DR1 Final Project

Design Research Plan

Digital Accessibility for Senior Citizens

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1. Introduction and Research Objectives

Overview:

As technology becomes increasingly integrated into daily life, it offers tremendous potential to improve convenience, safety, and connectivity. Devices like phones, laptops, desktops, smart speakers, thermostats, security cameras, and automated lighting systems promise ease of use and greater independence, particularly for senior citizens. However, only about 12% of older adults (65 and above) use smart home devices, compared to 30-40% among younger demographics. This shows a significant digital divide in the adoption of these technologies. The adoption and effective utilisation of such technology among older adults remains limited.

Senior citizens often encounter barriers such as limited digital literacy, small or unintuitive interfaces, and a lack of accessible instructions or support. These obstacles can result in frustration, abandonment of devices, or even exclusion from technological advancements meant to simplify their lives. Cost remains a prohibitive factor, with nearly 40% of older adults citing affordability as a reason for not adopting smart home technologies. Additionally, lower educational attainment correlates with reduced tech adoption, limiting access to the training required to use such devices. Consequently, a significant portion of this demographic is unable to benefit fully from the transformative potential of smart home devices.

This issue is critical, as senior citizens represent a growing segment of the population globally. With many seeking to "age in place"—living independently in their own homes rather than moving to assisted care facilities— technology could play a vital role in enabling that independence. Accessible and user-friendly designs can not only improve day-to-day

living but also enhance safety, such as by alerting caregivers in emergencies or automating routine tasks to reduce physical strain.

By addressing these challenges, this research aims to understand how smart devices can be redesigned or supported with complementary solutions, such as simplified apps, better tutorials, or personalized tech support, to improve accessibility for seniors.

Problem Statement:

Senior citizens struggle to effectively use technology and devices due to design complexities, lack of accessible guidance, and low digital confidence. This hinders their ability to benefit fully from technologies designed to enhance convenience and safety.

Research Objectives:

1. Identify specific challenges senior citizens face when interacting with technology and smart devices, including setup, navigation, and troubleshooting.
2. Examine the role of interface design and user support systems in improving accessibility and usability for older adults.
3. Investigate the types of assistance (e.g., family, technical support, online guides) senior citizens rely on to overcome barriers in using smart devices and technology.
4. Identify the attitudes and perceptions of senior citizens toward technology, including their feelings of trust, comfort, and relevance.
5. Investigate how interaction with technology influences senior citizens' sense of independence, safety, and daily living.

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2. Mixed Methods Design

Approach:

To comprehensively address the research objectives, a **mixed methods design** will integrate qualitative and quantitative approaches. This combination ensures a holistic understanding of both the lived experiences of senior citizens and broader usage patterns. For this research on digital accessibility for senior citizens, the combination strategy will be where qualitative and quantitative methods are implemented simultaneously—offers a

complementary and holistic approach to understanding the issue of digital accessibility for senior citizens.

Design Components:

Qualitative Methods:

1. Contextual Interviews to capture seniors' personal experiences, emotions, and pain points.
2. Understanding the physical context of the interviewees as well such as what their home is like, what their office is like, where might they use the devices and what is that space like.
3. Field observations would involve systematically and directly observing senior citizens interacting with smart home technologies in their natural environments, such as their homes. This method would allow researchers to capture authentic behaviors, challenges, and environmental factors that influence technology usage, and focus on understanding real-world contexts and unspoken barriers that seniors may not articulate in interviews or surveys.

Key Components in This Scenario:

1. Contextual Insights:
   Observations will focus on how seniors physically and cognitively engage with devices like smart speakers, thermostats, or security systems. For instance:
   - Do they struggle with voice commands or navigation?
   - How do their physical abilities impact their interaction (e.g., arthritis affecting touch screen use)?
2. Environmental Factors:
   The researcher will examine how the home setup or infrastructure supports or hinders technology usage. For example:
   - Are devices placed in accessible locations?
   - Are Wi-Fi or power outlets conveniently available?
3. Behavioral Patterns:
   Observations will capture habitual behaviors, such as:
   - Frequency of device usage.
   - Dependence on family members or caregivers for operation.

4. Unmet Needs and Gaps:
   By observing without interference, the researcher can identify pain points or gaps that participants may not be conscious of or willing to disclose.

Quantitative Methods:

1. Surveys to quantify patterns in device usage, challenges, and preferences.
2. Usability tests to measure task success rates and error frequency.

