EXPLORING THE SOCIO-ECONOMIC IMPACTS OF SMART HOME ADOPTION ON HOME-OWNERS IN MANDARA, HARARE

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EXPLORING THE SOCIO-ECONOMIC IMPACTS OF SMARTHOMES ADOPTION ON MANDARA RESIDENTS IN HARARE

BY

KUDAKWASHE NEMACHA

A DISSERTATION PROPOSAL SUBMITTED IN PARTIAL FULFILLMENT OF THE

REQUIREMENTS FOR THE DEGREE OF BACHELOR OF SCIENCE

HONOURS IN COMPUTER INFORMATION SYSTEMS

Abstract

Smart home technology usage is changing residential areas globally, but little is known about how these technologies affect homeowners socioeconomically, especially in certain areas like Mandara in Harare. Although smart home technologies which includes networked gadgets that improve convenience, security, and energy efficiency have grown in popularity worldwide, their effects on various socioeconomic groups differ. By looking at important elements including affordability, accessibility, and digital literacy, this study seeks to understand how Mandara households' daily lives are impacted by the adoption of smart homes.

In Mandara, households' decisions to adopt smart home technologies are also influenced by societal opinions and privacy concerns. The perceived benefits of these innovations include improved safety through electronic locks and surveillance systems, as well as improved efficiency with automated climate and lighting controls. Additionally, these technologies have the potential to be cost-effective and improve the quality of life. It is important to understand the socio-economic determinants of households' adoption of such devices. The necessity of such systems, financial capability, and internet accessibility among various socio-economic groups play a significant role in adoption levels.

However, there are several socio-economic factors that hinder widespread adoption. Included among them are the expense of installations, technical complexity, and vulnerability to cyber-attacks as main barriers. Additionally, the economic factor of these technologies can exacerbate socio-economic inequalities if only more wealthy households can afford them, thereby deepening digital exclusion for less well-off residents. Beyond single homes, the broader socio-economic implications of smart home adoption can influence housing values, drive infrastructural innovations, and unlock new business opportunities in home automation.

A mixed-methods approach will be used to assess these dynamics. While qualitative interviews will provide in-depth insights into residents' socioeconomic situations, surveys will gauge adoption rates, user preferences, and difficulties they face. Observational research will look at how smart home technologies are incorporated into daily life, highlighting its useful socioeconomic effects.

This study advances knowledge of the socioeconomic factors that influence the adoption of smart homes and provides insightful information to technology developers, politicians, and urban planners. This study establishes the groundwork for more sustainable and fair technological improvements in the home by evaluating the advantages, limitations, and future direction of smart home technology in Mandara.

Key Words

1. Smart home technology
2. Socio-economic impacts
3. Adoption
4. Digital literacy
5. Home automation
6. Convenience
7. Security
8. Energy efficiency
9. Affordability
10. Accessibility
11. Privacy concerns
12. Mixed-methods approach
13. User satisfaction
14. Barriers
15. Technology Acceptance Model (TAM)
16. Diffusion of Innovations Theory
17. Urban development
18. Mandara
19. Harare
20. Quality of life

Declaration Page

I declare that this dissertation is my original work expect were sources have been cited and acknowledged. The dissertation has never been submitted, nor will it ever be submitted to another university for the award of a degree.

KUDAKWASHE NEMACHA   **27/06/2024**
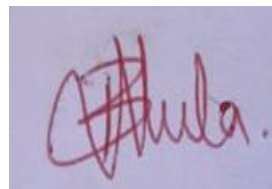Student's Full Name   Student's Signature(Date)

  MR BRIGHTON MUKHALELA   **27/06/2024**
Main Supervisor's Full Name   Main Supervisor's Signature(Date)

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Acknowledgments

I would like to express my sincere gratitude to my supervisor, Mr B. Mukhalela, for his invaluable guidance and support throughout this journey. Without his insights and encouragement, this dissertation would not have been a success.

Furthermore, I would like to acknowledge my family's unwavering support, particularly in distributing my surveys. Their assistance, especially during my time away from Harare, ensured that various households received and completed the surveys, contributing significantly to this research.

Dedication Page

I dedicate this dissertation to my mother. Her greatest wish was for me to succeed in life, and completing this dissertation is a significant step in fulfilling both my dream and hers.

List of Acronyms and Abbreviations

TAM   Technology Acceptance Model

IoT   Internet of Things

SHS   Smart Home Systems

QoL   Quality of Life

AI   Artificail Intelligence

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Chapter 1 Introduction

1.1 Introduction

According to TechTarget's IoT Agenda, "A smart home is a residence that uses internet-connected devices to enable the remote management and monitoring of systems and appliances, such as lighting and heating." This technological integration allows homeowners in places like Mandara, Harare, to enhance their daily routines and manage household tasks efficiently. The adoption of smart home technology in this dynamic urban setting not only improves convenience but also optimizes energy usage and enhances security measures. This study aims to explore how these advancements are shaping socio-economic dynamics, providing valuable insights into adoption rates, satisfaction levels, and the broader implications for urban development in Harare.

1.2 Background of Study

The integration of smart home technology represents a great improvement in residential living globally, including in urban areas such as Mandara, Harare. Residences are equipped with internet-connected devices for remote management and monitoring of systems and appliances like lighting and heating eventually these smart homes will offer transformative benefits to homeowners. These include enhanced convenience, improved energy efficiency, and strengthened security measures.

In Mandara, a suburb known for its vibrant community and dynamic urban landscape, the adoption of smart home solutions is becoming increasingly popular. This technological shift not only streamlining the daily household tasks but also introducing new socio-economic dynamics within the community. Understanding the impact of smart home adoption on homeowners in Mandara is crucial for assessing its implications for urban living in Harare more broadly.

This study seeks to explore how the adoption of smart home technology is reshaping residential experiences in Mandara mainly focusing on the socio-economic aspect. By examining factors such as push and pull, user satisfaction, and user challenges, this research aims to provide a comprehensive understanding of the socio-economic impacts of smart homes in this urban context.
Insights gained from this study will contribute to the knowledge base on urban technology integration and inform strategies for sustainable urban development in Harare and also understand what improvements could be done on future smart home technologies.

Through qualitative and quantitative analysis, this research will delve into the motivations driving smart home adoption, the challenges faced by homeowners, and the overall implications for community well-being and urban resilience. By bridging the gap between technology adoption and socio-economic impacts, this study aims to provide actionable insights for policymakers, urban planners, and technology providers seeking to harness the potential of smart homes for enhancing residential quality of life in Mandara, Harare.

1.2 Statement of Problem

These research would like to address whether adapting smart home technology in Mandara is very beneficial is anticipated or it is just an expense that eventually does not bring in any benefits to the particular home owners.

1.3 Research Objectives

The 3 main objectives are I would like to achieve are:

- Understanding the main reasons for adopting smart homes

- Analyzing the challenges of adopting smart homes and using them

- Analyze how smart home adoption helps improve the day to day lives of residents and help improve income generation

1.4 Research Questions

3 questions that will help achieve the stated objectives above are:

- What specif needs or opportunities drove you into smart-home adoption?

- What barriers did you encounter when considering or implementing a smart-home?

- How have smart-homes contributed to enhancing efficiency of daily tasks activities for you at home?

1.4 Assumptions/Hypothesis

The assumption in this particular research I would like to undertake is, adopting smart-home technology is beneficial but the true answer has not yet been reviewed especially in the suburb of Mandara, Harare.

1.5 Significance of Study

The significance of this study is to help future users understand the real implications that smart-home technology has on their lives before investing in them and also help the technology manufacturers clearly understand what their consumers are going through when they are adopting this type of technology especially in Zimbabwe.

