have direct access to the Internet. This makes it easy to control the device from anywhere in the world. Some drawbacks are limited battery life and a greater risk of attack from hackers.

- **Bluetooth**. These devices will talk directly to your phone and this makes them ideal for creating secure personal network. With the release of Bluetooth Low Energy (BLE), these devices can provide weeks and months of connectivity on a single battery charge. To connect these devices to the Internet for control or monitoring, it will require your phone to act as a gateway or a dedicated hub connected to the Internet.

- **IEEE 802.15.4 (Zigbee)**. This is a low energy, mesh networking protocol specifically built for device-to-device infrastructures. This protocol is the basis for Zigbee, Thread, and others. It is extremely low energy and can provide months and

years of operation on battery. Generally, the only way to talk to these devices over the Internet is to use a hub.

Can I Install Smart Home Devices Myself? Like any other home improvement project, some smart home projects are quick and easy, while some are time-consuming and more difficult. In almost all cases, there are physical tasks (e.g., removing dead bolts and thermostats and replacing them with their smart equivalents), as well as information technology and connection tasks (e.g., getting devices to "talk" to each other, setting up schedules).

What are some of the challenges of a smart home?

Today's smart home is not without its complications. Just like any emerging technology, smart home products are going through their fair share of growing pains. These problems range from occasional downtime to exposing your home network to cyber criminals. Since these new products directly affect the safety and security of your home, the bar needs to be set much higher. Current low-tech solutions (e.g., smoke alarm, light switches, deadbolts, thermostat) in the home are already near 100% reliable.

To be successful, new smart home products need that level of reliability and convenience. The heavy reliance on cloud computing means these devices may only be as dependable as your home internet connection. Lastly, there is heavy competition between large corporations for control of the smart home retail space, leading to a fragmentation of the market. This leads to consumers needing separate apps to control their lights, locks, or thermostats.

Are there security risks associated with smart home devices?

Issues with security and privacy are to be considered as with anything connected to the Internet. As with any account you have, the first line of defense is a strong and regularly changed password.

Do smart devices affect the selling price of a home?

Because smart home technology is new, its effect on home prices is just beginning to be evaluated. What we *do* know, according to a 2016 Coldwell Banker smart home survey, is that homeowners are willing to invest significantly in smart home technology. Seventy-two percent of millennial homeowners say they would spend $1,500 or more to make their home smart; 44 percent say they would pay $3,000 or more to do so. Who might be willing to pay more for a home with smart technology? Parents with children, for one; 59 percent told Coldwell Banker they would pay more for a smart home.

What happens to a smart home & smart device when the power goes out?

Many but not all smart devices will stop working, just like the devices, appliances and systems in any other home during a power outage. However, a number of these devices operate on batteries, like smart door locks, allowing them to continue to function, although any remote-controlled features enabled by the Internet won't work until the power is restored. Batteries in smart thermostats will also maintain the memory of programmed schedules of operation so the user doesn't need to be concerned about re-programming when the power is restored. Similarly, batteries backing up some camera

systems will continue to operate locally, although Internet-enabled remote monitoring won’t be available. All things considered, a smart home is no worse off than a “dumb” or non-connected home during a power outage and may be slightly better off.

Appendix B - Glossary of Terms

Sources: The terms contained in this glossary combine those found in glossaries complied by: CRT Labs at The National Association of Realtors (https://crtlabs.org/smart-homeglossary/); the Home Automation Glossary (https://www.vesternet.com/resources/glossary); and Smart Grid Today: (https://www.smartgridtoday.com/public/Glossary2.cfm).

Definitions reproduced from Smart Grid Today are with the limited permission.
To view the full glossary on Smart Grid Today's website, please visit:
https://www.smartgridtoday.com/public/glossary.cfm.

Actuator: A device that is triggered by a sensor.

AirPlay: The wireless protocol used by Apple to allow for audio and video streaming over a wireless network between compatible technologies.

Application (APP, app): A term used to describe an application that runs on mobile technologies such as personal smartphones and tablet computers.

Automated or Advanced Metering Infrastructure (AMI): A utility infrastructure with two-way communications for metering and associated systems allowing delivery of a wide variety of services and applications to the utility and customer.

Applet: The IFTTT Applet triggers an action or response using the IFTTT web service whenever an event occurred. (If this happens, do that) or (If this happens, do this, and then this, and then this).

Automation: The ability for your home or technologies to react without input from humans. For most smart homes, this is achieved by having multiple technologies communicate with each other, including sensors, cameras, and other products, to achieve varying levels of automation.

Bluetooth LE/ Bluetooth Smart: A wireless protocol that is popular among smart home technologies.

Cloud-to-Cloud: Many smart home products use cloud services for their core functionality. Although it is not ideal having your technologies relying on an Internet connection, it does sometimes allow for increased interoperability. Two technologies in the same room might not be able to communicate directly. Instead, messages are sent back and forth through their respective cloud services over the Internet. This is known as "cloud to cloud" and is becoming a popular way for hardware vendors to increase compatibility.

coMesh Network: Protocols that are designed using a mesh network means products can pass messages from device to device in a “hopping” fashion until the final destination is reached. Every device in your home acts as a range extender; the more technologies you have, the more powerful/ reliable your network becomes.

