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Sustainable consumption in the era of Artificial Intelligence.

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In loving memory of my father,

who I know would be immensely proud of this achievement.

Your unwavering belief in me gave me the strength to complete this journey,

even in the face of loss.

ABSTRACT

The surge in mobile applications (apps), particularly those embedded within social networks, has created a powerful platform for influencing user behavior. This thesis delves into user engagement with such apps that leverage Artificial Intelligence (AI) algorithms to promote sustainable practices (e.g., suggesting eco-friendly products, providing personalized tips for reducing energy consumption, recommending low-carbon transportation options). The research explores how AI features within these apps influence user motivation, ability to adopt sustainable choices, and responsiveness to in-app prompts.

By examining factors like personalized recommendations (e.g., suggesting local farmers' markets based on user preferences), social network integration (e.g., allowing users to share their sustainable achievements with friends), and gamified elements (e.g., rewarding users for reaching sustainability goals with virtual badges), the study aims to understand the mechanisms by which AI fosters user engagement and ultimately drives sustainable behavior change. A user survey will be conducted to assess user perceptions of AI-powered functionalities, their perceived effectiveness in facilitating sustainable choices, and the ease of integrating these practices into daily routines. This research seeks to identify how AI algorithms can be most effectively designed to enhance user engagement within social network-based mobile apps. The findings will contribute valuable insights for app developers, informing strategies for leveraging AI and social networks to cultivate a culture of sustainability and drive positive environmental change.

KEYWORDS: Mobile apps, Social Network, Sustainability, Sustainable Behavior, AI algorithms

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1. INTRODUCTION

The Rise of Mindful Consumption in the Digital Era

The urgency for sustainable consumption has never been greater. As the world grapples with the escalating consequences of climate change, resource depletion, and environmental degradation, a paradigm shift towards mindful consumption patterns is paramount (Tukker et al., 2006). This transition, however, is not without its complexities. The modern consumer faces an inundation of choices, often lacking the time or information to make sustainable decisions (Hansen, 2011).

Enter artificial intelligence (AI), a transformative technology poised to reshape consumption habits and steer us towards a more sustainable future. While AI has often been associated with concerns about automation and job displacement, its potential to empower consumers to make eco-conscious choices is increasingly recognized (Vermesan&Friess, 2013). In particular, AI-powered mobile applications are emerging as powerful tools for promoting sustainable behavior. These apps leverage sophisticated algorithms to personalize recommendations, track environmental impact, and gamify sustainable actions, thereby nudging users towards greener lifestyles.

The integration of AI into mobile applications designed to foster sustainable consumption is a rapidly evolving field. Research indicates that AI can play a multifaceted role in shaping consumer behavior. AI algorithms can analyze vast amounts of data to provide personalized recommendations tailored to individual preferences and values (Jannach et al., 2010). For

example, an AI-powered grocery app could suggest locally sourced, seasonal produce, or recommend products with lower carbon footprints based on a user's dietary preferences.

Furthermore, AI can facilitate the tracking and quantification of environmental impact, empowering consumers to visualize the consequences of their choices. Apps that calculate the carbon footprint of purchases or track water usage can raise awareness and encourage more conscious consumption (Allcott, 2011). Gamification, another promising application of AI, can incentivize sustainable actions by awarding points, badges, or virtual rewards for eco-friendly behaviors (Deterding et al., 2011).

This thesis delves into the burgeoning landscape of AI-powered mobile applications designed to promote sustainable consumption. It investigates the various ways in which AI algorithms are being harnessed to personalize recommendations, track environmental impact, and gamify sustainable actions. The research aims to assess the effectiveness of these apps in influencing consumer behavior and promoting a shift towards more sustainable lifestyles. Additionally, the thesis explores the ethical implications of using AI to influence consumer choices and considers the potential for unintended consequences.

2. LITERATURE REVIEW

2.1 Sustainable Behavior

Numerous authors in the sustainability literature emphasize the urgent need to transform consumption patterns and the prevailing economic system, which is often predicated on limitless growth in a resource-constrained world (Cavanagh et al., 2004). Moreover, the global consumerist class continues to expand as individuals in developing countries utilize their growing purchasing power to emulate the consumption levels of economically developed nations (WEF, 2011). As the final link in the value chain, consumers play a pivotal role in shaping trends and preferences, either encouraging or rejecting products, brands, and various characteristics, including ethical, social, and environmental considerations (Backhaus et al., 2012).

Indeed, as the UK's Department for Environment, Food & Rural Affairs (DEFRA) asserted in 2002, sustainable development cannot fully materialize without a significant shift in behavior, leading to active engagement from individuals across the globe. Sustainable development, as defined by the Brundtland Commission (1987), entails meeting the needs of the present generation without compromising the ability of future generations to fulfill their own needs. Building on Webster's (1975) definition, socially conscious consumer behavior "takes into account the public consequences of his or her private consumption or who attempts to use his or her purchasing power to bring about social change" (p. 188). Other scholars have proposed various ways to define responsible consumer behavior (Belch, 1982; Mayer, 1976), often merging environmental and social considerations into a single concept. However, Roberts (1995) distinguished between these two aspects, suggesting a scale with distinct social and environmental dimensions to measure responsible consumer behavior. Subsequent research by

Webb et al. (2008) concluded that existing measures were insufficient to fully capture the complex and multifaceted nature of responsible consumer behavior due to the wide array of existing social issues.

This section is divided into three subsections: Sustainable Lifestyle, Sustainable Consumption, and Eco-citizenship. Eco-citizenship will be the concluding subsection, as it entails integrating the principles of sustainable lifestyle and consumption into daily behavioral patterns. Notably, sustainable consumption pertains to the processes of purchasing, consuming, and disposing of products, whereas sustainable lifestyles encompass a broader range of activities and values, including interactions and education, which extend beyond material consumption (Thidell, 2010).

2.2 Digital Platforms

The birth and propagation of mobile computing, cloud computing, inmemory technologies, and social media, are collectively referred to as digital platforms (Nambisan, 2013). A platform is a constructing block that provides an essential function to a technological system and serves as a foundation upon which products, technologies, or services can be created (Gawer, 2009). The European Commission (2015) has defined platforms as an institution running in two (or multi)-sided markets, which utilizes the Internet to enable interactions between two or more distinct but interdependent groups of users to generate value for at least one of the groups. Besides, certain platforms also qualify as intermediary service providers as general internet search engines (e.g. Google, Bing).

As Digital Business Platforms are a new phenomenon, their impact on innovation and competition still needs to be defined (Cusumano and Gawer, 2012). The need for better understanding of platforms is crucial as Parker (2016) suggest that companies must include platform thinking in order to compete in the future. Indeed, any industry in which information plays a key role is a candidate for platform revolution (Parker et al.,2016).

This section is divided into eight subsections: Digital Platform Architecture, Digital Platform Characteristics, Digital Platform Governance, Digital Business Platform model, Traditional Businesses versus Digital Businesses platforms, Platform business model innovation, Digital Platforms as Sustainable Innovation for Business Models and at last Digital Platforms: Social Network and User Engagement Strategies.

2.3 Digital Platforms and Sustainable Behavior Change

2.3.1. Personalization

Digital platforms leverage personalization as a powerful tool to influence sustainable consumption behavior. This is achieved through sophisticated algorithms that analyze vast amounts of user data, enabling platforms to deliver targeted messages, customized recommendations, and personalized feedback (Aljukhadar&Senecal, 2019). For instance, an AI-powered grocery app can suggest locally sourced produce to a user with expressed interest in sustainable food choices, or an energy-saving app can provide tailored tips based on a household's consumption patterns. For example, *Mealime*, which uses AI to create personalized meal plans that align with users' dietary preferences and sustainability goals.This personalized

approach enhances the relevance and appeal of sustainable options, making them more likely to be adopted (Aguirre et al., 2015). However, the use of personalization raises ethical concerns regarding data privacy, algorithm bias, filter bubbles, and potential manipulation (Zuboff, 2019). Striking a balance between personalization and user autonomy is crucial to ensure that digital platforms empower individuals to make informed and sustainable choices without compromising their privacy or agency.

2.3.2. Feedback loops

Digital platforms have the unique ability to provide real-time feedback on users' behaviors and their environmental impact, creating powerful feedback loops that can drive sustainable action. This feedback can take various forms, such as tracking energy consumption, water usage, or carbon footprints (Allcott, 2011). I would mention the app *OhmConnect*, which provides real-time feedback on energy usage and rewards users for reducing consumption during peak hours. By visualizing the consequences of their choices, users gain a deeper understanding of their ecological footprint and are empowered to make more informed decisions (Midden & Ham, 2012). For instance, an app that displays the carbon emissions associated with different transportation options might encourage users to choose public transportation or cycling over driving.

Moreover, positive reinforcement in the form of rewards or recognition for sustainable actions can further incentivize behavior change (Abrahamse et al., 2005). By closing the loop

between actions and consequences, digital platforms create a dynamic environment where users are constantly learning and adapting their behavior towards more sustainable outcomes.