Sequence

Concurrent Design:

The research will follow a concurrent design, with qualitative and quantitative methods conducted simultaneously. This ensures that insights from one method can inform the other in real-time, enabling iterative refinement of data collection and analysis.

Value of Concurrent Strategy

1. Triangulation for Credibility:
   - Collecting different types of data simultaneously ensures that insights from one method can immediately validate or challenge those from the other. For instance:
     - If interviews reveal a common usability issue, survey results can confirm how widespread the issue is across a larger population.
2. Time Efficiency:
   - Conducting methods concurrently accelerates the research process, making it ideal for time-sensitive inquiries or projects with limited resources.
3. Holistic Understanding:
   - Captures the depth of personal experiences while concurrently measuring broad patterns, offering a balanced view of the problem.
4. Dynamic Adaptability:
   - As data is analyzed in real time, emerging themes from one method can inform adjustments in the other. For example:
     - Early interview insights might highlight the need to add specific questions to the survey.
5. Immediate Cross-Validation:

    - Allows researchers to identify discrepancies or corroborations in real time between qualitative insights and quantitative findings, enhancing the reliability of the conclusions

Synthesis Strategy

1. Combine qualitative findings (e.g., challenges, emotions, behaviors) with quantitative patterns (e.g., device usage rates, confidence levels).
2. Identify overlapping themes, such as common design flaws or support needs.
3. Use insights to propose solutions that address the most critical gaps in accessibility and usability.

Purpose

Qualitative insights will provide depth and context, uncovering nuanced emotional and cognitive barriers.

Quantitative findings will evaluate and generalize these insights, identifying key trends and priorities across a larger population.

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3. Application of Methods

Primary Research

Participant Screener:

- **Ideal Respondent Profile:**
    - Individuals aged 60 and above.
    - Living independently or with minimal assistance.
    - A mix of participants with varying levels of experience using smart devices.
    - Respondents aged 60 years and above to focus on older adults and their specific needs and challenges.
    - Living independently or with **minimal assistance**, as these individuals are more likely to interact directly with smart home devices, highlighting usability barriers and support needs.

    - A mix of respondents with **varying levels of experience** with smart home technologies: **Tech-savvy seniors** who already use these devices may provide insights into successful adoption strategies. **Novice users** or those hesitant about technology can highlight barriers to adoption.
    - Respondents should include those with mild physical limitations (e.g., arthritis) or sensory challenges (e.g., reduced vision/hearing), as these factors significantly impact usability.
    - A range of income levels ensures insights into how affordability and financial accessibility influence adoption rates.
- **Recruitment Strategy:**
    - Partner with community organizations, senior centers, and tech retailers.
    - Offer incentives such as gift cards or free tech workshops for participation.

How They Address the Problem Statement

Identifying Accessibility Barriers:

- Novice users or non-users can describe the reasons they avoid these technologies, such as complex setups, unclear instructions, or perceived irrelevance.

Exploring Usability Issues:

- Respondents with physical or sensory limitations can share specific difficulties (e.g., small buttons, unintuitive interfaces) that hinder effective utilization.

Understanding Adoption Motivators:

- Experienced users can provide insights into what encouraged them to adopt smart home devices (e.g., security, convenience), helping to identify what might work for others.

Providing Real-World Context:

- Respondents can describe how smart home devices fit (or fail to fit) into their daily lives, providing valuable real-world perspectives that secondary research might not reveal.

Uncovering Emotional and Cultural Barriers:

- Older adults hesitant about technology adoption may highlight emotional factors (e.g., fear of obsolescence, distrust of technology) and cultural norms that influence their behavior.

Highlighting Support Systems:

- Insights into how caregivers, family members, or communities influence their interaction with technology.

Qualitative Methods:

Contextual Interviews:

- Goal: Gain a deep understanding of personal experiences, frustrations, and aspirations.
- Interview Questions (full list below):
  - What motivated you to use smart home devices?
  - What features do you use most often?
  - What challenges have you faced during setup or daily use?
  - How do you usually resolve issues with your devices?
  - If you could change one thing about your devices, what would it be?

Field Observations:

- Framework: Observe participants interacting with their devices in their home environments.
- Data Points:
  - Observe participants performing common tasks, such as setting timers or adjusting lighting.
  - Record the time taken, error rates, and points of confusion.
  - Note any external help required (e.g., from family members).