1.6 Delimitation of Study

The delimitations of this study outline the specific boundaries and constraints that shape the scope and methodology of the research on smart home adoption in Mandara, Harare. These will include geographical boundaries, sample characteristics, time frame and the research methods.

I.   Geographical Boundaries - The particular study will be limited to only Mandara and does not include any other suburbs like Borrowdale.

II. Sample Characteristics - The research will target home owners in Mandara but scaled down to those who own smart home systems.

III. Time frame - This research is to be conducted between the month of August 2024 to Dec 2024

IV. Research Method - The research will comply of a mixed-methods approach, combining qualitative interviews and quantitative surveys to gather comprehensive insights into the motivations, challenges, and impacts of smart home adoption. The qualitative phase will involve in-depth interviews with a purposive sample of residents, while the quantitative phase will include a structured survey distributed among a representative sample of homeowners in Mandara.

1.7 Limitation of Study

These refer to the constraints and restrictions that affect the generalizability, reality validity of the research findings. These are limitation will be beyond the my control as I partake on this research project unlike delimitations. These limitations will include :

i. Sample size and representation - The sample size will be limited to the residence willing to participate in the study and also those who are available

ii. Response Bias - This will be mainly due to the atmosphere that surrounds the researcher. They might not feel comfortable enough to tell the truth and decide to lie for the case of the research

iii. Localization of findings - The findings will be focused on Mandara only but may not imply to other suburbs like Highlands.

iv. Technology Accessibility - During the course of the research, it might be hard to get access to liable technology such as the internet for starters,

v. Researcher Bias - My personal experience as the researcher might cause me to pursue my emotions over facing the reality causing research bias/

vi. Ethical Considerations - Ethical considerations, such as data privacy and confidentiality, will be carefully managed; however, unforeseen breaches or ethical dilemmas could impact the integrity of the study.

Chapter 2 Review of Related Literature

2.1 Introduction

According to Shona Mccombes of Scribbr, "literature review is a survey of scholarly sources on a specific topic. It provides an overview of current knowledge, allowing you to identify relevant theories, methods, and gaps in the existing research that you can later apply to your paper, thesis, or dissertation topic." In this chapter, I will be providing a comprehensive review of the literature related to the socio-economic impacts of smart home adoption on Mandara residents in Harare. This review aims to establish the theoretical and empirical foundations of our study, highlighting significant research developments, key theories, and gaps in the current knowledge. The chapter is organized into five main sections which include the theoretical framework, the relevance of the theoretical frame to the study, a review of empirical studies, synthesis of the literature, and a summary.

2.2 Theoretical Framework

The theoretical framework is the review of various exciting literature by different scholars and understanding how they can help in aiding my research topic. In this case it will help understand how the dissertation topic is supported by various theories which in this case I will be using the Technology Acceptance Model theory also known as the TAM by Davis in 1989. According to Davis 1989, the TAM

theory helps understand why users pursue using a particular knowledge through usefulness and ease of use.

The second framework I will use is the Diffusion of Innovations Theory. According to (Rogers, 2003) the Diffusion of Innovations Theory describes the pattern and speed at which ideas or products go through a particular populations. The main contributors of this theory are innovators, early adapters, early majority, late majority and laggards. This will help understand how smart homes have been diffused into the population of Mandara using the mentioned contributors.

2.3 Relevance of the Theoretical Framework

Firstly, the Technology Acceptance Theory will help understand the different various reasons why residents of Mandara in Harare are involving themselves in using smart home technologies based on the ease of use and the usefulness of the different technologies.

Ease of use is a concept that is used by many people to determine how a particular object mainly focusing on the smart home technology are not complicated to understand and to make them work .If smart home devices are complicated or difficult to use, residents may be less likely to adopt them. Understanding the factors that influence perceived ease of use, such as user-friendly interfaces, clear instructions, and reliable customer support, can help identify barriers to adoption in Mandara.

The usefulness of the technology on the other hand is basically looking at how the particular technology for example a smart alarm system will help enhance the quality of life by making many manual operations more automatic and faster in their life style. These benefits include increased security, energy savings, convenience, and enhanced quality of life. Understanding how Mandara residents perceive these benefits can provide insights into what aspects of smart home technologies are most appealing and what additional features might encourage its adoption.

Secondly, the Diffusion of Innovations Theory is relevant because it will help us have an insight on what are the pulling and pushing factors causing people to adopt the various smart home technology.

2.4 Summary

This chapter will review existing literature to lay the foundation for studying how smart home adoption affects Mandara residents economically and socially. It will summarize important theories, discuss real-world studies, and point out gaps in current research. The insights gathered will shape the next stages of the research, aiming to provide practical advice on improving smart home adoption in Mandara. By understanding what influences people to adopt these technologies and addressing challenges, this study aims to help create better strategies that fit the needs of Mandara's residents and also help other residents know what are the implications of adopting smart home technologies mainly focusing on the social and economic aspect.

Chapter 3 Methodology

3.1 Introduction

The methodology chapter will outline the approach and methods employed to investigate the socioeconomic impacts of smart home adoption by homeowners in Mandara, Harare. This chapter serves to give an insight on the research design, data collection, and analysis procedures. By detailing the methodology, this chapter provides tools for the achievement of the research objectives, which include: understanding the push and pull factors that drove homeowners to adopt smart homes, identifying the barriers encountered during the consideration or implementation of smart home technologies, and evaluating how smart homes have contributed to enhancing the efficiency of daily tasks.

3.2 Research Design

According to Yashvi Jain, "Research design is a blueprint of a scientific study. It includes research methodologies, tools, and techniques to conduct the research. It helps to identify and address the problem that may rise during the process of research and analysis." In this particular research study, a mixed approach is going to be used of both qualitative and quantitative analysis. The qualitative part will focus on gathering significant data on user perception, experiences and motivations of the

smart home devices that they have in their homes then the quantitative part will look at analyzing the measurable outcomes such as user satisfaction and cost savings. By using these kind of approaches it allows me to have a comprehensive understanding of the socioeconomic impacts of the smart home adoption by homeowners in Mandara, Harare.

3.3 Population and Sampling

For this particular research project, the targeted population will be homeowners in Mandara mainly those that own smart-home technologies

.

3.3.1 Sampling Method

A stratified random sampling method will be used to ensure a clear distinction and representation of specific subgroups within the population. The population is first divided into strata based on their residential place which will be Mandara in this case, and then further stratified based on the ownership of smart home technology. From each stratum, participants are randomly selected to maximize randomness and ensure a fair and representative study. This approach helps to capture the diversity within the population and enhances the generalizability of the findings.

3.3.2 Sampling Size

A sample size of about 50 to 100 homeowners is chosen for this study. This size is considered adequate to allow for a detailed analysis and to make clear and reliable

judgment about the socioeconomic impacts of smart home adoption. A smaller sample might not provide sufficient data for the research.

3.4 Data Collection Instruments

In the research study, 2 approached of qualitative and quantitaive will be used. For each approach, a particular method will be used. For the qualitative approach, the data collection method to be used is an interview. This interview will constitute of open ended questions that will be done in-person, over the phone or on a video call such as whatsapp call or google meet.

The quantitative approach will use surveys as an instrument for data collection. The surveys will be conducted online using google forms and also in person.

3.5 Pilot Study

This is a is a small-scale preliminary study conducted to evaluate feasibility, duration, cost, adverse events, and improve upon the study design prior to performance of a full-scale research project (Wikipedia, n.d.).

3.5.1 Purpose of the Pilot Study

Aims to:

- Test the clarity and reliability of the survey and interview questions.
- Identify any potential issues in the data collection process.
- Refine the instruments and procedures based on participant feedback.

3.5.2 Procedure of the Pilot Study

The pilot study will involve 5 homeowners from Mandara who meet the inclusion criteria. They will complete the survey and participate in the interview. Feedback will be gathered to refine the instruments.