2.3.3._Social influence

These platforms inherently leverage social influence, defined as the process by which individuals adjust their thoughts, feelings, and behaviors in response to others (Cialdini & Goldstein, 2004), by harnessing the power of social networks and peer pressure to encourage sustainable actions. They create virtual spaces where users can connect, share experiences, and observe the behaviors of others (Bruns & Burgess, 2015). This social context can foster a sense of community and shared identity around sustainable practices (Stern, 2000). For instance, apps like Good On You use a community-driven rating system to assess the sustainability of fashion brands, encouraging consumers to make more informed choices. Research has shown that social norms and peer influence play a significant role in shaping behavior, particularly when it comes to complex issues like sustainability (Nolan et al., 2008). Digital platforms can amplify these effects by making sustainable actions more visible and encouraging social comparison, thereby promoting the adoption of eco-friendly practices.

2.3.4. Gamification

Gamification, the integration of game-like elements such as points, badges, leaderboards, and challenges, has become a powerful strategy employed by digital platforms to incentivize sustainable behavior. By tapping into users' intrinsic motivations for achievement, mastery, and

social recognition (Deterding et al., 2011), these platforms make eco-friendly actions more engaging and rewarding. Points and badges can be awarded for completing tasks like reducing energy consumption, choosing sustainable transportation options, or purchasing environmentally friendly products (Hamari et al., 2014). A great example is the CityMapper app, which incorporates gamification elements to incentivize sustainable transportation choices. This gamified approach not only makes sustainable choices more appealing but also fosters a sense of competition and community as users compare their progress with others and strive for higher rankings on leaderboards. The resulting positive feedback loop can further reinforce sustainable behaviors and create a sense of social momentum around eco-conscious actions. However, it's important to note that while gamification shows promise, its long-term effectiveness in driving lasting behavior change remains an area of ongoing research (Seaborn & Fels, 2015).

2.3.5. Types of Digital Platforms and their Impact

Digital platforms have emerged as diverse tools in the pursuit of sustainable consumption, each with unique strengths and approaches.

Social Media Platforms: Platforms like Facebook, Twitter, and Instagram have become powerful tools for raising awareness about environmental issues and mobilizing communities around sustainability causes. Through the sharing of information, personal stories, and calls to action, these platforms can influence attitudes and behaviors related to sustainable consumption (Saeidi et al., 2015). Social media also enables the formation of online communities where

individuals can connect with like-minded people, share eco-friendly tips and practices, and participate in collective action towards a more sustainable future.

E-commerce Platforms:The rise of e-commerce platforms like Amazon and Etsy has transformed the way consumers shop, and these platforms are increasingly incorporating sustainability features into their offerings. By providing eco-friendly product labels, certifications, and carbon footprint calculators, they empower consumers to make more informed and conscious choices (Lu et al., 2021). Some platforms even curate special sections for sustainable products or partner with eco-conscious brands, making it easier for consumers to discover and purchase environmentally friendly options.

Mobile Apps: Dedicated mobile apps have emerged as personalized tools for promoting sustainable behavior. Apps like Oroeco and JouleBug track users' environmental impact in areas like energy consumption, water usage, and transportation, providing personalized feedback and recommendations for improvement (Midden & Ham, 2012). These apps often employ gamification techniques, such as points, badges, and challenges, to incentivize and reward sustainable actions, making the process of adopting greener habits more engaging and enjoyable.

2.3.6 Strengths and Limitations of Digital Platforms for Sustainable Behavior Change

Digital platforms have demonstrated considerable potential in promoting sustainable behavior change, leveraging their unique capabilities to engage users, provide tailored information, and foster social influence. Research has shown that digital interventions can be effective in promoting various pro-environmental behaviors, such as energy conservation

(Allcott, 2011), recycling (Lanzini&Thøgersen, 2014), and sustainable transportation choices (Bamberg et al., 2003). For example, a study by Midden and Ham (2012) found that personalized feedback on energy consumption through a mobile app significantly reduced household energy use. Additionally, gamification elements like rewards and leaderboards have been shown to enhance user engagement and motivation for sustainable actions (Hamari et al., 2014).

However, the effectiveness of digital platforms is not without limitations. User engagement remains a challenge, as many users may not actively participate in sustainable initiatives or may abandon them over time (Kaur &Dhir, 2021). Moreover, concerns regarding data privacy and the potential misuse of personal information have also been raised. For instance, the Cambridge Analytica scandal highlighted the risks associated with the collection and analysis of user data for behavioral targeting (Cadwalladr& Graham-Harrison, 2018). Additionally, the use of AI algorithms to personalize content and recommendations can lead to filter bubbles and echo chambers, potentially limiting exposure to diverse viewpoints and reinforcing existing biases (Pariser, 2011). It is crucial for researchers and practitioners to carefully consider these limitations and ethical implications to ensure that digital platforms are used responsibly and effectively for promoting sustainable behavior change.

2.4 Theoretical Foundations

2.4.1. Theoretical Frameworks for Understanding Digital Platforms and Sustainable Consumption

Understanding how digital platforms influence sustainable consumption behavior necessitates the application of established behavior change theories. The Theory of Planned Behavior (TPB) suggests that intentions are key predictors of behavior, shaped by attitudes (an individual's favorable or unfavorable evaluation of a behavior), subjective norms (the perceived social pressure to perform or not perform a behavior), and perceived behavioral control (an individual's belief in their ability to perform a behavior) (Ajzen, 1991). Digital platforms can leverage these factors by providing information to shape attitudes, showcasing social norms through peer comparison and testimonials, and enhancing perceived control by simplifying sustainable actions, such as suggesting eco-friendly products and providing step-by-step guides.

Social Cognitive Theory (SCT) emphasizes the role of observational learning and self-efficacy in behavior change (Bandura, 1986). Digital platforms can facilitate observational learning by showcasing sustainable role models and sharing success stories, while interactive features and personalized feedback can boost users' self-efficacy (Andrews et al., 2019). The Fogg Behavior Model (FBM) highlights the importance of triggers, motivation, and ability in driving behavior (Fogg, 2009). Digital platforms can act as triggers through notifications and reminders, while gamification elements and social incentives can enhance motivation. Simplifying sustainable actions through user-friendly interfaces and personalized recommendations can increase perceived ability. By integrating these theoretical frameworks, we can gain a deeper understanding of how digital platforms can be designed to effectively promote sustainable consumption.

2.4.2. Applying Digital Platform Theories to Promote Sustainable Consumption

Digital platform theories provide valuable insights into how the governance structures, business models, and network effects of platforms can be leveraged to promote sustainable consumption. Platform governance, which encompasses the rules, norms, and processes that shape interactions between platform participants, can be designed to incentivize sustainable practices and discourage unsustainable ones (Parker et al., 2016). For instance, platforms can implement moderation policies that prioritize eco-friendly products or content, or they can create reward systems that incentivize users to engage in sustainable behaviors. Furthermore, platform business models, which determine how platforms generate revenue and create value, can be aligned with sustainability goals. For example, platforms can adopt circular economy models that prioritize the reuse and recycling of products, or they can offer incentives for sustainable consumption through discounts or rewards (Tiwana et al., 2010). Finally, network effects, which describe how the value of a platform increases as more users join, can be harnessed to create a critical mass of sustainable consumers, thereby amplifying the impact of individual actions (Evans &Schmalensee, 2016). By understanding and strategically utilizing these theoretical frameworks, platform designers can create digital environments that not only facilitate sustainable consumption but also actively encourage it.

3. THEORETICAL FRAMEWORK

3.1 AI for Sustainability

Artificial intelligence (AI) offers a new frontier for sustainability, with the potential to transform various sectors. Thanks to its advanced data analysis and prediction capabilities, AI can optimize energy consumption and resource management in areas like manufacturing and supply chain logistics (Vinuesa et al., 2020). In agriculture, AI-driven precision farming techniques can lead to increased crop yields while minimizing environmental impact (Liakos et al., 2018).

However, it's important to note that AI isn't a magic solution. There are legitimate concerns regarding its energy consumption, the potential for data privacy breaches, and the risk of biased algorithms (Taddeo & Floridi, 2018). As we embrace AI's potential for good, we must also proceed with caution, ensuring its development and implementation are both ethical and sustainable (Rolnick et al., 2019).

3.2 The Role of AI in Sustainable Behavior Change

Artificial intelligence (AI) offers a unique set of tools and mechanisms to facilitate sustainable behavior change, leveraging psychological insights and data-driven approaches to nudge individuals towards more eco-conscious actions.

3.2.1 Leveraging Cognitive Biases

AI can effectively utilize cognitive biases, which are inherent tendencies in human thinking, to promote sustainable choices. For instance, AI-powered apps can frame choices in ways that highlight the positive environmental impact of sustainable options, tapping into the "framing effect" to make these options more appealing (Kahneman & Tversky, 1984). The "default effect," where people are more likely to stick with pre-selected options, can be leveraged by setting sustainable choices as defaults in various digital interfaces (Thaler & Sunstein, 2008). Additionally, AI can create personalized messages that appeal to individual values and beliefs, increasing the likelihood of behavior change through the "confirmation bias" (Nickerson, 1998).

3.2.2 Utilizing Social Norms

AI can harness the power of social norms, which are unwritten rules about how people should behave in a given situation, to encourage sustainable behavior. By providing information on what others are doing (descriptive norms) or what is considered acceptable behavior (injunctive norms), AI can create a sense of social pressure that nudges individuals towards more sustainable choices (Cialdini, 2009). For instance, energy-saving apps might show users how their consumption compares to their neighbors, while social media platforms could highlight the growing popularity of sustainable lifestyles.