Additional Observations That Could Address the Problem Statement

1. Patterns of Device Interaction
   - Observe how seniors interact with smart devices differently in various spaces (e.g., kitchen vs. bedroom).
   - Key Considerations:
     - Are devices used more frequently in certain rooms?

        - Is the interaction more voice-based or reliant on physical controls?
2. Environmental Factors
    - Lighting, ambient noise, and space layout can influence the ease of device use.
    - Examples:
        - A loud TV in the living room might hinder voice commands.
        - Poor lighting in a bedroom might make it hard to see small buttons on devices.
3. Common Tasks Across Rooms
    - Identify whether tasks differ in complexity based on the room.
    - Examples:
        - In the kitchen, tasks like setting timers or reading recipes might demand more visual or verbal clarity.
        - In the living room, controlling entertainment systems might require integration with multiple devices.
4. Accessibility Aids
    - Look for tools or adaptations participants use to mitigate difficulties.
    - Examples:
        - Use of magnifying glasses for small screens.
        - Relying on tactile feedback (e.g., physical switches) instead of touchscreens.
5. Error-Prone Interactions
    - Note moments of frustration, repeated errors, or requests for assistance.
    - Examples:
        - Incorrect device activations due to misunderstood commands.
        - Struggles with device setup or troubleshooting.
6. Impact of Space-Specific Needs
    - Different rooms pose unique challenges:
        - Kitchen: Devices must be resistant to splashes or grease and accessible when hands are occupied.
        - Bedroom: Devices need to be operable in low-light conditions or without disturbing sleep patterns.
        - Bathroom: Devices might need to withstand humidity and offer simple, quick commands.
7. Adaptation Strategies
    - Observe creative ways participants adapt to device limitations.
    - Examples:

        - Workarounds like using smartphones for tasks meant for smart speakers.
        - Post-it notes as reminders for voice commands or setup instructions.
8. Interplay Between Technology and Manual Methods
    - Assess when and why participants revert to non-digital methods.
    - Examples:
        - Preferring physical switches over smart device controls in urgent situations.
        - Writing notes by hand instead of using reminders.

Differences by Space

- Kitchen: Higher demand for multitasking, with a focus on accuracy (e.g., timers) and resilience (e.g., moisture-resistant devices).
- Living Room: Focus on entertainment control, which might require more interconnectivity (e.g., smart TVs, lighting).
- Bedroom: Emphasis on ease of use in dim light and non-disruptive interactions (e.g., silent alarms, subtle lighting).
- Bathroom: Need for hands-free interactions and durability in a moisture-rich environment.

Quantitative Methods:

Surveys:

- Distributed online and in person to collect responses from a broader demographic.
- Sample survey questions:
    - What smart devices do you own?
    - On a scale of 1-5, how easy are they to use?
    - How often do you rely on others for technical support?
    - What features would improve your experience?

Usability Testing:

- Tasks such as setting up a device or troubleshooting a problem will be timed and analyzed.
- Metrics:
    - Task completion rates

        - Time taken
        - Error frequency

Mini Plan for Usability Testing

This usability testing plan will assess the interaction of older adults (60+) with smart home devices to identify barriers and usability issues that hinder accessibility. The goal is to measure how easily they can complete key tasks with various devices and to uncover pain points in the process.

Tasks to Assess

These tasks are selected based on their relevance to the accessibility challenges that older adults typically face when using smart home technology.

1. Task 1: Setting up a new smart home device
    - Description: Participants will be asked to set up a smart speaker (e.g., Amazon Echo, Google Nest) from unboxing to basic configuration, such as connecting it to Wi-Fi and linking it with a mobile app.
    - Relevance: Setting up new devices is often a barrier for older adults, as it requires technical skills and understanding of multiple devices and apps. This task reflects the frustration many older users face when trying to integrate new technology into their home.
    - Metrics:
        - Task Completion Rate: Whether the participant successfully completes the setup.
        - Time Taken: Time taken to complete each step (e.g., unboxing, app installation, Wi-Fi connection).
        - Error Frequency: Number of mistakes or setbacks (e.g., connection issues, wrong steps followed).
2. Task 2: Adjusting the settings for comfort (e.g., adjusting thermostat or lighting)
    - Description: Participants will adjust the temperature on a smart thermostat (e.g., Nest) or change the lighting settings through a smart speaker or app.
    - Relevance: Many older adults struggle with adjusting settings due to the complexity of interfaces, small buttons, or voice command misunderstandings. This task examines how seniors interact with home comfort technology.
    - Metrics:

        - Task Completion Rate: Whether the user completes the task successfully (e.g., correct temperature set, desired light level achieved).
        - Time Taken: The time it takes to find and change the setting.
        - Error Frequency: Whether the participant accidentally changes the wrong setting, needs help, or gives up.
3. Task 3: Voice Command Accuracy
    - Description: Participants will issue a series of basic voice commands to a smart speaker (e.g., asking for the weather, playing music, setting a timer).
    - Relevance: Voice interaction is essential for seniors with limited mobility or vision. However, voice recognition issues can be frustrating if the device doesn't respond correctly or quickly.
    - Metrics:
        - Success Rate: The number of correct responses to voice commands.
        - Time Taken: Time between issuing the command and receiving the response.
        - Error Frequency: Frequency of misinterpreted commands, requiring rephrasing or repeating commands.
4. Task 4: Troubleshooting a Problem
    - Description: Participants will be asked to troubleshoot a common problem, such as the smart speaker not responding, Wi-Fi connection issues, or device pairing failures.
    - Relevance: Older adults often face challenges troubleshooting technology. This task evaluates how easily seniors can resolve device issues on their own, an important part of their device autonomy.
    - Metrics:
        - Task Completion Rate: Whether the participant can identify and resolve the issue without external help.
        - Time Taken: The time it takes to troubleshoot and resolve the issue.
        - Error Frequency: How many steps were taken that didn't resolve the issue, or the number of times assistance was required.

Devices to Use

- Smart Speakers (e.g., Amazon Echo, Google Nest): These devices are common for controlling home settings, playing music, and issuing commands, making them highly relevant for seniors who may be less inclined to use mobile devices or apps.

- Smart Thermostat (e.g., Nest, Ecobee): Useful for testing how seniors adjust home comfort settings, as this is one of the most commonly adopted smart devices.
- Smart Lighting (e.g., Philips Hue, LIFX): To test ease of adjusting home ambiance and usability through mobile apps or voice commands.
- Smartphone/Tablet (for app-based interactions): For controlling devices like thermostats and lights via apps, testing whether seniors can navigate mobile interfaces comfortably.

Comparing Performance Across Devices

It will be valuable to compare task performance between:

1. Voice-activated devices (e.g., Amazon Echo) and App-controlled devices (e.g., using a smartphone to control a thermostat): This comparison helps assess whether seniors are more comfortable with voice commands or app interfaces. Some seniors might prefer the simplicity of voice commands, while others might struggle with voice recognition.
2. Mobile Apps vs. Physical Interfaces (e.g., manual thermostat controls): To assess whether older adults prefer tactile controls or digital interfaces and whether physical buttons (on devices like thermostats or lighting switches) provide more comfort and confidence.

Metrics Measurement and Data Collection

1. Task Completion Rate: For each task, measure whether the user successfully completes the task, e.g., whether they correctly set up the device, adjusted the temperature, or resolved the troubleshooting issue.
2. Time Taken: Track the time from the start of each task to completion. This helps measure the efficiency of interaction, with longer times indicating potential usability issues.
3. Error Frequency: Count the number of mistakes or steps where the user struggles (e.g., incorrect voice commands, failed setup attempts, or errors in the troubleshooting task). This will highlight common pain points and difficulties.
4. User Satisfaction (Post-task): After each task, users will rate their experience on a scale (e.g., 1 to 5), noting how comfortable or frustrated they felt. This adds a qualitative dimension to understand their emotional response.

Test Execution Strategy

- Test Duration: Each task will take 15–30 minutes, with a break in between tasks.
- Session Setup: Begin with a brief introduction to the devices and tasks. Then, conduct the tasks in a randomized order to avoid bias. A moderator will be present to answer questions, but the goal is to minimize interference.
- Post-Task Discussion: After each task, a short debrief will help capture immediate feelings, frustrations, or successes.

Why These Tasks Are Relevant

The tasks selected are central to seniors' interaction with smart home technology, and they directly address the problem of limited accessibility and ease of use. By examining device setup, troubleshooting, and basic task execution, we can identify usability barriers that prevent adoption or full utilization of smart home devices. Understanding these challenges will ultimately inform recommendations for improving device accessibility and overall user experience for older adults.

Secondary Research

- Review existing literature on usability and accessibility for aging populations.
- Analyze user manuals, apps, and interfaces of popular smart device brands.
- Study market data on smart home adoption rates among seniors.
- Research best practices for creating inclusive interfaces.

