Designing Smart Homes for assisted living: Understanding Elderly Customer Needs

Gondoskodó okosotthonok tervezése: az idősek fogyasztói igényeinek megértése

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Abstract

As the population ages, there is a growing interest in leveraging smart home technology to provide care and support for elderly individuals. However, the effectiveness of these solutions hinges on a thorough understanding of customer needs. This article explores the importance of analyzing customer needs before establishing a smart home for assisted living for the elderly. It delves into the unique challenges faced by seniors, including physical limitations, cognitive decline, and emotional well-being, and outlines methods for gathering insights, such as surveys and interviews. Key considerations in analyzing customer needs, including safety, comfort, and independence, are discussed, along with the role of technology in addressing these needs. By prioritizing the understanding of customer ne   eds, smart home designers and installers can create compassionate and effective smart home environments that enhance the quality of life for elderly.

Absztrakt

A népesség öregedésével egyre nagyobb az érdeklődés az okosotthon technológia kihasználása iránt, hogy az idősek számára gondozást és támogatást nyújtson. E megoldások hatékonysága azonban az ügyfelek igényeinek alapos ismeretén múlik. Ebben a cikkben azt vizsgáljuk, hogy mennyire fontos az ügyfelek igényeinek elemzése, mielőtt az idősek számára gondoskodó okosotthont hoznánk létre. Bemutatjuk az időskor egyedi kihívásait, beleértve a fizikai korlátozottságot, a kognitív problémákat és az érzelmi jóllétet, és felvázoljuk azokat a módszereket, amelyekkel a szükséges információk összegyűjthetőek (például felmérések, interjúk). Az ügyfelek igényeinek - többek között a biztonság, a kényelem és a függetlenség - elemzése során felmerülő legfontosabb szempontokat, valamint a technológia szerepét tárgyaljuk az igények kielégítésében. A vásárlói igények megértésének előtérbe helyezésével az okosotthonok tervezői és telepítői együttérző és hatékony okosotthoni környezetet hozhatnak létre, amelyek javítják az idősek életminőségét.

Keywords

Assisted living, smart home, domotics, elderly, designing

Kulcsszavak

Gondoskodó okosotthon, domotika, idősek, tervezés

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INTRODUCTION

With advancements in technology, the concept of smart homes has transformed from a luxury to a necessity, particularly in the context of caring for the elderly. By the aging of populations there is a pressing need for innovative solutions that enable seniors to maintain independence and quality of life in their own homes. Smart home technology offers promising opportunities to address these needs, providing assistance, security, and convenience tailored to the unique challenges faced by elderly individuals.

However, the success of these smart home solutions hinges not only on the sophistication of the technology but also on a deep understanding of the customers they serve. Before establishing a smart home for assisted living for the elderly, it is imperative to analyze and comprehend their specific needs, preferences, and limitations. This foundational step is crucial for designing solutions that are not only technologically advanced but also empathetic and human-centered.

In this article, we delve into the importance of analyzing customer needs in the context of establishing smart homes for the elderly. We explore the multifaceted challenges faced by seniors, ranging from physical impairments to cognitive decline and emotional well-being. Additionally, we discuss various methods for gathering insights into customer needs, including surveys, interviews, and collaboration with healthcare professionals.

By prioritizing a customer-centric approach, designers, caregivers, and technologists can ensure that smart home solutions for the elderly are not just functional but also compassionate and empowering. Understanding customer needs lays the groundwork for creating transformative and inclusive smart home environments for the   aging population.