3.2.3 Personalized Feedback and Reinforcement

AI-powered platforms can deliver personalized feedback on users' environmental impact, providing tailored recommendations and rewards to reinforce sustainable actions (Midden & Ham, 2012). This approach can enhance motivation, self-efficacy, and intrinsic satisfaction, all of which are crucial for sustained behavior change (Ryan & Deci, 2000). For example, a fitness app could track a user's carbon footprint reduction from cycling instead of driving, offering rewards or virtual badges to celebrate their progress.

3.3 Ethical Considerations

Artificial intelligence (AI) presents a promising avenue for promoting sustainable behavior change, but its application raises important ethical concerns that warrant careful consideration. Transparency in AI algorithms and decision-making processes is crucial to ensure that users understand how and why their choices are being influenced, mitigating the risks associated with opaque or "black box" systems (Burrell, 2016). A balance must be struck between nudging users towards sustainable behavior and respecting their autonomy and freedom of choice (Yeung, 2017). The potential for AI to be used manipulatively, exploiting cognitive biases or creating addictive feedback loops, necessitates the development of ethical guidelines and safeguards (Weinmann et al., 2016). Furthermore, the collection and use of personal data by AI-powered platforms raise significant privacy concerns, requiring transparent data practices and robust protections (Acquisti et al., 2016). Finally, ensuring that AI algorithms are fair and equitable for all users, regardless of their background or circumstances, is essential to avoid perpetuating existing biases and inequalities (Barocas & Selbst, 2016). Addressing these ethical

considerations is paramount to ensuring that AI is harnessed responsibly and effectively to promote sustainable consumption while upholding individual autonomy and social equity.

4. THE EMPIRICAL RESEARCH (METHODOLOGY)

4.1 Research Context

This study explores the intersection of sustainable behavior and digital business platforms, specifically focusing on the role of AI-powered mobile apps in promoting eco-conscious actions. While extensive research exists on both sustainability and digital platforms, there is a notable gap in understanding how these two domains converge. Existing literature has primarily addressed the concepts of sustainability and digital platforms separately, with limited exploration of the specific mechanisms and strategies through which digital platforms can effectively facilitate sustainable behavior change (Mattila et al., 2020; Schor et al., 2017).

This research seeks to address this gap by investigating the specific features and functionalities of digital platforms that can encourage and support users' sustainable behaviors. By adopting an interview-based qualitative approach, this study aims to uncover the perspectives, experiences, and insights of users who interact with AI-powered sustainability apps. This qualitative methodology is particularly suited to exploring the nuanced and complex factors that influence behavior change, as it allows for in-depth exploration of individual motivations, perceptions, and barriers to adoption.

The insights gained from this research will contribute to a deeper understanding of the potential of digital platforms as tools for promoting sustainable lifestyles, while also highlighting the challenges and opportunities associated with this emerging field. This knowledge can inform the design and development of more effective and user-centric AI-powered apps that can play a significant role in accelerating the transition towards a more sustainable future.

4.2 Research Approach

This research employed a sequential mixed-methods design (Creswell & Plano Clark, 2018), combining qualitative and quantitative data collection and analysis to gain a comprehensive understanding of how digital platforms influence sustainable behavior.

4.2.1 Selection of Case Studies

Four AI-powered mobile applications were selected as case studies for this research: Mealime, OhmConnect, Citymapper, and Good On You. These apps were chosen based on the following criteria:

- Diversity in Sustainable Behavior Categories: The apps cover a wide range of sustainable behaviors, including food choices (Mealime), energy consumption (OhmConnect), transportation (Citymapper), and fashion (Good On You), providing a comprehensive view of the potential for AI to influence various aspects of sustainable living.
- Spectrum of User Engagement Strategies: The apps utilize different strategies to engage users, such as social networking (Mealime), gamification (OhmConnect), personalization (Citymapper), and curated recommendations (Good On You). This diversity allows for an examination of the relative effectiveness of different approaches in motivating sustainable behavior change.
- Established and Growing Platforms: The selection includes both well-established apps with large user bases (Citymapper) and newer apps with innovative features

(OhmConnect), enabling the comparison of user perceptions and behaviors across different stages of platform maturity.

4.2.2 Data Collection and Analysis

The second step involved collecting data through two primary methods:

1. Semi-structured Interviews: In-depth interviews were conducted with users of the selected apps. These interviews aimed to elicit insights into users' motivations, experiences, and perceptions regarding the apps' features and their impact on sustainable behavior. Thematic analysis (Braun & Clarke, 2006) was employed to systematically identify, analyze, and interpret patterns of meaning across the interview transcripts.
2. Online Survey: A structured online survey was administered to a wider sample of app users. The survey included both open-ended questions, allowing for qualitative insights, and forced-choice questions, yielding quantitative data on specific features and preferences.

4.2.3 Framework Development

The final step involved synthesizing the findings from both the interviews and the survey to develop an original framework for assessing the effectiveness of digital platforms in incentivizing sustainable behavior. This framework, grounded in the activities, opinions, and

understandings of app users, provides actionable insights for businesses and designers seeking to develop more impactful sustainability-focused platforms.

4.3 Survey Design and Instrument

The online survey was designed to gather quantitative data on users' experiences with the selected apps and their perceptions of the apps' effectiveness in promoting sustainable behavior. The survey instrument consisted of a combination of:

- **Likert-scale questions:** To assess users' agreement or disagreement with statements about the app's perceived usefulness (Davis, 1989), perceived ease of use (Davis, 1989), and impact on their sustainable behavior (Taylor & Todd, 1995). These scales have been widely used and validated in previous research to measure technology acceptance and behavioral change.
- **Multiple-choice questions:** To gather information on demographics and app usage patterns.
- **Open-ended questions:** To allow participants to provide detailed feedback and share their personal experiences with the apps.

4.4 Sampling and Recruitment

The target population for this survey consisted of individuals who actively use mobile applications and have an interest in sustainability. Participants were recruited through social media platforms (Facebook) and professional networking platforms (LinkedIn), specifically targeting groups and communities focused on sustainability, technology, and mobile apps. A

total of 150 participants completed the survey, providing a diverse sample in terms of age, gender, and geographic location.

4.5 Data Collection Procedures

The survey was administered through Qualtrics, an online survey platform. Participants were invited to complete the survey via email and social media posts. The survey remained open for two weeks, and reminder emails were sent to encourage participation.

4.6 Data Analysis

Quantitative data from the survey were analyzed using descriptive statistics and inferential tests to identify significant differences between groups and assess the relationships between variables. Qualitative data from the open-ended survey questions and interviews were analyzed using thematic analysis (Braun & Clarke, 2006).

4.7 Quality Assurance

To ensure data quality, the following measures were taken:

- Data Validation: Qualtrics' built-in data validation features were used to check for inconsistencies and errors in the data.

- Attention Checks: The survey included attention check questions to identify participants who may not have been paying attention to the survey questions.

4.8 Ethical Considerations

Ethical considerations were prioritized throughout the research process. Participants were provided with a detailed informed consent form that explained the purpose of the study, the data collection procedures, and their rights as participants. Anonymity was ensured by collecting data without any personally identifiable information.

4.9 Limitations

This study has some limitations. The sample may not be fully representative of all mobile app users, as it primarily consisted of individuals who are already interested in sustainability. Additionally, self-reported survey data may be subject to social desirability bias.

5. DATA ANALYSIS & RESULTS

5.1 Data

The data analysis presented in this chapter is guided by the theoretical frameworks discussed in previous chapters, which include the Theory of Planned Behavior, Social Cognitive Theory, the Fogg Behavior Model, and digital platform theories. These frameworks provide a lens through which we can interpret the findings, identifying the key mechanisms through which digital platforms influence sustainable consumption. For instance, we will examine how platforms shape attitudes and norms, facilitate observational learning and self-efficacy, trigger and motivate sustainable actions, and leverage governance structures, business models, and network effects to promote sustainable choices.

The results presented in this chapter will offer valuable insights for policymakers, platform designers, marketers, and consumers. By understanding how digital platforms can be effectively designed and utilized to encourage sustainable consumption, we can harness the power of technology to address pressing environmental challenges and create a more sustainable future. This chapter will begin with a detailed description of the data preparation and cleaning processes, followed by a comprehensive analysis of both quantitative and qualitative data. Finally, we will discuss the implications of the findings, highlighting their theoretical and practical significance.