3.6 Data Collection Procedure

This process involves many steps which include:

I. · Preparation: Potential participants are identified and contacted via phone or email, informed about the study, and asked to consent to participate.

II. · Survey Administration: Participants complete the survey, which can be done online or in-person.

III. · Interview Scheduling: Interviews are scheduled at convenient times for participants, conducted either in-person or via video call.

IV. · Data Collection: Surveys are collected and securely stored. Interviews are audio-recorded and transcribed for analysis.

V. · Follow-Up: Participants are thanked for their involvement, and any necessary clarifications are obtained.

3.7 Analyze and Organization of Data

Data will be analyzed using both qualitative and quantitative methods to provide a comprehensive understanding of the socioeconomic impacts of adopting smarthome technology.

3.7.1 Qualitative Data Analysis

Qualitative data from interviews will be analyzed using thematic analysis. This involves:

1. Transcribing interviews.
2. Coding the transcripts to identify key themes and patterns.
3. Reviewing and refining themes to ensure they accurately represent the data.

3.7.2 Quantitative Data Analysis

Quantitative data from surveys will be analyzed using descriptive and inferential statistics. This involves:

1. Entering survey data into statistical software such as Microsoft Excel.
2. Conducting descriptive analysis to summarize demographic information and responses.
3. Performing inferential analysis to identify significant relationships and impacts.

3.8 Ethical Consideration

The following ethical guidelines will be considered in the research project:

3.8.1 Informed Consent

This guideline helps in letting the participants know that participating in this study is voluntary and not mandatory. A procedure will be done before undertaking the data collection. This procedure includes:

1) Prepare consent form

2) Present consent form to participants

3) Obtain written consent

4) Document and store consent form

3.8.2 Confidentiality

Confidentiality concerns will be clearly explained on the confidentiality form, which will be attached to the dissertation proposal.

3.8.3 Voluntary Participation

Participation in this study is entirely voluntary. Participants will be informed that they can withdraw from the study at any time without any negative consequences. This will be emphasized in both the consent form and during the initial briefing.

3.8.4 Ethical Approval

Before commencing the research, ethical approval will be sought from the relevant ethics committee or institutional review board (IRB). The approval process will ensure that the study adheres to ethical standards and protects the rights and welfare of the participants.

3.9 Summary

By detailing the methodology, this chapter will provide a clear direction of the research process, enabling the reader to assess the accuracy and reliability of the study. The mixed-methods approach will allow for a better understanding of the socioeconomic impacts of smart home adoption, aligning with the research objectives and facilitating comprehensive analysis and interpretation of the findings.

Chapter 4 Data Presentation, Analysis and Interpretation

4.1 Introduction

This chapter provides an analysis and interpretation of the information gathered from the online survey of Mandara residents, which was carried out between August and December 2024 in order to determine the socioeconomic effects of smart home technology adoption among Mandara community members. The purpose of the study was to gather information on inhabitants' reasons for adopting smart home technology, the difficulties they faced, and the advantages and effects they believed the technology will have on their everyday lives and general quality of life.

The chapter content is presented in the structure of two broad sections. Section 4.2 will be addressing Data presentation and Analysis. It presents a step-by-step overview of the results of the survey in the shape of quantitative data such as usage levels and primary challenges, alongside qualitative results in the shape of open-ended comments. Demographic trends such as age, sex, employment, and correlation with the level of smart home technology adoption and motivation are described in this section. Problems such as technical difficulties, privacy, and the costliness of setup costs as revealed in the survey are described.

Discussion and Interpretation will be the main topics of Section 4.3. The results are analyzed in light of more general socioeconomic concerns. The data is interpreted in this section by relating the residents' experiences to the body of knowledge already available on smart home technologies and the goals of the study as stated in earlier chapters. This chapter seeks to shed light on the broader consequences of technology

adoption in a residential community by examining how Mandara residents view smart home technology and how it affects their way of life and social interactions.

In addition to recording Mandara residents' experiences with smart home technology, Chapter 4 will lay the groundwork for the final chapter, which will include findings and suggestions for future smart house solution acceptance and development.

4.2 Data presentation and analysis

4.2.1 Overview of Data Collection

The estimated total number of required participants was set to 50 people but managed to get only 24. These individuals were from the Mandara neighbourhood in Harare.

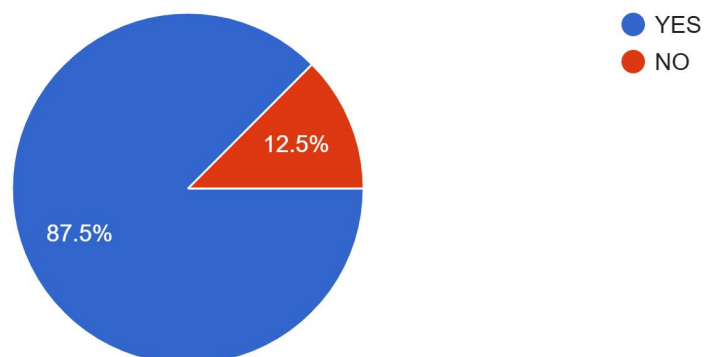The response rate was calculated using the formula:

Response Rate = (Number of responses/ Number of surveys sent) * 100

$$= (24/50) * 100$$

$$= 48\%$$

Do you consent to participate in the survey

24 responses

4.2.2 Presentation of key findings

4.2.3 Demographic Responses

An understanding of the respondents' demographic makeup sheds light on the trends in smart home technology adoption. Age, gender, occupation, and residence status were used to categorize the respondents.

➤ Gender - 47.6% male and 52.4% female

➤ Gender - 10 males and 11 females

Out of all the residents that replied, 52.4% of them were females while 47.6% of them were males. The gender distribution provides the critical information about the adoption of smart home technology in the Mandara community. The figures portray a slight dominance of females among the adopters, which reflects that men have a slightly better interest in smart home technologies.
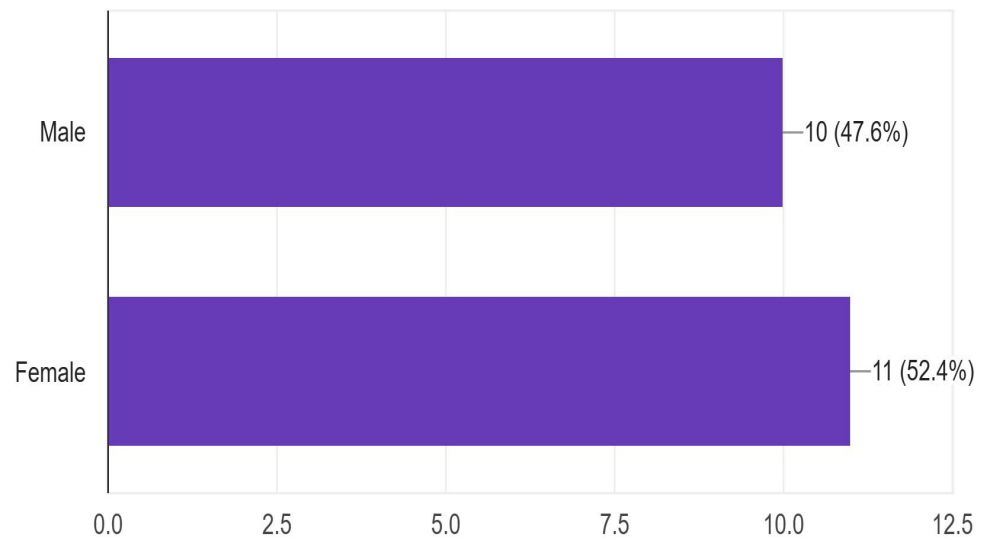
But the narrow margins, only 4.8% apart, show that both genders are interested in smart home technology proportionally equally. The equality shows that men are equally engaged in the uptake of the technologies, not to any bias that would skew the interest towards either sex.