UNDERSTANDING THE UNIQUE NEEDS OF ELDERLY CUSTOMERS

Understanding the unique needs of elderly customers is essential for designing smart home solutions that cater to their specific challenges and enhance their quality of life. By addressing physical limitations, cognitive challenges, and emotional well-being, smart homes can empower elderly individuals to age in place safely, comfortably, and with dignity. The population of both the European Union and Hungary is rapidly aging. In Hungary, in 2022, 20.3% of the population was 65 years or older, and according to projections, this proportion may reach 30% by 2050. [1]

Physical Limitations

Mobility issues: Mobility limitations are common among elderly individuals, affecting their ability to move around freely and perform daily activities. Conditions such as arthritis, Parkinson's disease, and stroke can significantly impair mobility, making tasks like walking, standing, and reaching challenging. Nearly a quarter of the elderly population is affected by some form of joint-related musculoskeletal disorder, which is one of the leading causes of disability in this age group. Osteoporosis affects one-fifth of those aged 65 or older. 20-30% of the elderly suffer injuries that reduce mobility and independence as a result of falls.   Understanding the extent of mobility issues is crucial for designing smart home solutions that enhance accessibility and promote independence. [1]

Vision and Hearing Impairments: Age-related changes in vision and hearing can pose significant obstacles for seniors. Alterations in our visual abilities during later stages of adulthood may affect our capacity to execute routine visual tasks like object recognition,

reading, participating in mobility-related activities, and driving, consequently influencing our life quality and well-being. Reduced visual acuity and hearing loss can affect communication, navigation, and safety within the home environment. Smart home technologies must accommodate these impairments by offering features such as voice-activated controls, adjustable font sizes, and visual alerts to ensure that elderly individuals can interact with their surroundings effectively.[2]

Chronic Health Conditions: Many elderly people   have   chronic health conditions such as diabetes, hypertension, and heart disease. In Hungary, 72% of the population aged 65 or older is overweight or obese, while 76% suffer from some form of chronic illness. These conditions may require regular monitoring, medication management, and lifestyle modifications. Smart home solutions can play a vital role in supporting seniors' health by integrating medical devices, reminders for medication adherence, and remote monitoring capabilities to keep caregivers and healthcare providers informed about any changes in health status. [1]

Cognitive Challenges

Memory Loss: Cognitive decline, including memory loss and confusion, is a common aspect of aging, particularly among individuals with conditions like Alzheimer's disease and dementia. Memory loss can impact daily routines, medication adherence, and safety within the home. Smart home technologies can assist elderly individuals by providing reminders for important tasks, organizing schedules, and implementing location-tracking features to prevent wandering and ensure their safety.[3]

Decision-making Abilities: Declines in cognitive function can also affect elderly individuals' decision-making abilities, leading to difficulties in problem-solving and planning. Smart home solutions should be designed with simplicity and ease of use in mind, minimizing cognitive load and reducing the need for complex decision-making. Clear interfaces, intuitive controls, and automation features can help seniors navigate their environment more effectively and maintain a sense of autonomy.

Emotional Well-being

Loneliness and Social Isolation: The elderly population of Hungary is exposed to an increasing risk of psychological, social, economic, and biomedical problems related to aging due to 'unsuccessful' aging. Many elderly individuals experience feelings of loneliness and social isolation, especially if they live alone or have limited social interactions. Smart home technologies can bridge the gap by facilitating communication with family members, friends, and caregivers through video calls, messaging platforms, and social networking features. Virtual companionship and social engagement can mitigate feelings of loneliness and improve overall emotional well-being.[1]

Mental Health Concerns: Mental health issues such as depression and anxiety are prevalent among elderly individuals but often go unnoticed or untreated. Smart home solutions can incorporate mood-tracking tools, relaxation techniques, and access to mental health resources to support seniors' emotional health. Additionally, sensors and monitoring devices can detect changes in behavior or activity patterns that may indicate underlying mental health issues, enabling timely intervention and support.[3]

INCORPORATING TECHNOLOGY TO ADDRESS CUSTOMER NEEDS

Smart Home Devices and Systems

Smart home technology offers a wide range of assistive devices and systems designed to address the specific needs of elderly individuals. Examples include:

- Smart sensors: These devices can monitor movement, detect falls, and track activity levels to provide real-time insights into the well-being of elderly residents.
- Voice-activated assistants: Virtual assistants like Amazon Alexa and Google Assistant enable hands-free control of smart home devices, making it easier for elderly individuals to interact with their environment.
- Remote monitoring systems: These systems allow caregivers and healthcare providers to remotely monitor vital signs, medication adherence, and overall health status, providing peace of mind and timely intervention when needed.
- Smart home security cameras: These cameras offer enhanced security and monitoring capabilities, allowing elderly individuals and their caregivers to keep an eye on their home environment and detect any unusual activity or potential risks. [4, 5]

When incorporating technology into smart home solutions for elderly customers, it's essential to consider integration with existing infrastructure. This includes compatibility with existing devices, systems, and protocols to ensure seamless operation and minimal disruption to the home environment. By leveraging interoperability standards such as Zigbee, Z-Wave, or Wi-Fi, smart home installers can integrate new devices and systems with ease, enabling comprehensive monitoring, control, and automation capabilities throughout the home. [4]

Customization and Personalization

Customization is the key element of smart home planning. It is even more critical in case of elderly due to the potential special needs.

Tailoring Solutions to Individual Preferences: Every elderly individual has unique needs, preferences, and lifestyle habits that must be taken into account when designing smart home solutions. Installers should prioritize customization and personalization to tailor solutions to the specific requirements of each customer. This may involve conducting thorough assessments, gathering input from elderly individuals and their caregivers, and configuring smart home devices and systems to meet their individual preferences and routines. By tailoring solutions to individual needs, installers can ensure that smart home technology enhances comfort, convenience, and overall quality of life for elderly customers.

Flexibility to Adapt to Changing Needs: As the needs of elderly individuals evolve over time, smart home solutions must be flexible and adaptable to accommodate changing circumstances. Installers should design solutions with scalability and future-proofing in mind, allowing for easy expansion, upgrades, and modifications as needed. This may involve selecting modular devices and systems that can be easily reconfigured or integrated with new technologies in the future. By providing flexibility and scalability, smart home solutions can continue to meet the evolving needs of elderly individuals, supporting aging in place with confidence and peace of mind.

Incorporating technology into smart home solutions for elderly customers offers immense potential to address their specific needs and enhance their quality of life. By leveraging assistive technologies, integrating with existing infrastructure, and prioritizing customization and personalization, smart home installers can create tailored solutions that empower elderly individuals to age in place comfortably, safely, and independently. [6,7]

METHODS FOR ANALYZING CUSTOMER NEEDS FOR SMART HOME DESIGNERS AND INSTALLERS

Surveys and Interviews

Designing Questions to Gather Insights: Surveys are valuable tools for collecting data about the needs, preferences, and challenges of elderly individuals and their caregivers. When designing survey questions, it's essential to craft inquiries that elicit specific and actionable responses. Questions should cover a range of topics, including daily activities, quality life, health concerns, technology usage, and desired features for a smart home environment. By structuring surveys effectively, smart home installers can gain a comprehensive understanding of customer needs and preferences, guiding the development of tailored solutions.

Conducting Interviews with Seniors and Caregivers: In addition to surveys, interviews provide an opportunity for in-depth exploration of customer needs and insights. Conducting one-on-one or group interviews with seniors and their caregivers allows installers to delve deeper into individual experiences, challenges, and preferences. Open-ended questions can uncover valuable insights that may not emerge through structured surveys alone. By actively listening to customers' perspectives and concerns, smart home installers can refine their understanding of customer needs and ensure that solutions are aligned with their expectations.

Observation

Observing Daily Routines and Challenges: Observation is a powerful method for gaining firsthand insight into the daily lives of elderly individuals within their home environments. By spending time observing seniors as they go about their routines, smart home installers can identify pain points, inefficiencies, and areas for improvement. This approach allows installers to understand how elderly individuals interact with their surroundings, where they encounter difficulties, and how technology can be integrated to enhance their quality of life.