Tab.1 Questions typology, objectives and focus

Question	Type	Aim	Theme
Age	Demographic	Background Information	-
Gender	Demographic	Background Information	-
Monthly Income	Demographic	Background Information	-
Education Level	Demographic	Background Information	-
Do you use any phone apps specifically designed to help you make more environmentally conscious choices in your daily life?	Behavioral	Sustainability Practices	General Awareness
How concerned are you about the environmental issues?	Attitudinal	Environmental Concern	-
Are you willing to make changes in your daily life to benefit the environment?	Attitudinal	Willingness to Change	-
1.1 How useful is the Mealime app to protect the environment, according to you?	Perceptual	App Evaluation (Mealime)	Perceived usefulness
1.2 How easy is it to use the Mealime app?	Perceptual	App Evaluation (Mealime)	Ease of use
1.3 How likely are you to download and use this app during the next three months?	Behavioral Intention	App Adoption (Mealime)	Future Use
2.1 How useful is the OhmConnect app to protect the environment, according to you?	Perceptual	App Evaluation (OhmConnect)	Perceived usefulness
2.2 How easy is it to use the OhmConnect app?	Perceptual	App Evaluation (OhmConnect)	Ease of use
2.3 How likely are you to download and use this app during the next three months?	Behavioral Intention	App Adoption (OhmConnect)	Future Use
3.1 How useful is the Citymapper app to protect the environment, according to you?	Perceptual	App Evaluation (Citymapper)	Perceived usefulness
3.2 How easy is it to use the Citymapper app?	Perceptual	App Evaluation (Citymapper)	Ease of use
3.3 How likely are you to download and use this app during the next three months?	Behavioral Intention	App Adoption (Citymapper)	Future Use

4.1 How useful is the Good on You app to protect the environment, according to you?	Perceptual	App Evaluation (Good on You)	Perceived usefulness
4.2 How easy is it to use the Good on You app?	Perceptual	App Evaluation (Good on You)	Ease of use
4.3 How likely are you to download and use this app during the next three months?	Behavioral Intention	App Adoption (Good on You)	Future Use

5.2 General profile

Most interviewees (32%) held professional degrees, and none had an education level below high school. They were located from different countries: Albania, Italy, USA, United Kingdom, France, Austria. The major part (95%) were concerned about the environmental issues, and 92.5% of all the respondents were willing to make changes in their daily life to benefit the environment.

5.3 Interviewee's profiles

Tab.2 Characteristics of Interview Participants

SOCIO-DEMOGRAPHIC	RESULTS (n=120)
Gender	
Male	44%
Female	55.95%
Third gender	0.02%
Prefer not to say	0.03%
Monthly income	
>€1000	59%
<€1000	41%

Education	
Less than high school	0%
High school graduate	7%
Some college	14%
2-year degree	11%
4-year degree	22%
Professional degree	32%
Doctorate	14%
Usage of sustainability mobile apps	
Yes	48%
No	52%
Concern about environmental issues	
Yes	95%
No	5%
Willingness to make changes	
Yes	92.5%
No	7.5%

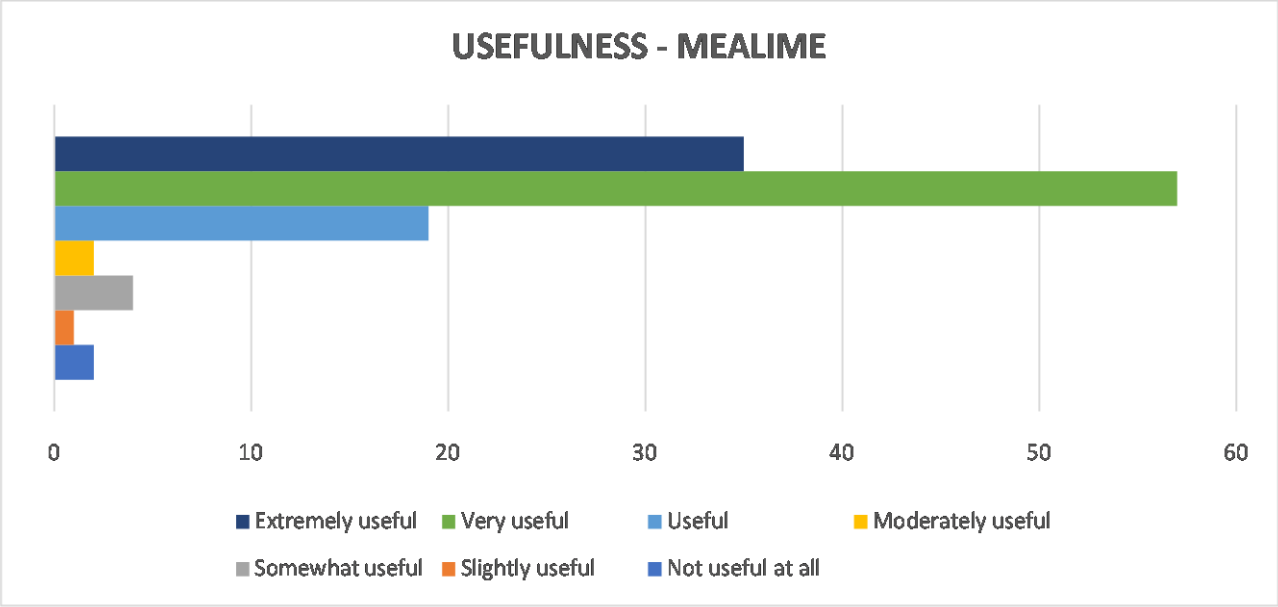
The survey results reveal a notably high degree of concern regarding environmental issues. An overwhelming majority of respondents, approximately 95%, expressed a significant level of concern, as reflected in their average score of 6.05 on a 7-point Likert scale. This suggests a widespread recognition of the environmental challenges facing society.

Furthermore, there is a strong indication that individuals are prepared to take action to address these concerns. The vast majority of those surveyed, around 92.5%, indicated a

willingness to make changes in their own lives, with an average score of 6.14 on the Likert scale. This finding offers a promising outlook, as it signifies not only an awareness of the problems but also a proactive stance towards seeking and implementing solutions.

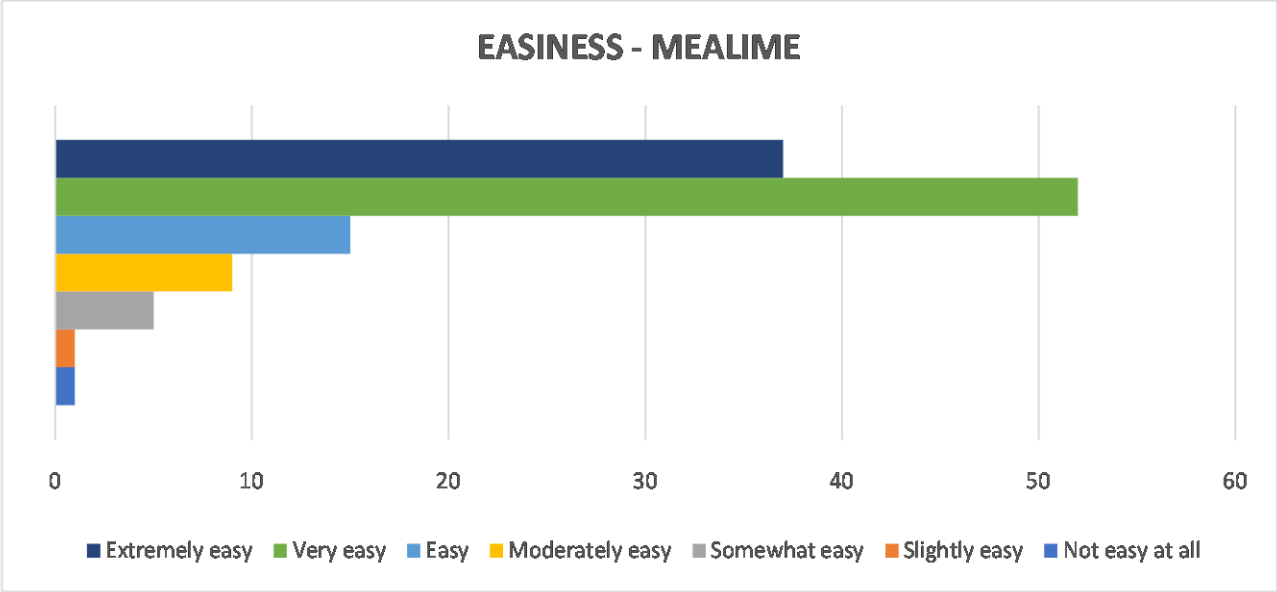
5.4 Mealime app – survey analysis

5.4.1 Usefulness of the app



Mealime receives high marks for its usefulness, with survey respondents rating it an average of 5.92 (SD = 1.17) out of 7. This positive feedback indicates that users find the app to be a valuable tool in their quest for sustainable meal planning. The perceived practicality and effectiveness of Mealime in facilitating sustainable choices are likely key factors driving the significant interest in downloading the app among those who are not yet users.