Device: A specific electronic product that can be controlled through the wireless network. The device can be a local wireless controller, which controls a specific light or appliance (usually connected to it by mains wiring), or a sensor that provides input to the network. Each device is seen as a network Node.

Digital Home Assistants: Digital applications that use voice recognition to aid in the control of a smart home. Amazon’s Alexa, the Google Assistant, and Siri are all examples of voice assistants that are designed to control smart home technologies.

Dimmer: A wireless controlled device that controls the brightness, as well as the On/Off state of a local light.

Ethernet: Common system to create a computer network using cables (wired network). This system is less common in homes, where the more convenient Wi-Fi (wireless) system is used. However, the wireless Router typically includes Ethernet sockets so that a PC or other device can be directly connected to it.

Event: A set of commands that is instigated following a trigger from a device or sensor. For instance, when a motion detector is tripped a light comes on.

Gateway: Connects your home automation network to the Internet. The Gateway enables you to control the network and all the technologies on it from anywhere in the world using a computer or smartphone. It also enables your network to send and retrieve information from specific remotely located servers.

Geofence: A virtual perimeter for the real world. Using your Wi-Fi, Bluetooth, or GPS radios, your Smart Home software can trigger events based on your physical location. For example, you can use a geofence to automatically turn off your lights when you leave for the day.

Groups: A collection of individual technologies, which can be controlled as a group. For instance, a controller can switch them all on with one action, rather than having to turn on each device individually.

Home Automation: All aspects of adding control to your home and appliances. It can be as simple as adding remote control to a few lights or creating a more complex system that includes automatic sensors and security systems.

Hub: The central device that allows all the different products (lights, locks, thermostats) to work together. Most hubs will also act like a universal remote, as well as providing the tools necessary to automate your technologies.

IFTTT: “If This, Then That” allows users to connect multiple technologies by creating “recipes” for products that may not natively speak to each other. For instance, you can have your lights flash on and off when you need to leave work at 5 p.m. if you find yourself often late to dinner.

Interoperability: The ability for different smart home technologies and services to reliably work together.

IoT (Internet of Things): A broad term that refers to everyday technologies such as lights, thermostats, and locks that can connect to the Internet and to each other. These connected technologies can exchange data and work together, automating tasks that used to be manually performed.

Internet Protocol IP: A device that can send information using a computer network or the Internet. It is commonly used with security cameras.

Load: An electrical load is an electrical component or portion of a circuit that consumes electric power such as appliances and lights.

Network: Two or more technologies connected together. This enables the technologies to be controlled and to communicate with each other. The reason for home automation it is typically referred to a Wireless Network as a Network.

Pairing: The process to add a device to a wireless network. When paired, the device can be controlled by the network.

Portable Controller: A network controller that can be moved around the home. These controllers are normally hand-held and battery powered.

Protocol: The language that technologies use to send commands to one another. Examples of popular smart home protocols include X10, Bluetooth Low Energy, Z-wave, and ZigBee.

Router: Connects a local area network (LAN) to the Internet.

Sensor: Offers a wide variety of information that can tell you not only about things going on in your home, but also be used for home automation. Presence sensors can detect if people are in a certain area, detect motion indoors and outdoors, gather indoor environmental quality factors, and report this information to other technologies using IFTTT, a smart home hub, or other protocols to make devices like lights, fans, and heating, ventilation and air condition (HVAC) units run.

Setpoint Temperature: The temperature that the thermostat is set to. If the room's temperature is below the setpoint temperature, the thermostat will send a signal (or close a switch) to turn on the heating system.

Smart Assistant: The virtual person that “lives” in a hub to assist you such as Amazon’s Alexa or Apple’s Siri.

Smart Grid: A nickname for the utility power distribution grid enabled with computer technology and two-way digital communications networking.

Smart Locks: Technologies that connect to your existing door or dead bolt locking system and are operated via a wireless signal and controllable through an interface on a smartphone, watch or tablet.

Smart Meter: A utility meter for electricity, natural gas or water, usually, that always includes two-way communications technology (see AMI).

Smart Outlets (also called ‘Smart Plugs’): An adaptor that is used for ‘non-smart’ technologies that allows them to be remotely controlled (either by voice or app).

Virtual Private Network (VPN): A method of keeping the presence of and network technologies belonging to users secure and hidden from other users on the same network infrastructure.

Wi-Fi: A local area network that uses high frequency radio signals to transmit and receive data over distances of a few hundred feet.

X10: One of the oldest protocols still used in home and building automation. Developed in the in the 1970s, it uses the power lines in your home to allow communication between technologies. This simple system is very reliable, but not as capable as modern protocols.

Z-Wave: A wireless communications protocol designed for home automation. It is mainly used in the residential space to provide a simple yet reliable way to wirelessly control lighting, locks, HVAC, and window treatments.

ZigBee: A low-cost, low-power, wireless mesh network designed to be used with technologies or sensors that had very low power consumption and did not need to send large amounts of data