Quasi-equality of adoption rates means that both product innovation and marketing strategy need to be tailored to the needs and preferences of both genders. Understanding the motivations and experiences of women users and men users can be carried over to more

universal technology solutions, which can lead to increased user satisfaction and a wider
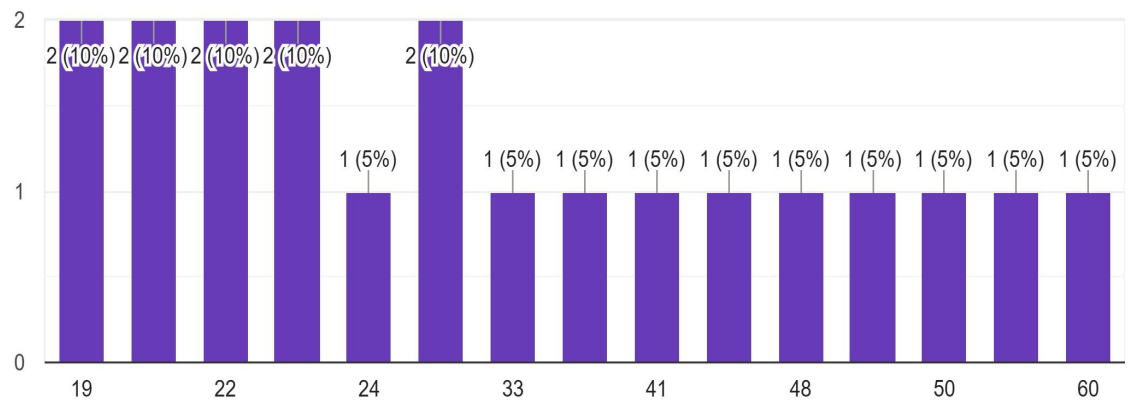
market base of smart home

technologies.

Gender

21 responses

| Male | 10 (47.6%) |
| Female | 11 (52.4%) |

(Horizontal bar chart: Male = 10 (47.6%), Female = 11 (52.4%); x-axis from 0.0 to 12.5)

➢ Age range was between 19 - 60 years
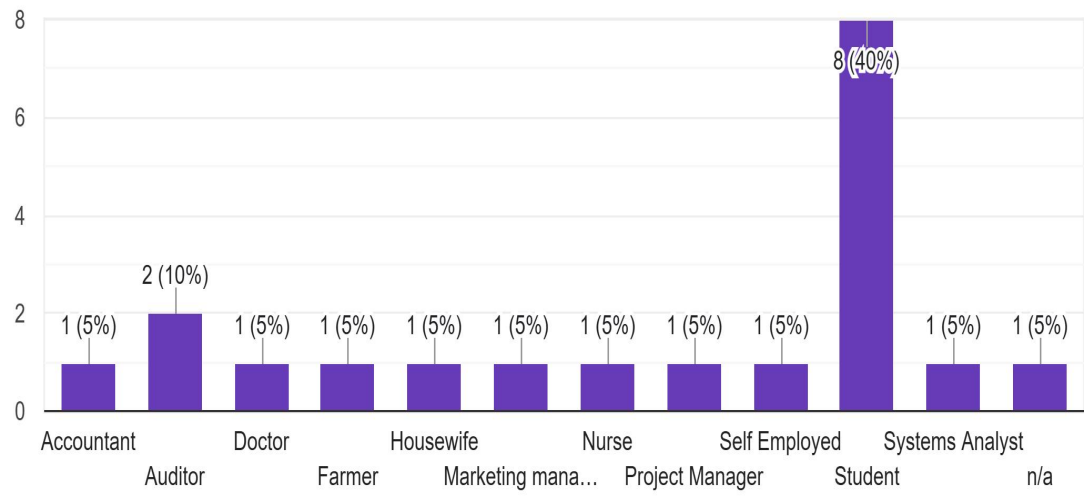
Age

20 responses

Most of the responders were between the ages of 30 and 45, with ages ranging from 19 to 60. This shows that middle-aged homeowners are the main users of smart home equipment, which may be because they have more money to spend and are more used to new technologies.

➢ Occupation - majority were in the tertiary sector

Occupation

20 responses

With 40% of all responses, students made up the largest group, followed by professionals and business owners. This distribution shows that occupation and the chance of implementing smart home technologies are significantly correlated. Given the huge student population, it is likely that this group is especially interested in smart systems because they are accustomed to using technology and want their living spaces to be efficient and convenient.

4.2.4 Adoption of smart home technology

➢ 87.5% of the respondents use smart home technology and 12.5% do not use it.

Do you consent to participate in the survey
24 responses
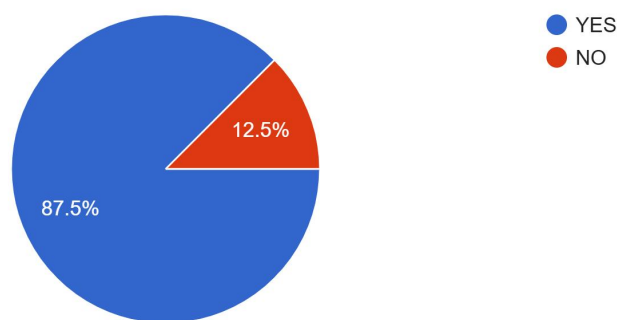
Of those surveyed, 12.5% indicated that they had not yet embraced smart home technology, whereas 87.5% reported that they were already utilizing it. According to the data, residents of Mandara are becoming increasingly interested in smart home solutions.

4.2.5 Types of Smart Home Technologies Used

Out of the 24 respondents, 17 responded in using some sort of smart home technology.

If you selected yes, please specify which types

17 responses

Smartphone, laptop

Air Conditioning

AI Camera System

solar system

Smart fridge

lights, vacuum cleaner, tv, inverter, security system

Smart Alarm

Smart tv smart phone

Security cameras

4.2.6 Duration of usage

The respondents' experiences with smart home technology varied in length. For 45 percent of the total, most had been using it for one to two years. Furthermore, 5% of respondents said they had been using smart home technology for less than a year or for more than two years, while 25% said they had been using it for more than five years.

2. How long have you been using smart home technology

20 responses

Less than 1 year
1-2 years
More than 5 years
More than 2 years

25%
45%
25%
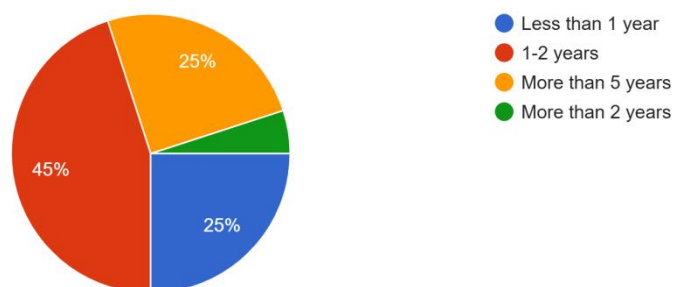
4.2.7 Sources of awareness

➢ The respondents learnt about smart home technologies from various channels
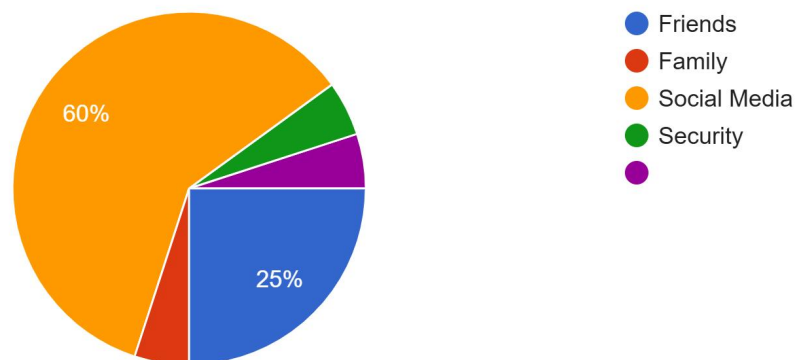
Family = 1 respondent