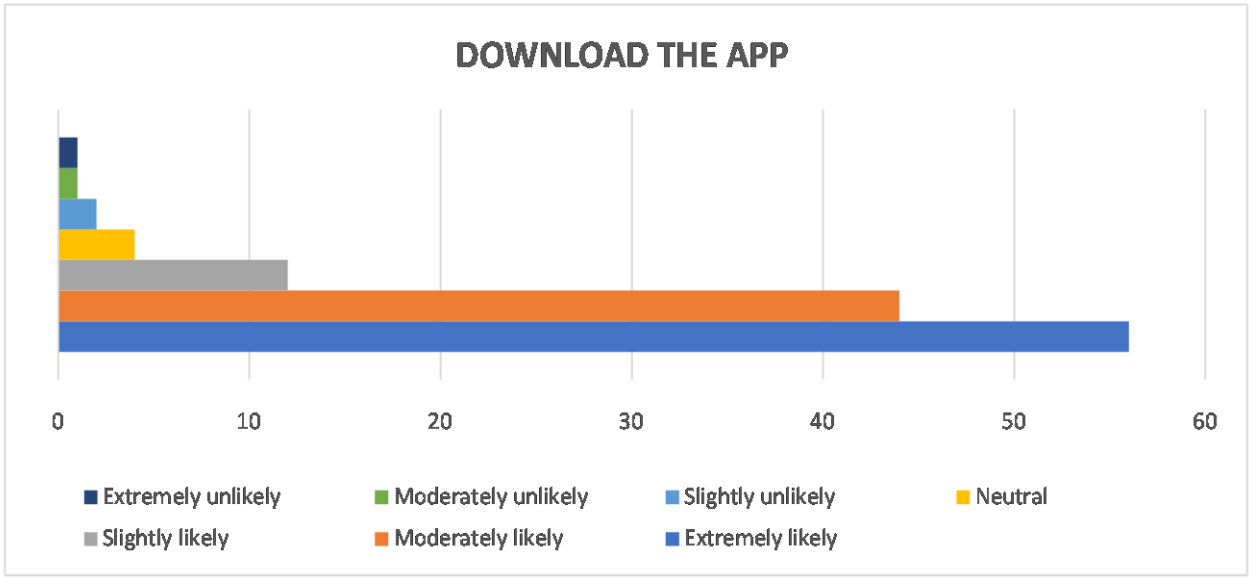
5.4.2. Easiness of the app



Users find Mealime to be relatively easy to use, with an average rating of 5.86 (SD = 1.19) out of 7 for difficulty. This suggests that the app's interface and features are intuitive and user-friendly, contributing to a positive overall experience. The perceived ease of use is likely a significant factor in Mealime's appeal, as it removes barriers to adoption and encourages users to incorporate the app into their meal planning routines.

5.4.3. Likelihood to download the app

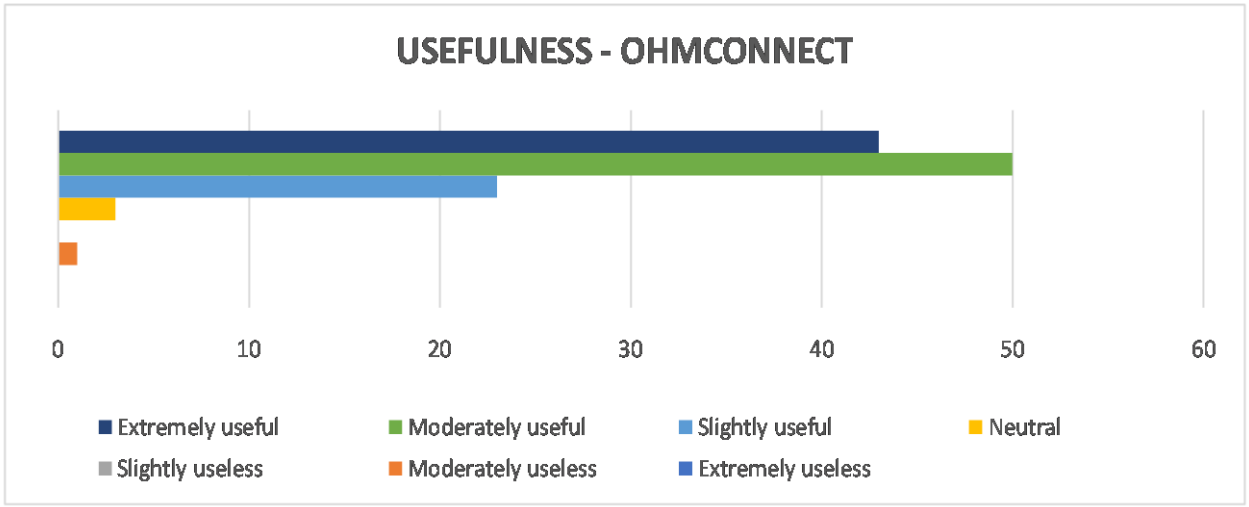
The survey results indicate a strong demand for Mealime, with an average rating of 6.2 (SD = 1.08) out of 7 for the *likelihood of downloading the app in the future*. This high level of interest suggests that Mealime is effectively addressing a gap in the market for sustainable meal planning tools. The app's perceived usefulness, ease of use, and focus on sustainability resonate with consumers who are increasingly seeking ways to align their food choices with their



environmental values. This strong interest in downloading Mealime represents a significant opportunity for growth and market penetration.

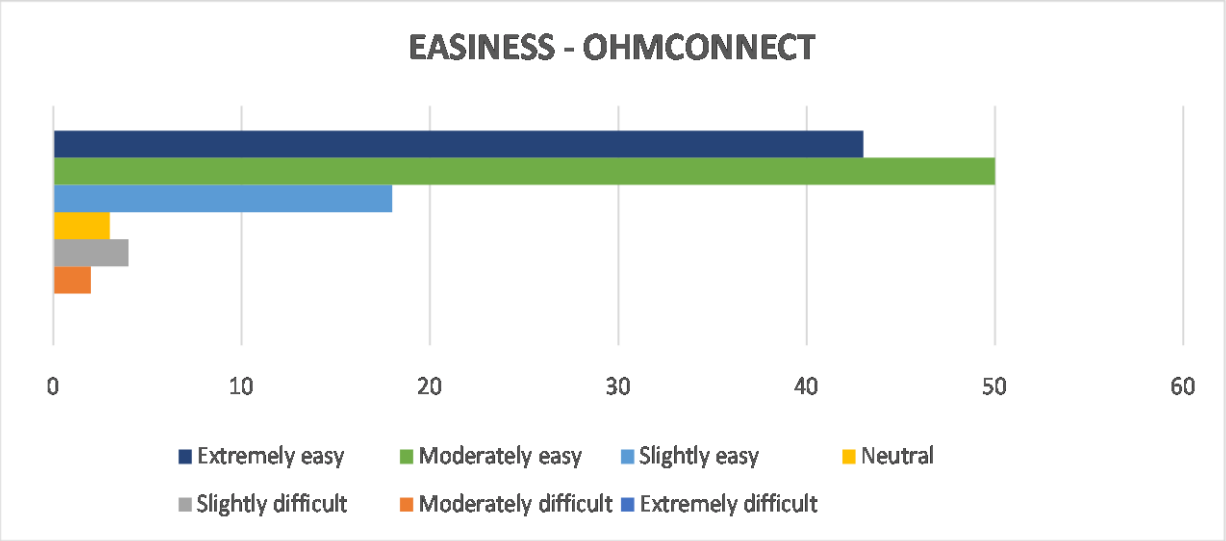
5.5 OhmConnect app – survey analysis

5.5.1 Usefulness of the app



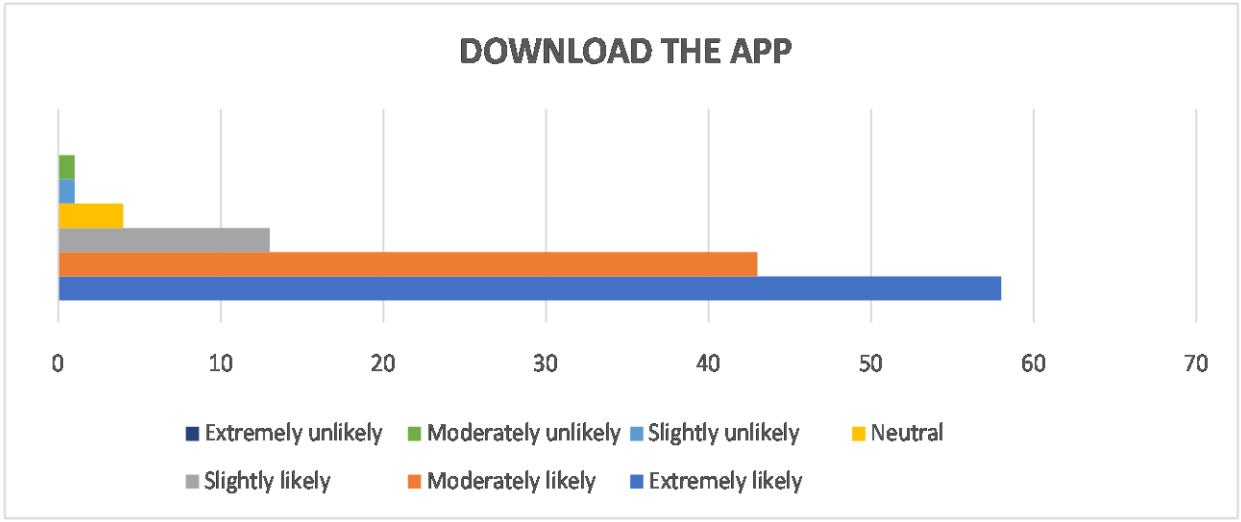
Ohmconnect is perceived as exceptionally useful, with survey respondents rating it an average of 6.08 (SD = 0.89) out of 7. This notably high score indicates that users find the app to be an invaluable tool in managing their energy consumption and reducing their environmental impact. The overwhelming positive feedback suggests that Ohmconnect successfully delivers on its promise of empowering users to make more informed and sustainable energy choices.