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4. Data Integration

The integration and synthesis of data from qualitative and quantitative methods in this research would utilize **triangulation** as the primary strategy. Triangulation allows for cross-verification of findings from different sources or methods, ensuring a comprehensive understanding of the research problem. However, **expansion** could also play a role in extending insights beyond what a single method could reveal.

Triangulation for Integration

Triangulation ensures that the strengths of one method complement the limitations of another. For this study, integration would involve:

1. Cross-Validation:
    - Example: If field observations indicate that seniors frequently rely on caregivers for troubleshooting technology, survey data might confirm how common this behavior is across a larger group. This alignment strengthens the reliability of findings.
2. Confirming Themes Across Methods:
    - Themes emerging from qualitative interviews (e.g., emotional barriers like fear of failure) can be validated quantitatively (e.g., surveys revealing 60% of seniors express anxiety about damaging devices).
3. Discrepancy Analysis:
    - In cases where findings diverge, further analysis can explore why. For instance:
        - Interviews may reveal positive attitudes towards technology, while survey results might show low adoption rates, leading researchers to investigate unspoken barriers like affordability or accessibility.

Expansion for Broader Insights

Expansion leverages the diverse strengths of each method to build a more complete understanding of the issue:

1. Building Context with Qualitative Data:
    - Qualitative methods provide the "why" behind quantitative trends.
    - Example: If surveys reveal that 70% of seniors find smart home devices "complex," interviews or field observations can explore what "complexity" means in practice.
2. Quantifying Qualitative Findings:
    - Insights from interviews and observations can inform the creation of targeted survey questions to quantify broader trends.
    - Example: If interviews suggest that ergonomic design is a major usability factor, surveys can assess how widespread this concern is.

Synthesis of Secondary Research

These sources collectively help address the problem statement by identifying the barriers older adults face with digital technologies and highlighting the need for greater accessibility. The academic studies provide a theoretical foundation for understanding the cognitive, physical, and technological barriers, while market and design standard research

offers practical insights into the existing challenges and potential solutions. Together, these sources lay the groundwork for the research plan by providing both empirical data and design recommendations for improving digital accessibility among older adults.

Deliverables:

- A set of actionable design recommendations for improving accessibility. The suggestions are specific, feasible, and capable of leading to tangible improvements.
- Prototypes or wireframes for a digital solution tailored to senior citizens. These recommendations should be clear enough to be put into practice, whether they involve design changes, process modifications, or new strategies that address the challenges identified.

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5. Reflection

Research Process:

- Recruiting a diverse participant pool with varying levels of tech familiarity may require extensive outreach.
- Emotional barriers, such as frustration or embarrassment about tech usage, may require sensitive handling during interviews.

Expected Outcomes:

- A clear and deeper understanding of seniors' specific needs and pain points regarding smart devices and technology.
- Design recommendations for an intuitive app or platform to simplify interaction with smart home devices.
- Insights into how product designers can build more inclusive technologies.
- A set of evidence-based design principles to inform more inclusive product development.
- A digital solution concept, such as a simplified app, that supports seniors in effectively using smart home devices.

Impact:

This research has the potential to empower senior citizens, improve their quality of life, and set a benchmark for accessibility in the tech industry.

1. Empowering Seniors Through Technology

By making digital tools, such as smartphones, tablets, and smart home devices, more accessible to seniors, this research could significantly empower older adults to maintain control over their environments. With better access to technology, seniors can stay connected to family, access critical healthcare resources, and engage in community activities, thus reducing isolation—a major issue for many elderly people. According to the *National Institute on Aging*, social isolation is linked to a higher risk of serious health conditions such as heart disease and depression (NIA, 2020). This research could ultimately help seniors retain their independence and feel more in control of their lives.

2. Improving Health and Safety

Improving accessibility could save lives by enhancing seniors' ability to interact with life-saving technologies, such as emergency call systems, health monitoring apps, or safety alerts in smart homes. For example, *The Journal of Aging & Social Policy* highlights that seniors often struggle with using health apps, which can delay or even prevent necessary medical interventions (Yardley et al., 2016). By creating more intuitive, senior-friendly devices and interfaces, seniors would be more likely to monitor their health and seek timely medical care. This could reduce hospitalizations, improve treatment adherence, and lead to better health outcomes.