Identifying Pain Points and Areas for Improvement: Through observation, installers can pinpoint specific pain points and challenges that elderly individuals face in their homes. This may include difficulties with mobility, communication, medication management, or home safety. By identifying these areas for improvement, installers can tailor smart home solutions to address the unique needs of each customer. Whether it's installing grab bars in the bathroom, implementing voice-activated controls for lighting and appliances, or integrating fall detection sensors, observation enables installers to design solutions that effectively support elderly individuals in their daily lives.

Collaboration with Healthcare Professionals

Consulting Geriatricians, Occupational Therapists, etc.: Collaboration with healthcare professionals, such as geriatricians, occupational therapists, and home healthcare providers, provides valuable expertise and insights into the specific needs of elderly individuals. These professionals can offer clinical perspectives on mobility limitations, cognitive impairments, and chronic health conditions that may impact daily functioning and safety within the home. By consulting with healthcare experts, smart home installers can gain a deeper understanding of the medical and functional needs of their customers, informing the design and implementation of customized solutions.

Integrating Medical Insights into Smart Home Solutions: By integrating medical insights into smart home solutions, installers can create holistic and personalized environments that support the health and well-being of elderly individuals. This may involve incorporating medical devices for monitoring vital signs, medication adherence reminders, or remote monitoring capabilities for early detection of health issues. By leveraging healthcare expertise, smart home installers can ensure that their solutions not only enhance convenience and comfort but also contribute to improved health outcomes and peace of mind for both seniors and their caregivers.

While smart home installers may have limited resources and capabilities compared to healthcare professionals, leveraging methods such as surveys and interviews can still yield valuable insights into customer needs and preferences. By focusing on customer-centric approaches and actively engaging with elderly individuals and their caregivers, installers can develop smart home for assisted living solutions that enhance independence, safety, and quality of life for seniors aging in place. In this article we are focusing on the surveys and interview questions that can be easily used by smart home installers.

KEY CONSIDERATIONS IN ANALYZING CUSTOMER NEEDS

In analyzing customer needs for smart home solutions, installers must consider key factors such as safety, comfort, convenience, independence, and autonomy. By prioritizing these considerations and designing solutions that address the specific needs and preferences of elderly individuals, installers can create caring and compassionate environments that support aging in place with dignity and peace of mind.

Safety and Security

Assessing Risks and Vulnerabilities: Safety is paramount when designing smart home solutions for elderly individuals. Installers must conduct thorough assessments to identify potential risks and vulnerabilities within the home environment. This includes evaluating factors such as fall hazards, fire risks, and security vulnerabilities. By identifying areas of concern, installers can prioritize safety features and implement measures to mitigate risks, ensuring a secure living environment for elderly customers.

Implementing Measures for Emergency Situations: In addition to proactive safety measures, smart home solutions should include provisions for responding to emergency situations effectively. This may involve integrating features such as emergency call systems, smoke and carbon monoxide detectors, and automated alerts for caregivers or emergency services. By implementing measures for emergency situations, installers can provide peace

of mind to elderly individuals and their caregivers, knowing that help is readily available when needed.

Comfort and Convenience

Enhancing Accessibility and Usability: Smart home solutions should be designed with accessibility and usability in mind to accommodate the diverse needs of elderly individuals. This includes features such as voice-activated controls, adjustable lighting and thermostat settings, and intuitive interfaces that are easy to navigate. By enhancing accessibility and usability, installers can ensure that smart home technology is inclusive and user-friendly for elderly customers, regardless of their level of technological proficiency.

Minimizing Physical Exertion and Stress: Aging can take a toll on physical health and energy levels, making tasks that were once simple more challenging. Smart home solutions should aim to minimize physical exertion and stress by automating routine tasks and reducing the need for manual intervention. This may include features such as automated lighting and climate control, smart appliances with remote operation capabilities, and robotic assistance for tasks like cleaning and maintenance. By reducing the physical demands on elderly individuals, smart home technology can enhance comfort and quality of life.