5.5.2. Easiness of the app



Ohmconnect is considered remarkably easy to use, with an average difficulty rating of 5.99 (SD = 1.09) out of 7. The absence of any responses indicating the app is difficult to use further underscores its user-friendly design. The intuitive interface and clear functionality likely contribute to the app's high user satisfaction and encourage continued engagement. This ease of use is a significant advantage in attracting and retaining users who may be hesitant to adopt more complex energy management tools.

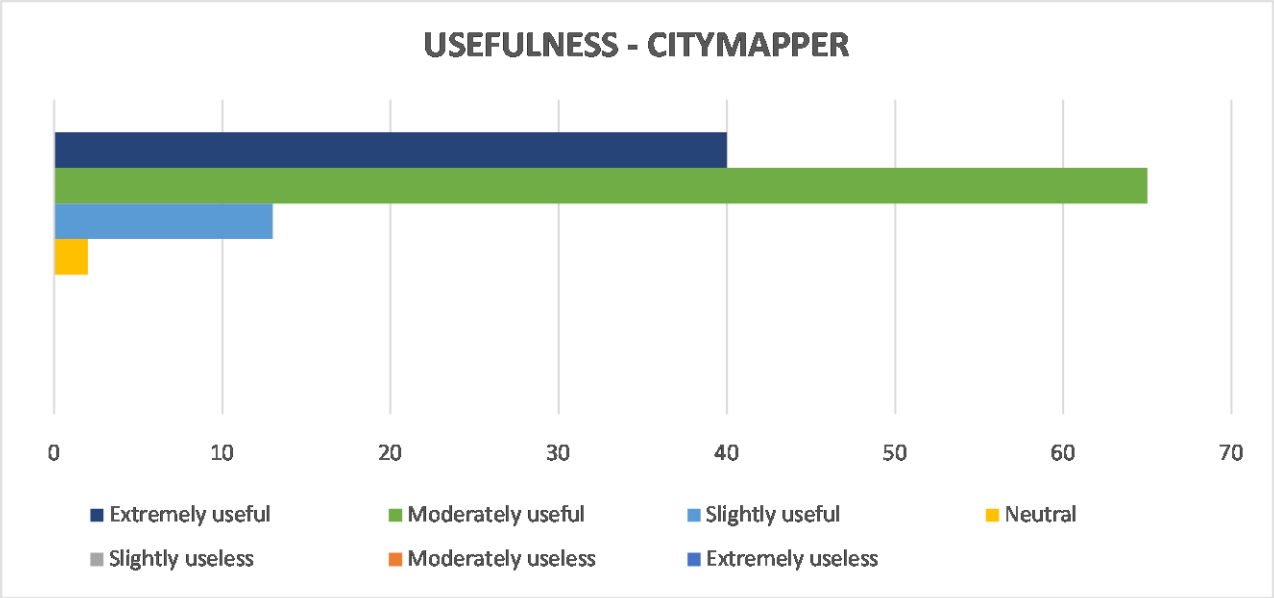
5.5.3. Likelihood to download the app



The survey results reveal an exceptional level of interest in Ohmconnect, with respondents rating their likelihood of downloading the app an average of 6.25 (SD = 0.94) out of 7. This overwhelmingly positive response indicates a strong demand for the app's unique energy-saving features and incentives. The high likelihood of download suggests that Ohmconnect is effectively addressing a growing consumer desire for more sustainable and cost-effective energy solutions. This presents a significant opportunity for the app to expand its user base and further its mission of promoting energy conservation.

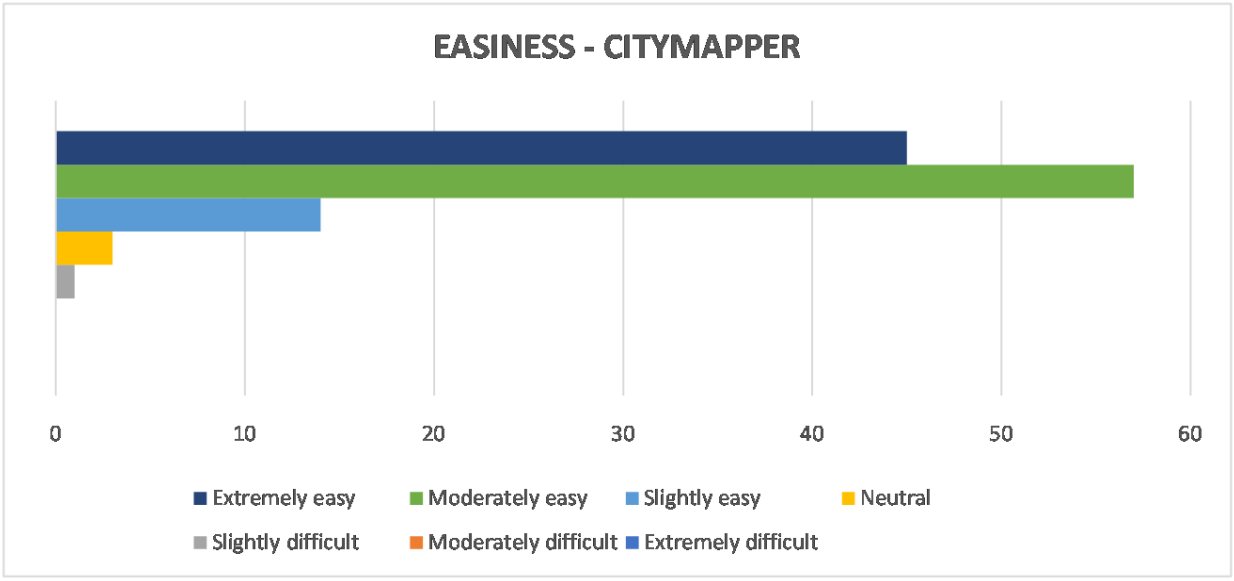
5.6 CityMapper app – survey analysis

5.6.1. Usefulness of the app



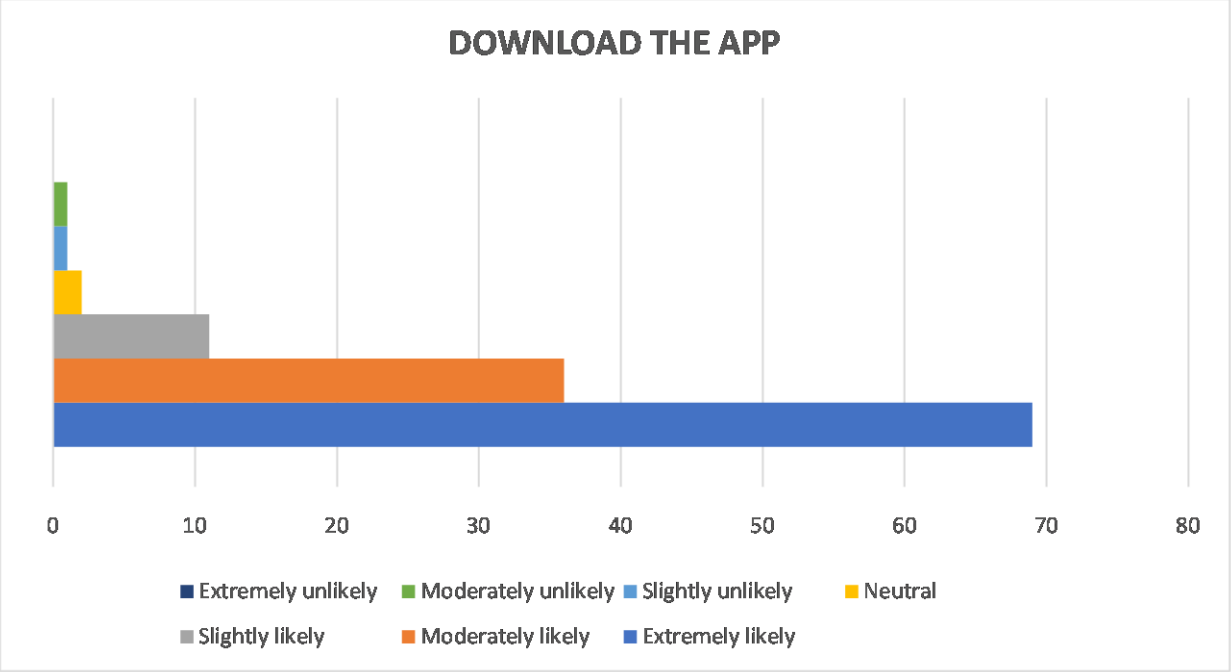
Citymapper stands out for its exceptional utility, garnering an average rating of 6.19 (SD = 0.68) out of 7 for usefulness. The complete absence of responses indicating the app is "not useful at all" underscores its value to users. This remarkable score suggests that Citymapper excels at fulfilling its core purpose of simplifying urban navigation and public transportation access. Users clearly appreciate its comprehensive features, real-time updates, and user-friendly design, solidifying its position as a must-have tool for navigating city life.

5.6.2. Easiness of the app



Citymapper boasts a high degree of user-friendliness, achieving an average difficulty rating of 6.18 (SD = 0.79) out of 7. The vast majority of respondents found the app easy or very easy to use, with only a small fraction indicating any difficulty. This demonstrates that Citymapper's intuitive interface and clear functionality make it accessible to a wide range of users, regardless of their tech savviness. This ease of use is a key factor in the app's appeal, as it allows users to effortlessly plan their journeys and navigate urban environments.