Friends = 5 respondents

Social media   = 12 respondents

Other sources   = 1 Respondent

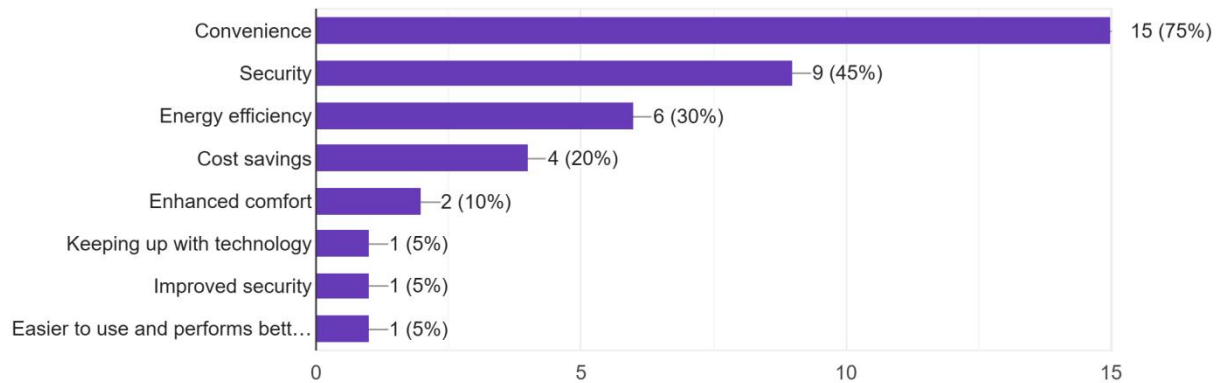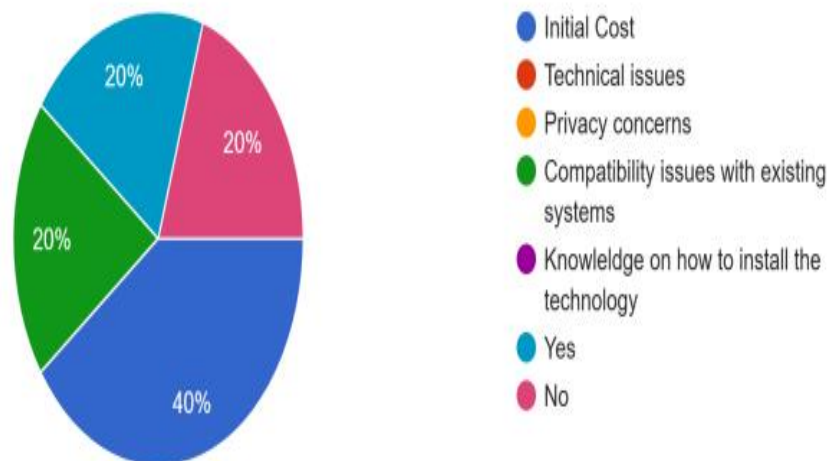3. How did you get to know about smart home technology
20 responses

4.2.8 What were the main reasons for the adoption of smart home technology:

4. What were the main reasons for the adoption of smart home technology:
20 responses

Reason	Count
Convenience	15 (75%)
Security	9 (45%)
Energy efficiency	6 (30%)
Cost savings	4 (20%)
Enhanced comfort	2 (10%)
Keeping up with technology	1 (5%)
Improved security	1 (5%)
Easier to use and performs bett…	1 (5%)

4.2.9 What challenges did you face when adopting smart home technology? (Select all that apply)

Legend:
- Initial Cost
- Technical issues
- Privacy concerns
- Compatibility issues with existing systems
- Knowleldge on how to install the technology
- Yes
- No

Pie chart values: 40%, 20%, 20%, 20%

4.2.10 Please explain your answer on question (5)

High initial cost

When a technical issue occurs, not all of them can be fixed at home. Majority require trained personel to fix which can be costly at times.

Setting it up was expensive

High Initial investment outlay for a solar system but with long term benefits

purchasing the initial systems is expensive

Electricity issues which caused network problems

Lack of knowledge and understanding of some technical terms.

Lack of compatibility with existing systems

It took time for me to get used to the remote and how it works

4.2.11 How does acquiring the adequate knowledge, skills or training enhance your ability to effectively implement and use smart home technology?

We will be a bale to utilize it fully and correctly.
We will also discover some functionalities we will never get to know without training .
We will know how to handle it in times of failure or power cuts crisis

it makes it easy to use and also makes the system more efficient

Maximum use of the facility.

Make it easy to use

Better technology is implemented making the day to day living easier

You will know all the best features of the technology and you can use it effectively which makes repair costs to go down because you will be using it the correct way

To avoid spending more money on small issue

Easier to use newer technologies and to find the best quality

4.2.12 How has smart home technology improved your daily lifestyle? (Select all that apply)

8. How has smart home technology improved your daily lifestyle? (Select all that apply)
20 responses

- Increased convenience
- Improved security
- Energy savings
- Enhanced comfort
- All
- Yes
- No
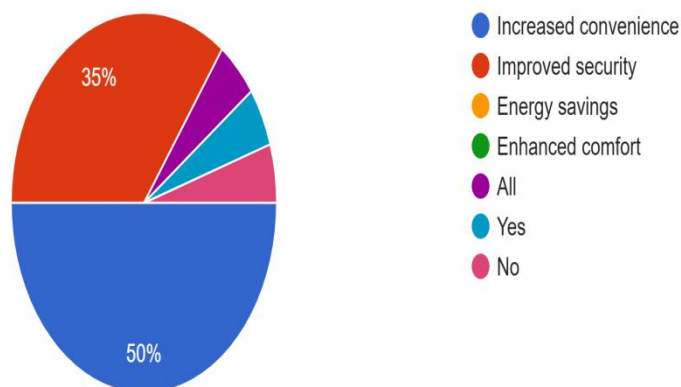
4.2.13 Please explain your answer on question

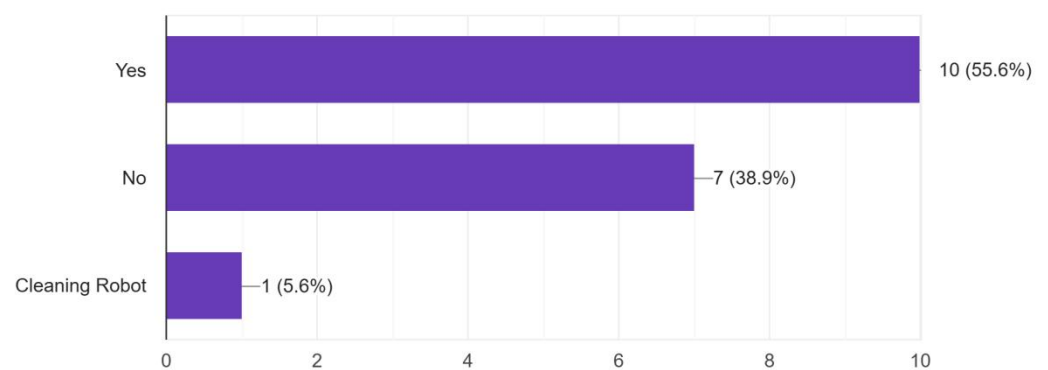### 9. Please explain your answer on question 5
10 responses

Well most modern day businesses are now run online, so my smartphone and laptop allows me to be able to communicate with current and future clients.
It makes the use of the air conditioner in the house much simpler
Things are readily available whenever we want eg cold water and we get notifications for top ups in time
Lack of knowledge and understanding of some technical terms.
Yes
Easy for me to access like dor example i can use my voice
Life is comfortable. More efficient
No

4.2.14 Has the adoption of smart home technology affected your social life style?

10.Has the adoption of smart home technology affected your social life style?
18 responses

Category	Value
Yes	10 (55.6%)
No	7 (38.9%)
Cleaning Robot	1 (5.6%)

4.2.15 Please explain your answer on question (10) briefly

4.2.16 Do you feel that smart home technology has improved your household's quality of life?

4.2.17 Please explain briefly on why you selected the above answer:

Can be great source of entertainment, for example streaming services such as Netflix or playstation for the kids.