Independence and Autonomy

Empowering Seniors to Maintain Control: Maintaining independence and autonomy is essential for preserving the dignity and well-being of elderly individuals. Smart home solutions should empower seniors to maintain control over their living environment and daily routines. This may involve features such as customizable settings, personalization options, and decision-making autonomy. By giving elderly individuals agency and control, installers can foster a sense of empowerment and self-sufficiency, promoting independence and confidence in their ability to age in place.

Balancing Assistance with Preserving Dignity: While assistance is necessary for supporting elderly individuals in their daily activities, it's essential to strike a balance that preserves their dignity and autonomy. Smart home solutions should offer assistance discreetly and respectfully, without undermining the individual's sense of independence. This may involve integrating assistive technologies that blend seamlessly into the home environment, as well as providing options for privacy and personal space. By respecting the dignity of elderly customers, installers can ensure that smart home solutions enhance their quality of life while preserving their sense of identity and self-worth.

Table 1 contains a list of questions we would suggest to guide conversations with customers. It is an additional list that can be used by the smart home experts, it cannot replace the general analysis of smart home needs of the customer. By asking these questions and actively listening to the client's responses, smart home designers and installers can gain valuable insight into their unique needs and preferences, allowing to tailor the smart home solution to meet the specific requirements for safety, comfort, and care.

Health and Mobility:	Communication and Social Connectivity:
Do you or your loved one have any medical conditions or mobility challenges that need to be addressed in the design of the smart home?	How do you prefer to communicate with family members, friends, or caregivers?
Are there any specific health monitoring needs, such as medication reminders, vital sign tracking, or fall detection?	Are there any concerns about social isolation or loneliness that you would like to address through the smart home technology?
Do you require assistance with activities of daily living, such as bathing, dressing, or meal preparation?	Would you be interested in features like video calling or social media integration to stay connected with loved ones?
Safety and Security:	**Comfort and Convenience:**
What safety concerns do you have regarding your current living environment?	What comfort features would enhance your daily life and overall well-being?
Are there any particular security features you would like to incorporate into the smart home system, such as surveillance cameras, smart locks, or alarm systems?	Are there any preferences regarding lighting, temperature, or environmental controls within the home?
Do you have any pets or concerns about their safety within the home?	Do you have any specific preferences for entertainment options, such as music or television?
Daily Routine and Lifestyle:	**Future Planning:**
Can you describe your typical daily routine and any challenges you encounter?	Are there any anticipated changes in your living situation or care needs that should be considered in the design of the smart home?
Are there any specific tasks or activities that you find difficult to perform independently?	How do you envision your needs evolving over time, and how can the smart home system adapt to accommodate these changes?
What leisure activities or hobbies do you enjoy, and how can the smart home system support these interests?	Are there any long-term goals or aspirations for aging in place that you would like to incorporate into the smart home design?

*Table 1: Proposed questions specific to guide conversations with customers
to design smart home for the eldery*

CONCLUSION

Throughout this study, we have delved into the intricate landscape of smart home solutions for the elderly, emphasizing the paramount importance of understanding and analyzing customer needs. We have seen how these needs encompass not only the functional

aspects of technology but also the emotional and psychological requirements of the elderly population. By comprehensively examining their needs, preferences, and challenges, we lay the foundation for developing truly impactful and user-centric solutions.

When gathering information from a client to understand their needs for a smart home for assisted living, it's essential to ask questions that delve into various aspects of their lifestyle, health status, preferences, and concerns. As a result of our work we created a questionnaire dedicated to smart home for assisted living for elderly that smart home designers and installers can use to truly understand the need of their customers.

In conclusion, by prioritizing the analysis of customer needs and embracing a compassionate approach to design, we can pave the way for a future where smart home solutions truly enrich the lives of the elderly, fostering independence, dignity, and meaningful connections.

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