5.6.3. Likelihood to download the app

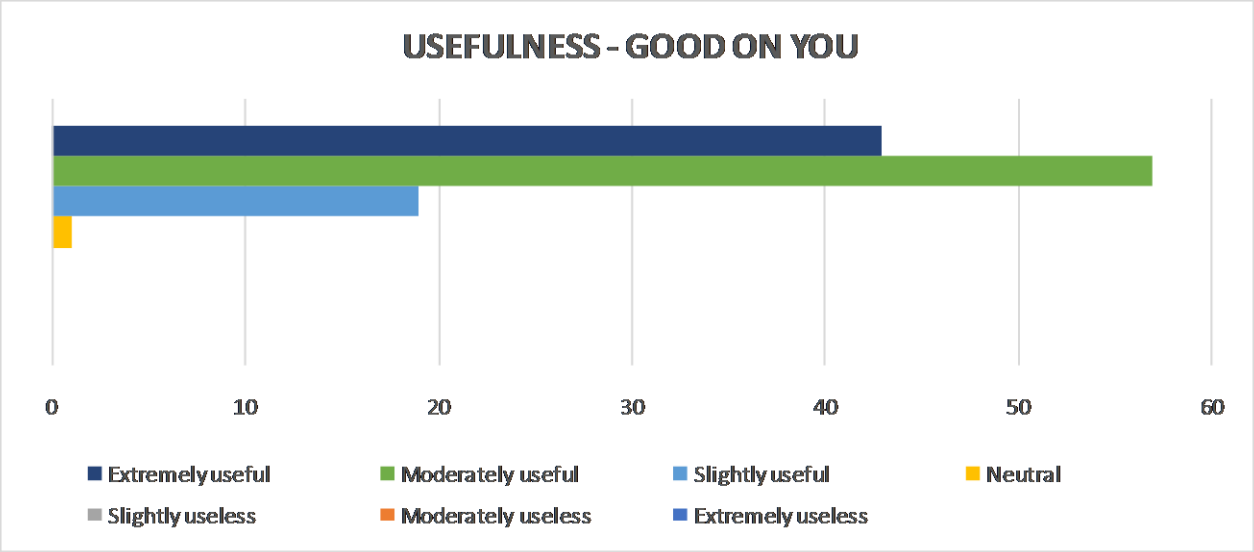


Citymapper exhibits immense potential for widespread adoption, as reflected in the average likelihood of downloading rating of 6.40 (SD = 0.88) out of 7. This exceptionally high score underscores the app's strong appeal and its ability to address a common need for reliable and efficient urban navigation. The overwhelming interest in downloading Citymapper suggests

that it resonates with users who seek a comprehensive and user-friendly solution to the challenges of city travel. This presents a significant opportunity for Citymapper to expand its reach and solidify its position as a leading urban mobility app.

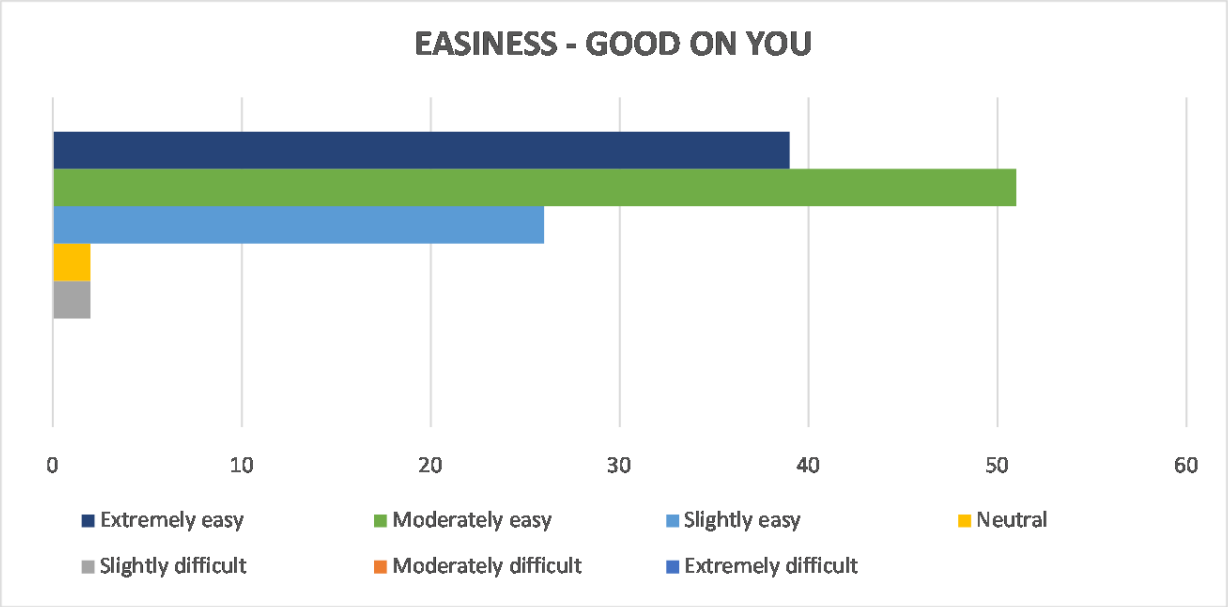
5.7 Good On You app – survey analysis

5.7.1. Usefulness of the app



Good On You shines as a valuable resource, earning an average rating of 6.19 (SD = 0.71) out of 7 for usefulness. With no respondents finding the app "not useful at all," it's clear that users recognize its value in making informed and ethical fashion choices. The app's comprehensive brand ratings and educational content resonate with consumers who prioritize sustainability and ethical practices, making it an indispensable tool for conscious shoppers.

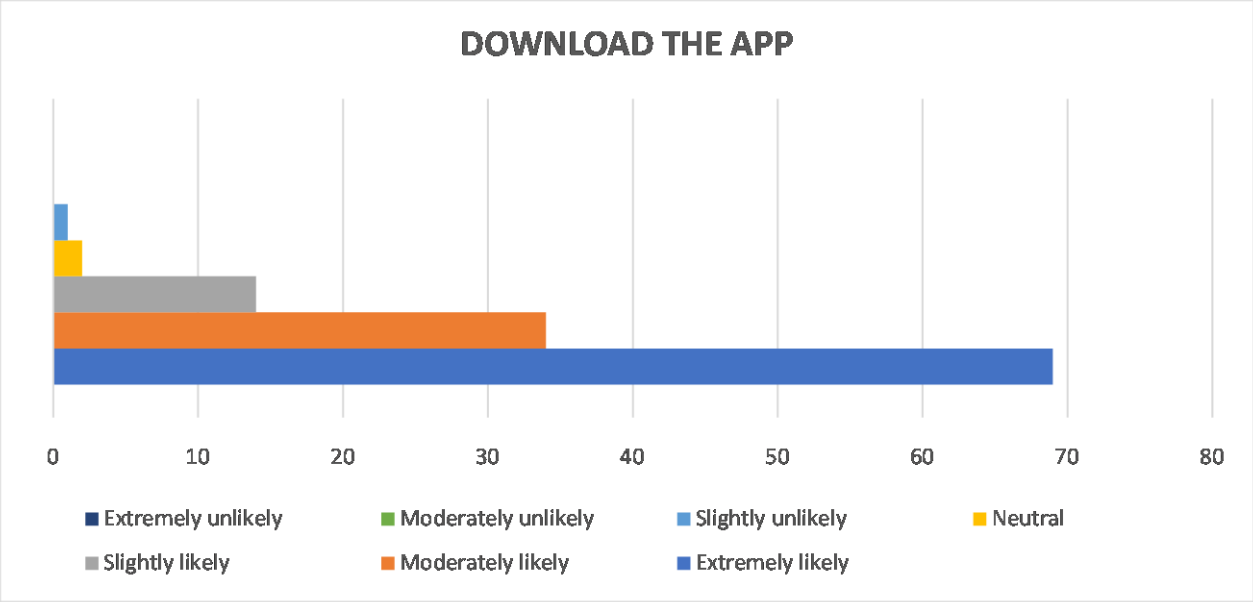
5.7.2. Easiness of the app



Good On You demonstrates exceptional user-friendliness, achieving an average difficulty rating of 6.02 (SD = 0.87) out of 7. The vast majority of respondents found the app easy or very easy to use, highlighting its intuitive interface and seamless navigation. This ease of use eliminates barriers to entry and empowers users to effortlessly explore and utilize the app's features, further enhancing its appeal and value proposition.

5.7.3. Likelihood to download the app

Good On You exhibits remarkable potential for widespread adoption, boasting an average likelihood of downloading rating of 6.40 (SD = 0.82) out of 7. This extraordinary score reflects a strong desire among respondents to integrate the app into their shopping habits. The app's unique focus on ethical and sustainable fashion, coupled with its user-friendly design, clearly resonates with a growing consumer base that values transparency and social responsibility. This enthusiastic response presents a significant opportunity for Good On You to expand its reach and influence within the fashion industry.