3. Fostering Greater Digital Literacy

Digital illiteracy among seniors is a major barrier to the adoption of technology. The research could play a role in creating clearer guidelines for tech companies to design more accessible products that don't just target the tech-savvy. In turn, this could support programs aimed at improving digital literacy among older adults. Studies such as the one conducted by the *Pew Research Center* show that older adults who learn to use digital tools for health care and daily tasks are more likely to stay independent longer and experience improved mental health outcomes (Pew Research Center, 2020).

4. Promoting Equity in Technology Access

There's a significant opportunity to ensure that aging populations are not left behind in an increasingly digital world. According to *AARP's 2020 study on technology use among older adults*, seniors are adopting smartphones and tablets at an increasing rate, but the adoption rate still lags behind other age groups (AARP, 2020). By addressing barriers like small text, complicated interfaces, and non-intuitive design, this research could promote more equitable access to the same resources that younger, more tech-savvy populations enjoy, potentially reducing the digital divide that impacts seniors.

5. Setting a Benchmark for Accessibility

As the technology industry continues to evolve, setting a standard for accessibility in digital products could have a ripple effect throughout other sectors. By identifying specific design features that can assist seniors, this research could influence tech companies to adopt these standards, thereby improving the overall digital ecosystem. A universal design approach benefits not only seniors but also other underserved populations, such as people with disabilities or those who are not as digitally literate. According to *The Universal Design Institute*, products that are designed with accessibility in mind are more likely to be used by a wide range of people, thereby benefiting society at large (Universal Design Institute, 2018).

Survey Design

Quantitative surveys will collect data from a broader audience. Sample questions:

1. What smart home devices do you use most frequently?
2. How would you rate the ease of setting up your device? (1 = Very Difficult, 5 = Very Easy)
3. How often do you need help from someone else to use your devices?
4. What features do you think are missing from your devices?
5. How confident are you in troubleshooting device issues on your own?

Ideal Screener Survey

1. What is your age?
    - Options:

        - Under 18
        - 18–39
        - 40–59
        - 60+ (Desired Answer)

    Why:
    The study focuses on older adults aged 60 and above, as this demographic is more likely to face unique accessibility and usability challenges with smart home devices.

2. Do you live independently or with minimal assistance?
    - Options:
        - Yes (Desired Answer)
        - No

    Why:
    The study aims to explore how seniors navigate technology in their own living environments, without heavy reliance on caregivers. Respondents living independently provide insights into their interaction with technology as primary users.

3. Have you ever used or currently use any smart home devices (e.g., smart speakers, thermostats, lights)?
    - Options:
        - Yes, I currently use smart home devices
        - Yes, but I've stopped using them
        - No, I've never used them

    Desired Answer:
    A mix of all three options is ideal.

    - Current users: Share insights into adoption motivators and usability successes.
    - Former users: Identify barriers to sustained use.
    - Non-users: Highlight adoption challenges and perceptions.
4. Do you have any physical or sensory limitations (e.g., reduced vision, hearing, or mobility)?
    - Options:
        - Yes
        - No (Desired Answer)

Why:
While both responses are valuable, individuals with limitations provide specific feedback on design elements affecting accessibility.

5. What is your comfort level with using technology in general?
    - Options:
        - Very comfortable
        - Somewhat comfortable
        - Neutral
        - Somewhat uncomfortable or very uncomfortable (Desired Answer)

    Why:
    The focus is on those who find technology challenging, as they highlight design gaps and offer perspectives on accessibility issues.

6. Which of the following smart home devices have you used or are familiar with? (Select all that apply)
    - Options:
        - Smart speakers (e.g., Alexa, Google Home)
        - Smart lights
        - Smart thermostats
        - Smart security cameras
        - None of the above

    Desired Answer:
    A range of responses is valuable:

    - Familiar users: Offer insights on usability and design issues.
    - Non-users: Help explore adoption barriers and misconceptions.
7. Do you feel that technology is designed with your needs in mind?
    - Options:
        - Yes
        - No (Desired Answer)

    Why:
    Those who feel excluded by design provide critical insights into gaps in accessibility and usability.

8. Are you open to discussing your experiences with smart home devices in a 30–60 minute interview?
    - Options:
        - Yes (Desired Answer)
        - No

    Why:
    Willingness to participate ensures qualitative data can be collected from relevant individuals.