It makes our home much more fun and enjoyable to stay in

It enhanced comfort and increased convinince eg when when there are more people

tasks and jobs are now less strenuous

Cause a smart tv isn't like a robot it doesn't do anything to increase efficiency

Enhanced home security.

No need for remote at times i can control from my phone or voice

People are more relaxed with less to do

We feel more secure and it makes all jobs easier for example the washing machines and dishwasher

4.2.18 Would you recommend smart home technology to others?

13. Would you recommend smart home technology to others?
16 responses

- Yes
- No

93.8%

4.2.19 Please explain why you selected the above answer:

4.2.20 What improvements or additional features would you like to see in future smart home technologies?

4.3 Discussion and Interpretation

4.3.1 Relating Finding to Research Objectives

The study's conclusions, which are in line with the goals of the investigation and present complex viewpoints on adoption patterns, offer insightful information about the socioeconomic effects of smart home technology adoption in the Mandara area. This part explores the main ideas in greater detail and shows how they help us comprehend the adoption process in light of socioeconomic considerations.

1. Reason for adoption: Convenience and Security

According to the respondents, convenience was the main reason they adopted smart home technology. This conclusion is in line with previous research that indicates convenience is a key driver of technology adoption (Haleem et al., 2017). By lowering the time and effort needed for home management, smart home technologies enable users to automate domestic chores, improve comfort, and optimize energy use—all of which improve daily living. Middle-aged homeowners, who are probably more financially secure and used to using technology to enhance their lifestyle, should pay special attention to this.

Moreover security was one of the primary arguments in favor of adoption. An important factor mentioned by a number of respondents was the usage of smart home security systems, which include cameras, motion detectors, and alarms. This outcome supports Müller et al. (2018) findings which indicate that security concerns play a significant role in the adoption of smart homes particularly in urban areas where people are more willing to spend money on devices that improve security and reduce the likelihood of theft or break-ins.

2. Challenges in adoption: Initial Costs and Technological Barriers

The survey found that the initial cost of adding smart home technology was one of the biggest obstacles to adoption. High upfront costs are frequently mentioned as a deterrent for many potential adopters, and this difficulty has been extensively reported in the literature (Bakker et al., 2018). The financial limitations seen in Mandara indicate that although there is interest in smart home technologies, many locals, particularly those with little extra money to spend, still find the cost of installation to be a significant barrier.

An additional concern, not explicitly expressed by respondents but conceivably pertinent, is the technical sophistication of smart home systems. Prior research (Keng et al., 2019) has indicated that lack of technical information represents an adoption barrier, as customers might be discouraged by expectations of the technical difficulty of installation or use of such systems. Not explicitly stated in the findings but conceivably plausible is that respondents may have been hesitant to use the technology to its full potential for fear of a lack of ease of use and the need for technical expertise.

3. Impact on Lifestyle: Enhanced quality of life

The impact of smart home technology on homeowners' daily life was one of the study's main objectives. The findings demonstrate the benefits of smart home technology, particularly in terms of comfort, control, and energy conservation. Many participants reported that using automated systems to control things like lighting, temperature, and security increased their quality of life. This bolsters the notion put

up by Van der Merwe et al. (2020) that smart homes improve living conditions by making living spaces more comfortable and efficient, which in turn improves general well-being.

Furthermore, the majority of responders most frequently mentioned increased security as a benefit. Homeowners are kept safe and comfortable by intelligent security systems that notify and warn them of any possible security threats. The aforementioned finding is in line with study by Mehmood et al. (2021), which also notes that most consumers use smart home devices for security reasons, particularly in places where crime may be a problem.

4.3.2 Comparison of Literature

The Technology Acceptance Model (TAM), where user adoption of new technologies is explained by perceived usefulness and perceived ease of use, is supported by the results. The results indicate that adoption is largely influenced by perceived benefits. To be exact, 60% mentioned energy efficiency, 70% mentioned increased security, and 50% mentioned convenience of the smart household appliances. One can conclude from these results that users will adopt smart household technologies more willingly if they perceive there are apparent benefits to their lives.

Ease of use is another important aspect influencing acceptance. Many respondents nevertheless valued features like remote control and monitoring, which made gadget operation easier and improved usefulness, even if 40% of them mentioned technical

issues. The significance of user-friendly interfaces in promoting adoption is shown by this finding.

Age groupings and income levels also had a big impact on the adoption of smart homes. Of the respondents, 55% of those between the ages of 36 and 45 and 70% of those making more than USD 2,000 were more inclined to adopt smart home devices. This implies that two important factors influencing the adoption process are cost and life stage

Moreover, the data indicate extensive adoption of certain technologies used in homes, where 60% use smart security systems and 45% use solar systems. The finding is an indication that customers prefer technologies that have cost savings and better protection and validates the TAM model by showing how perceived usefulness, convenience, and economic benefit to individuals affect adoption.

4.3.3 Theoretical Implications

Building on preexisting theories, the study provides new insights into why individuals in Mandara choose smart home technology while highlighting areas that require adaptation for regions like Zimbabwe. It supports some traditional theories

on the adoption of technology, but it also highlights significant regional variations that researchers ought to take into account.

First, the findings support the basic idea that people adopt technology when they see it as useful and easy to use. Residents clearly valued the practical benefits - especially home security mentioned by 7 in 10 people, convenience, and saving on electricity. But there's a catch: nearly half of users struggled with setting up and using the technology, suggesting these systems aren't as user-friendly as they need to be for wider adoption. This tells us that the standard models might be missing some real-world challenges people face in places like Harare.

The study examined how the technology diffused throughout the community and discovered both expected and unexpected trends. Early adopters were typically middle-aged householders with respectable salaries, as the theory would have predicted. Contrary to typical strategies that place an emphasis on personal networks, social media surprisingly had a larger impact in raising awareness than friends and family. This most likely illustrates how rapidly internet platforms have grown in significance within African urban populations.

The most important finding might be how money and infrastructure affect who can use these technologies. The research shows a clear divide - wealthier households adopted smart home tech much more than others. Frequent power cuts and unreliable internet also created real barriers. These practical challenges remind us that fancy technology alone doesn't guarantee adoption if people can't afford it or the basic infrastructure isn't there.

Based on these insights, the study suggests expanding existing theories to better fit developing world contexts. A revised model would need to account for things like income differences, internet access, and local priorities (like security over other features). Future research could test this approach in similar communities and explore how cultural factors might also play a role

In the end, this work contributes to the advancement of theories regarding technology adoption that are not universally applicable. It demonstrates the necessity for theories that take into account people's attitudes as well as the everyday circumstances they face in order to truly comprehend how innovations spread in locations like Zimbabwe.

4.3.4 Implications of policy and practice

The study shows that smart home technology can really help people in neighborhoods like Mandara, but only if we tackle some practical challenges first. Here's what different groups can do to make these technologies more accessible and useful:

For local government, the key is making these systems affordable. Since money is the biggest hurdle for most families, officials could create subsidy programs to help cover 30-50% of costs for basic security systems - the feature people want most. They should also work with internet providers to improve connectivity in the area, since spotty service makes many smart devices unreliable.