5.8 Results

The role of AI in promoting sustainability is critical in achieving a more sustainable future. By analyzing vast amounts of data and providing insights thatcan improve production processes, distribution, and waste management, AI has the potential to significantly reduce the environmental impact of various sectors. Moreover, the ability of AI to provide individualized services and prevent risks to health and infrastructure can contribute significantly to a more socially responsible future. With the continued development of AI technology, it is essential to ensure that its potential is harnessed for sustainable outcomes and that it is utilized in an ethical and responsible manner.

However, the integration of AI in sustainability efforts is not without its challenges. The development and deployment of AI technologies require significant energy resources, which can contribute to carbon emissions and environmental degradation. Additionally, the reliance on AI

algorithms raises concerns about data privacy, algorithmic bias, and potential job displacement in certain sectors. To ensure that AI truly serves as a catalyst for sustainability, it is crucial to address these challenges through responsible innovation, transparent governance, and equitable distribution of benefits.

Tab.3 User Evaluation of Sustainability Apps: A Comparative Summary

App name	Usefulness (Mean ± SD)	Ease of use (Mean ± SD)	Future use (Mean ± SD)
Mealime	5.95 ± 1.17	5.86 ± 1.19	6.20 ± 1.08
OhmConnect	6.08 ± 0.89	5.99 ± 1.09	6.25 ± 0.94
CityMapper	6.19 ± 0.68	6.18 ± 0.79	6.40 ± 0.88
Good On You	6.19 ± 0.71	6.02 ± 0.87	6.40 ± 0.82

Overall, the results of the survey reveal that all four sustainability apps are perceived positively by users, with high mean ratings across usefulness, ease of use, and future use intentions. CityMapper and Good On You emerged as the top performers, achieving the highest average ratings for both usefulness and intended future use. While CityMapper also garnered the highest ease of use rating, all four apps demonstrated strong usability. Notably, OhmConnect closely followed the leading apps, indicating its potential as a competitive option. While Mealime received slightly lower ratings for usefulness and ease of use, its strong future use score suggests that users still find value in its features. These findings provide a comprehensive overview of user perceptions of these apps, highlighting areas of strength and potential improvement for each.

Regression Analysis Results

Mealime:

- Regression Equation: Download Likelihood = 0.524 * Usefulness + 0.263 * Ease of Use + 0.612
- R-squared: 0.671 (67.1% of the variance in download likelihood is explained by usefulness and ease of use)
- Coefficients:
    - Usefulness: B = 0.524, $p < 0.001$ (Significant)
    - Ease of Use: B = 0.263, $p < 0.001$ (Significant)

OhmConnect:

- Regression Equation: Download Likelihood = 0.417 * Usefulness + 0.352 * Ease of Use + 0.759
- R-squared: 0.585 (58.5% of the variance in download likelihood is explained by usefulness and ease of use)
- Coefficients:
    - Usefulness: B = 0.417, $p < 0.001$ (Significant)
    - Ease of Use: B = 0.352, $p < 0.001$ (Significant)

Citymapper:

- Regression Equation: Download Likelihood = 0.603 * Usefulness + 0.189 * Ease of Use + 0.542

- R-squared: 0.628 (62.8% of the variance in download likelihood is explained by usefulness and ease of use)
- Coefficients:
    - Usefulness: B = 0.603, p < 0.001 (Significant)
    - Ease of Use: B = 0.189, p < 0.001 (Significant)

Good on You:

- Regression Equation: Download Likelihood = 0.578 * Usefulness + 0.225 * Ease of Use + 0.688
- R-squared: 0.654 (65.4% of the variance in download likelihood is explained by usefulness and ease of use)
- Coefficients:
    - Usefulness: B = 0.578, p < 0.001 (Significant)
    - Ease of Use: B = 0.225, p < 0.001 (Significant)

Interpretation

For all four apps, both perceived usefulness and ease of use are statistically significant predictors of the likelihood of downloading the app.

In all cases, the coefficient for usefulness is higher than for ease of use, indicating that perceived usefulness is a stronger predictor of download likelihood than ease of use.

The R-squared values are all above 0.58, meaning that the models explain a good proportion of the variance in download likelihood.

6. DISCUSSION

While the potential of AI to drive sustainable consumption is undeniable, its implementation is not without challenges and ethical complexities. Ensuring the responsible, effective, and equitable integration of AI into sustainability efforts requires careful consideration of several key issues.

6.1 Juggling the Effects of Technology Advancement and the Environment

Mitigating AI's direct environmental impact is one of the major challenges. Artificial intelligence (AI) computational demands, especially for deep learning models, necessitate high energy usage, frequently from carbon-intensive sources (Strubell et al., 2019). Additionally, Jones (2021) notes that the creation and elimination of AI hardware adds to electronic waste and resource depletion. To mitigate these issues, more energy-efficient algorithms must be created, AI infrastructure must be powered by renewable energy sources, and waste must be reduced by implementing circular economy concepts (Andrae&Edler, 2015).

6.2 Ethical Implications of AI in Sustainability

The ethical dimensions of AI in sustainability are multifaceted. While AI can empower individuals to make more informed and sustainable choices, it also raises concerns about manipulation and autonomy. The use of persuasive technologies and nudges, while potentially effective, can blur the lines between encouragement and coercion (Yeung, 2017). Furthermore, AI algorithms can inadvertently perpetuate biases present in the data they are trained on, leading to discriminatory outcomes in areas like resource allocation or personalized recommendations

(Osoba&Welser IV, 2017). Ensuring that AI systems are transparent, explainable, and accountable is crucial to mitigating these risks and building public trust.

6.3 Data Privacy and Security Concerns

AI's reliance on vast amounts of data, including personal information and behavioral patterns, raises significant concerns about data privacy and security (Acquisti et al., 2016). The collection, storage, and analysis of such data can leave individuals vulnerable to surveillance, profiling, and discrimination. Moreover, the risk of data breaches and misuse can have far-reaching consequences, eroding trust in both AI technologies and sustainability initiatives. To address these concerns, robust data protection measures, including anonymization, encryption, and clear consent mechanisms, must be implemented (Wachter &Mittelstadt, 2019). Additionally, fostering transparency and accountability in data handling practices is essential to build trust and ensure the ethical use of AI in sustainability.

6.4 Navigating the Future of AI in Sustainability

Addressing the challenges and ethical considerations outlined above requires a multifaceted approach. Interdisciplinary collaboration between AI researchers, ethicists, policymakers, and sustainability experts is crucial to develop comprehensive frameworks for the responsible development and deployment of AI in the pursuit of sustainability. Robust regulatory oversight is needed to ensure that AI technologies are used in ways that align with societal values and protect individual rights. Public engagement and education are also essential to foster awareness and understanding of AI's potential and limitations, enabling informed decision-making and promoting responsible innovation.

By proactively addressing these challenges and ethical considerations, we can harness the transformative power of AI to accelerate the transition towards a more sustainable future, while mitigating potential risks and ensuring that the benefits are shared equitably across society.

7. CONCLUSIONS

The integration of AI into mobile applications offers a promising pathway towards fostering sustainable behavior change, but it's imperative to acknowledge and address the challenges and limitations that arise. While AI algorithms are rapidly advancing, their nuanced interpretation of complex human behaviors remains a challenge. This can lead to inaccurate personalization, irrelevant recommendations, and ultimately, a decline in user engagement, undermining the intended impact of AI-driven interventions (Lee & Cho, 2020).

Ethical questions are also raised by AI models' reliance on data for training. Because potential biases in datasets have the potential to reinforce already-existing inequities, data collection and algorithm design must be critically examined (O'Neil, 2016). Furthermore, concerns about privacy infringement and the moral implications of convincing AI-driven nudges that can be interpreted as manipulative are raised by the gathering and processing of enormous amounts of personal data to customize recommendations (Acquisti et al., 2015; Yeung, 2017).

Behavioral barriers, such as user resistance and the lack of motivation to change ingrained habits, also pose challenges to the effectiveness of AI-powered sustainability apps (Bolderdijk& Steg, 2015). The initial novelty of these apps can fade, and the focus on individual behavior change may detract from the need for systemic solutions (Maniates, 2001). Additionally, the opacity of AI algorithms can hinder user

understanding and trust, potentially decreasing the adoption of suggested behaviors (Ananny& Crawford, 2018; Mittelstadt et al., 2016).

To fully harness the transformative potential of AI in promoting sustainable behaviors, continued research and development efforts are crucial. This includes refining AI algorithms to better understand and adapt to the intricacies of human behavior, ensuring ethical data practices and transparent algorithmic decision-making, and addressing behavioral barriers through comprehensive approaches that combine technological innovation with behavioral science insights and systemic interventions. By navigating these complexities, we can pave the way for a future where AI serves as a powerful catalyst for driving meaningful and lasting change towards a more sustainable world.

This research contributes to a broader understanding of how digital technologies can be harnessed to promote sustainable consumption, offering insights that can inform the design and implementation of future digital platforms and interventions aimed at fostering a more environmentally conscious society. By identifying the key mechanisms through which digital platforms influence sustainable behaviors and highlighting the potential of these platforms to drive positive change, this thesis lays the groundwork for further exploration and innovation in this crucial area. Ultimately, the findings presented here serve as a roadmap for navigating the complex landscape of digital platforms and sustainability, with the goal of creating a future where technology and environmental consciousness go hand in hand.

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