Interview Questions

General Usage and Experience

1. When did you first start using smart devices and other forms of technology, and what motivated you to do so?
2. Which smart devices do you currently own, and which do you use most often? Why?
3. How do these devices fit into your daily routine? Are there specific tasks they help you with regularly?

Challenges and Barriers

4. Can you describe any challenges you faced when setting up your devices?
5. Are there specific features or functions you find difficult to use or understand?
6. Have you ever experienced technical issues with these devices? How did you address or resolve them?

Support and Assistance

7. Do you rely on anyone (family, friends, customer support) to help you with your smart devices? If so, how often and for what types of issues?
8. How do you usually look for help or information about your devices (e.g., manuals, online tutorials, customer service)?

Perceptions and Attitudes

9. How do you feel about using smart devices overall? Do they make your life easier, or are they more frustrating?
10. Are there any concerns you have about using technology, such as privacy or reliability?

Accessibility and Adaptation

11. Are there any design elements (e.g., screen size, voice commands, app interfaces) that make it easier or harder for you to use smart devices?
12. Have you made any adjustments to the way you use these devices to make them more suitable for your needs?

Broader Impacts

13. In what ways have smart devices impacted your sense of independence, safety, or comfort at home?
14. Do you feel these devices meet your expectations? Why or why not?

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"Barriers to Digital Literacy for Older Adults" – Journal of Aging & Social Policy

- Relevance: This study investigates the digital literacy barriers that older adults face when interacting with modern technologies, particularly those related to smart devices. It offers valuable insights into cognitive and physical limitations, such as reduced vision and hearing, and provides an understanding of how these factors contribute to challenges with using technology. This is directly relevant to the problem statement regarding the lack of accessibility in smart home devices for seniors.
- Why it's relevant: By identifying these barriers, this source helps explain why adoption and effective use of smart technologies remain limited, particularly among

older adults. It provides a foundation for understanding the obstacles seniors face when trying to use technology in their homes.

"Smart Homes for the Aging Population: A Review of Recent Research" – International Journal of Human-Computer Interaction

- Relevance: This article reviews the recent research on smart homes and aging populations, highlighting how smart technologies can assist seniors in managing their daily lives. It explores the features that make smart homes accessible and the challenges that persist in making these devices more user-friendly for older adults.
- Why it's relevant: It helps outline the current state of smart home adoption by seniors and the usability issues that hinder effective utilization. This directly informs the design of more accessible devices and the approach to studying seniors' needs in this context.

"Aging and Technology: A Review of the Challenges Faced by Older Adults" – Gerontechnology Journal

- Relevance: This review article discusses the physical and cognitive challenges that older adults face with technology, particularly digital interfaces. It looks at how seniors interact with technology like smartphones, smart home devices, and assistive tools. The article also delves into the role of technology in supporting seniors' independence.
- Why it's relevant: This provides a comprehensive understanding of the limitations older adults face when using smart technologies and the gap between the potential benefits and the reality of usage. It offers important background information for designing products and conducting usability research.

"Smart Home Devices for Older Adults: A Market Survey" – Consumer Electronics Association (CEA)

- Relevance: This market survey examines the features of smart home devices currently available in the market, analyzing their accessibility for older adults. It identifies the most popular smart home devices used by seniors and their perceived ease of use.
- Why it's relevant: Understanding the market landscape allows for a clear picture of what is currently offered to seniors in terms of smart home devices, helping to pinpoint the areas where accessibility improvements are most needed.

"Designing Accessible Smart Home Technologies: Standards and Guidelines" – Universal Design Foundation

- Relevance: This source offers guidelines and best practices for designing accessible technology that caters to diverse populations, including older adults with physical or cognitive limitations. It outlines universal design principles, such as simplicity, ease of navigation, and the importance of clear feedback in user interfaces.
- Why it's relevant: This source will help in understanding what design standards exist for inclusive technology and how those can be applied to smart home devices to make them more accessible to seniors. It's crucial for ensuring the devices are usable by all, particularly those with limited technological fluency.

"Digital Inclusion for Seniors: Exploring the Accessibility of Mobile Health Applications" – Journal of Medical Internet Research

- Relevance: This article discusses how older adults interact with mobile health applications, focusing on accessibility and usability issues. It identifies challenges such as small font sizes, complex navigation, and limited support for assistive technologies.
- Why it's relevant: While it focuses on health apps, the principles outlined here for accessibility are transferable to other types of technology, particularly smart home devices. This helps build an understanding of how to improve the usability of smart technologies in general for older adults.