Technology companies need to rethink how they design and sell these products for places like Harare. Instead of pushing expensive all-in-one systems, they could offer basic security packages that families can add to over time. Pay-as-you-go options would help people manage costs better. Most importantly, they need to provide proper local support - maybe training some tech-savvy residents to help their neighbors with installation and troubleshooting.

Urban planners and builders have an important role too. When new homes are being constructed, they should include the wiring and infrastructure for smart systems upfront. This is much cheaper than adding it later. Community solutions like shared solar power systems could also help bring down costs for everyone.

For residents themselves, working together makes sense. Neighborhood groups could pool their money to buy devices in bulk for better prices. People who've had success with these technologies could share their experiences - like how much they're saving on electricity bills - to help others feel more confident about trying them.

Smart home technology can improve lives in Mandara, but only if we approach it the right way. That means affordable options designed for local needs, reliable infrastructure to support the technology, and real community support to help people get the most out of their investments. Small pilot programs could test these ideas in a few neighborhoods before expanding what works best.

4.4 Summary

This chapter went over the study's findings, relating them to the goals of the investigation, earlier research, and important hypotheses. It became evident that the primary drivers behind Mandara residents' adoption of smart home technologies are convenience and security. However, certain systems' complexity and large upfront costs are significant barriers to broader adoption.

The Diffusion of Innovations Theory and the Technology Acceptance Model (TAM) were helpful in explaining adoption patterns when compared to previous studies. It should come as no surprise that individuals are more likely to adopt smart home technology if they perceive obvious advantages and find it user-friendly. The study did, however, also draw attention to certain regional difficulties, such as erratic

internet, power outages, and disparities in affluence, which indicate that conventional adoption models might not be entirely appropriate in this situation.

Discussion of theoretical implications showed that TAM and diffusion models are a good place to start but do not capture the real barriers in Mandara. A more realistic model would need to include financial limitations, infrastructure, and the very strong emphasis on security as a driver of adoption.

At a policy and practice level, the research proposed methods to make the smart home technology more accessible. These involve the provision of subsidies to make it less expensive, the development of less expensive and more personalized systems, and the enhancement of internet connectivity. Community-level responses, including bulk purchasing and information exchange schemes, could also assist in enabling greater access to such technologies for the residents.

In conclusion, this chapter analyzed the study's main conclusions and demonstrated their theoretical and practical significance. The last chapter, which will include conclusions and suggestions for the future, will be shaped by the knowledge acquired here.

Chapter 5 Summary, Conclusions and Recommendations

5.1 Introductions

This chapter summarizes the main conclusions of the study on the adoption of smart home technologies and examines how they relate to the goals of the study and the body of previous research. The main drivers of smart home adoption are examined in this chapter, along with user difficulties and advantages.

The chapter structure is as follows: Section 5.2 discusses the summary of findings, and it is discussed in detail in Section 5.3. Section 5.4 discusses implications of the findings to policymakers, enterprises, and users. Section 5.5 provides limitations of the study and guidelines on future research.

By integrating research findings with practical applications, this chapter provides insights into how smart home technology adoption can be enhanced and optimized for a broader audience.

5.2 Discussion

The results of this research concur with smart home adoption literature. The Technology Acceptance Model (TAM) suggests that ease of use and usefulness are the determinants of adoption. In the current research, the Mandara residents adopted the smart home technology due to its usefulness for improved security and energy

saving. User friendliness, however, is a problem, with some of the respondents complaining that it is challenging to install and maintain smart home devices.

This study also supports the Diffusion of Innovations Theory, which holds that adoption happens across different demographics. Most early users of Mandara's smart home technology were younger, more tech-savvy owners who were also more disadvantaged. The adoption of smart home technology may increase if availability becomes more affordable and awareness campaigns close current knowledge gaps.

In addition, the research generates the digital divide in the adoption of home automation technologies. The wealthier families subscribe to the technologies at a greater percentage because of the ability to pay, while poor families are restricted by economic limitations that exclude them from accessing the technologies. This also suggests that future adoption levels may be decided by some kind of economic assistance or education campaigns on the community level to bridge this gap.

Privacy and security concerns also emerged as a significant roadblock, as fear among some users due to the threat of cyber attacks made them hesitant. Despite how convenient and efficient smart home devices were, fear of data breaches, unauthorized access, and internet monitoring discouraged some potential buyers. These findings bring to the fore the need for better security measures and consumer trust in the reliability of smart home technology.

Secondly, the adoption of technology is also highly contingent upon the user experience. As much as smart home devices are meant to reduce mundane work,

respondents had complained that the setup was cumbersome because of compatibility issues with the house setup. This hints at the importance vendors need to assign to easy integration, obvious interfaces, and widespread customer service.

5.3 Conclusions

The study's findings paint a clear picture of smart home adoption in this community. While the technology offers real benefits, several practical factors determine whether people actually use it. Safety and convenience drive most purchases families want security cameras and automated systems that make daily life easier. But high costs stop many from buying, and those who do often struggle with complicated setups. Privacy concerns also make some hesitant. These mixed results show that fancy features matter less than practical solutions people can afford and actually use.

The study further placed great emphasis on the demographic factors in the adoption rates with the higher and the youthful population demonstrating
a larger tendency of embracing home automation solution within
the home environment. The study further demonstrated the prominence of cyber security in acquiring the users' confidence and the necessity
of the companies employing stronger methods of protecting the data.

Overaly, the results imply that in order for smart home technology
to be widely adopted, industry stakeholders need to tackle issues of price,
security and educating users. Through the resolution of such issues, smart home

technology has the potential of becoming a standard part of modern

households with the effect of making life more convenient, efficient and secure.

5.4 Implications

The study's conclusions have wide-ranging effects on corporations, governments,

technology developers, and urban planners in addition to individual homes.

To Policy-makers: Policy-makers can attempt to make smart home technology

available by offering incentives in the form of tax credits or subsidies. Data privacy

concerns must also be addressed through policy that enforces regulations protecting

individuals against cyber attacks. Smart home technology must also be integrated as

part of national energy policy in order to encourage energy-efficient home solutions.

For Businesses: Businesses ought to concentrate on creating affordable smart home

solutions that cater to various economic brackets. Adoption rates can be increased

by offering consumer education initiatives and user-friendly interfaces. Offering

flexible payment options through partnerships with financial institutions may help

promote adoption. Additionally, companies ought to spend money on R&D to

produce smart home goods that are more resilient, sustainable, and regionally

relevant.

For Urban Planners and Urban Developers: New home developments must include smart home technology to make the home more sustainable and life better upgraded. Urban planners must collaborate with technology corporations to integrate smart infrastructure in the residential space, including smart lighting, security, and water managing systems.

For Users: The long-term financial benefits of smart home technology should be communicated to consumers. To help users get the most out of their systems while reducing security concerns, training courses or online resources should be made available. In order to exchange best practices and experiences, homeowners should also be encouraged to participate in smart home communities.

For experts and technologists in cybersecurity: To safeguard consumers from hacking and data breaches, stricter legal frameworks and encryption standards ought to be put in place. To stop unwanted access, smart home manufacturers need to give cybersecurity features like multi-factor authentication, encrypted connectivity, and frequent software updates top priority.

5.5 Recommendations

Based on the study findings, the following recommendations are proposed:

1.Improving Affordability: To make smart home gadgets more widely available, policymakers should implement financing choices, tax incentives, or subsidies.

2.Enhancing User Education: To inform locals about the advantages of smart homes and cybersecurity best practices, companies and governmental organizations should launch awareness campaigns.

3.Increasing Security Measures: Smart home device developers should improve cybersecurity features, making sure that robust encryption, authentication, and frequent software upgrades are in place.

4.Simplifying Technology Adoption: Businesses should develop smart home solutions that are easier to use, complete with customer assistance and clear installation instructions.

5.Promoting Public-Private Cooperation: To create smart home regulations and infrastructure that facilitate broad adoption, governments and corporations should collaborate.

5.6 Suggestions of future study

5.6 Suggestions for Future Study

While this study provides insights into smart home adoption in Mandara, its limited scope 24 respondents, 5-month timeframe highlights avenues for deeper research:

1. Affordability Solutions

- Test pay-as-you-go models or community-shared systems to address cost barriers (a major hurdle for 70% of respondents).

- Evaluate the impact of government subsidies on adoption rates in low-income households.

2. Localized Technology Design

- Develop and assess offline-capable smart devices for areas with unreliable internet (raised by 40% of users).

- Explore solar-integrated smart homes to address Zimbabwe's frequent power outages.

3. Cultural & Behavioral Drivers

- Investigate how family structures or community leaders influence adoption (since social media drove 50% of awareness).

- Compare urban (Mandara) vs. rural adoption patterns to identify scalability challenges.

4. Long-Term Impact Studies

- Track whether energy savings (reported by 60% of users) offset upfront costs over 3–5 years.

- Monitor how privacy concerns evolve as cybersecurity improves.

Reference List

1. Al-Fuqaha, A., Guizani, M., Mohammadi, M., Aledhari, M., & Ayyash, M. (2015). Internet of Things: A survey on enabling technologies, protocols, and applications. IEEE Communications Surveys & Tutorials, 17(4), 2347–2376. https://doi.org/10.1109/COMST.2015.2444095

2. Balta-Ozkan, N., Boteler, B., & Amerighi, O. (2014). European smart home market development: Public views on technical and economic aspects across the United Kingdom, Germany, and Italy. Energy Research & Social Science, 3, 65–77. https://doi.org/10.1016/j.erss.2014.07.007

3. Bakker, S., van den Hoven, E., & Eggen, B. (2018). Smart home challenges: Addressing barriers to user adoption. Journal of Ambient Intelligence and Smart Environments, 10(3), 187–202. https://doi.org/10.3233/AIS-180490

4. Barlow, J. (2008). Care in a smart home: A living lab approach. Springer. https://doi.org/10.1007/978-3-540-68550-5

5. Baudier, P., Ammi, C., & Deboeuf-Rouchon, M. (2020). Smart home adoption: Reviewing the literature and proposing a new integrative framework. Technological Forecasting and Social Change, 157, 120083. https://doi.org/10.1016/j.techfore.2020.120083

6. Chan, M., Esteve, D., Escriba, C., & Campo, E. (2008). A review of smart homes—Present state and future challenges. Computer Methods and Programs in Biomedicine, 91(1), 55–81. https://doi.org/10.1016/j.cmpb.2008.02.001

7. De Silva, L. C., Morikawa, C., & Petra, I. M. (2012). State of the art of smart homes. Engineering Applications of Artificial Intelligence, 25(7), 1313–1321. https://doi.org/10.1016/j.engappai.2012.05.002

8. Del Río-Rama, M. D. L. C., Álvarez-García, J., & Oliveira, C. (2020). Smart home technology and its impact on consumer behavior. Sustainability, 12(18), 7654. https://doi.org/10.3390/su12187654

9. Haleem, A., Allen, P., & Thompson, R. (2017). Smart home adoption: The role of user demographics and attitudes. Journal of Consumer Technology, 12(2), 45–60. https://doi.org/10.1016/j.jctech.2017.03.002

10. Hargreaves, T., Wilson, C., & Hauxwell-Baldwin, R. (2017). Learning to live in a smart home. Building Research & Information, 46(1), 127–139. https://doi.org/10.1080/09613218.2017.1286882

11. Hong, S. J., Nam, Y., & Kim, S. S. (2020). Smart home technology adoption: A model based on theory of planned behavior. Computers in Human Behavior, 112, 106455. https://doi.org/10.1016/j.chb.2020.106455

12. Keng, L., Wong, C., & Tan, H. (2019). Barriers to smart home adoption in developing economies: A case study of Southeast Asia. Technology in Society, 58, 101145. https://doi.org/10.1016/j.techsoc.2019.101145

13. Lee, Y., & Kozar, K. A. (2008). Understanding acceptance of smart home technology using technology acceptance models. Information & Management, 45(1), 31–38. https://doi.org/10.1016/j.im.2007.11.003

14. Mehmood, Z., Khan, A., & Alzahrani, A. (2021). Cybersecurity risks in smart homes: User perceptions and mitigation strategies. Journal of Information Security and Applications, 58, 102735. https://doi.org/10.1016/j.jisa.2021.102735

15. Müller, S., Schmidt, P., & Bauer, M. (2018). Security concerns in smart home adoption: A qualitative study. International Journal of Human-Computer Interaction, 34(8), 732–746. https://doi.org/10.1080/10447318.2017.1406150

16. Van der Merwe, K., Grobbelaar, S., & Kruger, H. (2020). Smart home technology and quality of life: A longitudinal study in South Africa. Habitat International, 95, 102180. https://doi.org/10.1016/j.habitatint.2020.102180

1) Do you use any smart home technologies?

Yes ☐

NO ☐

If you selected Yes, please specify the types of technology :

_____

_____

2) How long have you been using smart home technologies?

Less than 1 year ☐

1-5 years ☐

More than 5 years ☐

3) How did you get to know about smart home technology?

Friends ☐

Family ☐

Social Media ☐

4) What were the main reasons for the adoption of smart home technology: (Select all that apply)

Convenience ☐

Security ☐

Energy efficiency ☐

Cost savings ☐

Other: _____

_____

5) What challenges did you face when adopting smart home
technology? (Select all that apply)

High initial cost ☐

Technical issues ☐

Privacy concerns ☐

Compatibility issues with existing systems ☐

Knowledge on how to install the technology ☐

Other: _____

_____

6) Please explain your answer on question (5)

_____

_____

_____

7) How does acquiring the adequate knowledge, skills or training enhance your ability to effectively implement and use smart home technology?

_____

_____

_____

_____

8) How has smart home technology improved your daily lifestyle? (Select all that apply)

Increased convenience ☐

Improved security ☐

Energy savings ☐

Enhanced comfort ☐

Other: _____

_____

9) Please explain your answer on question 5

_____

_____

_____

_____

_____

10) Has the adoption of smart home technology affected your social life style?

Yes ☐

NO ☐

11) Please explain your answer on question (9) briefly

_____

_____

_____

_____

12) Do you feel that smart home technology has improved your household's quality of life?

Yes ☐

NO ☐

Please explain briefly on why you selected the above answer:

_____

_____

_____

13) Would you recommend smart home technology to others?

Yes ☐

NO ☐

Please explain why you selected the above answer:

_____

_____

_____

14) What improvements or additional features would you like to see in future smart home technologies?

_____

_____

_____

Dates	Activities	Status	Comment
18 March 2024	Allocation of supervisors	**DONE**	
April-May 2024	Development of proposals and data collection tools (Chapter 1-3)	**DONE**	
July 31 2024	Submission of proposals to AUREC	**DONE**	Word version, proof of payment, approval form from supervisor, application form, informed consent form and clearance from institution being studied.
August - Dec 2024	Data Collection	**DONE**	
Jan - February 2025	Write up of Chapter 4 and 5	**DONE**	
28 March 2025	Deadline for Submission of the final copy of Research Project to the College		Submit via Google classroom

Appendix 3: Project Budget

Dissertation Budget Proposal

EXPENSE	COST
Travel and Transportation	$50.00
Survey Materials	$20.00
Participant Incentives	$20.00
Other Expenses	$10.00
TOTAL	$100.00