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Faculty of Business Economics

Master of Management

Master's thesis

Is GenZ really that different? Evaluations of Mobile Service Offers: And what can we learn from that?

Thao Chi Thai

Thesis presented in fulfillment of the requirements for the degree of Master of Management, specialization International Marketing Strategy

SUPERVISOR :
Prof. dr. Allard VAN RIEL

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ABSTRACT

Customers evaluate services based on dimensions that vary according to the specific industry, type of services, and expectations. Born into a fully-fledged technological world, Generation Z displays unique characteristics and expectations regarding adopting and using technology. This research, hence, discovers the evaluation dimensions that Generation Z uses when adopting super apps, drawing on the characteristics of super apps and the usage behaviors of Generation Z. The identified dimensions include multi-service offerings, consistent transactions, integrated user interface/experience, social benefits, and social influence. These dimensions are crucial drivers of super app usage and adoption mediated through perceived convenience and connection. User satisfaction is also an influential factor in Generation Z's adoption decision, driven by convenience and connection. Interestingly, perceived risks do not affect Generation Z's intention to adopt super apps. However, these risks should be managed as hygiene factors to ensure a secure app environment. Additionally, the research highlights generational differences in evaluating super app adoption. Generation X values the convenience super apps provide, but it is not the primary driver of their adoption. In contrast, younger generations - Y and Z, demand more than convenience. For these younger demographics, social influence, integration, and engagement are crucial for attracting and retaining them within the apps. The findings offer insights for app providers on how to enhance app design to meet the expectations of Generation Z and tailor it to the varying expectations of different user demographics.

Keywords: *Gen Z, super apps, evaluation dimensions, generational differences, perceived risks, user satisfaction, perceived convenience, perceived connection, user satisfaction*

STATEMENT OF AUTHORSHIP

I confirm that this is my graduation thesis, under the instruction and supervision of Pr. Dr. Allard Van Riel. Except where reference is made in the thesis text, contains no material published elsewhere or extracted in whole or in part from a thesis I have qualified for or been awarded another degree or diploma.

No other person's work has been used without acknowledgment in the view. This master's thesis has not been submitted for any degree or diploma award in any other tertiary institution.

Thai Thao Chi

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I want to acknowledge the assistance of ChatGPT in structuring and improving the fluency of the sentences and paragraphs within this thesis. However, it is essential to note that the ideas and knowledge presented herein are entirely the result of my research efforts.

Despite my diligent efforts to conduct this research, I acknowledge that this thesis may have some shortcomings due to my limited knowledge and resources. Therefore, I welcome feedback and reviews from lecturers and readers to enhance the quality of this research further.

Thai Thao Chi

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LIST OF ABBREVIATIONS

Number	Abbreviation	Full word/phrase
1	AVE	Average Variance Extracted
2	CA	Cronbach's Alpha
3	CR	Composite Reliability
4	CTA-PLS	Confirmatory Tetrad Analysis
5	DOI	Diffusion of Innovation Theory
6	ECM	Expectation Confirmation Model
7	FOLO	Fear of Living Offline
8	FOMO	Fear of Missing Out
9	GDPR	General Data Protection Regulation
10	Gen X	Generation X
11	Gen Y	Generation Y
12	Gen Z	Generation Z
13	HSD	Honest Significant Difference
14	HTMT	Heterotrait-Monotrait
15	IS	Information Systems
16	ITA	Adoption and usage of super apps
17	M	Multi-service
18	MGA	Multi-Group Analysis
19	MICOM	Measurement Invariance of Composite Models
20	NPT	Nonparametric Test
21	PC	Perceived Convenience
22	PC	Perceived Connection
23	PER	Personalization
24	PLS	Partial Least Squares
25	PR	Perceived Risks
26	RQ	Research question
27	SA	Satisfaction
28	SB	Social Benefits
29	SEM	Structural Equation Modeling
30	SEM-PLS	Structural Equation Modeling-Partial Least Squares
31	SI	Social Influence
32	Super app	Super application
33	T	Consistent Transaction
34	TAM	Technology Acceptance Model
35	TPB	Theory of Planned Behavior
36	TRA	Theory of Reasoned Action
37	U	Integrated UI/UX
38	UI	User Interface
39	UTAUT	Unified Theory of Acceptance and Use of Technology
40	UX	User Experience
41	VIF	Variance Inflation Factor

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CHAPTER 1: INTRODUCTION TO THE RESEARCH TOPIC

Chapter 1 provides an overview of the research, including an introduction to the research work, the rationale, motivation, problem statement, and the proposed research agenda. This chapter also outlines the research contributions to the academic and business fields.

1.1. Introduction

It has become prevalent for companies in any sector to offer their services in a mobile format. Mobile applications (apps) are now pivotal personal assistants, enabling users to communicate, transport, shop, and finance within just a few touches. The penetration of these applications into everyday life has fundamentally transformed the interaction with the world. Notably, the COVID-19 epidemic has intensified the use of mobile apps further (Suryadi et al., 2021), resulting in the mobile app market becoming highly profitable yet fiercely competitive. As a result, mobile service providers are challenged to differentiate themselves among a myriad of mobile app solutions. To gain a competitive edge, it is crucial for service providers to understand users' expectations and adapt their offerings to specific customer segments.

Generation Z (Gen Z), or digital natives (Prensky, 2001), stands out as the vanguard of mobile users. They represent the mobile-first demographic, displaying an exceptional mobile adoption rate of 99% (Ahmed, 2019), spending half of their hours awake on screen time (Faughnder, 2022). Unlike previous generations, they have come of age in the digital world where Internet connections and smartphones are continuously accessible (Seemiller & Grace, 2017). Hence, this generation has been raised with the ease and novelty of technology to manage their daily life over the screen. This poses the question of whether Gen Z possesses distinct expectations and requirements regarding technology compared to previous generations (Generation X - Gen X and Generation Y – Gen Y) and how firms may effectively identify and accommodate these disparities.

Furthermore, it is worth noting that Gen Z experiences distinct economic settings and lifestyles in different geographical regions. These disparities can lead to region-specific demands for technology and services (Khan, 2022). In Asian cultures, where time is frequently equated with monetary value, there is a strong preference for rapid and efficient solutions that provide ease of use with little effort (Mustaffa, 2023). This cultural value has contributed to the emergence of new app technology in Asia, particularly the Southeast Asia region - "super app." Unlike single-purposed apps, super apps combine multiple service offerings such as messaging, social media, digital payment, and shopping into a single platform. Super apps are devised as an ecosystem that facilitates convenience and efficiency, makes users' lives easier, and matches the needs of the Asian market. The global super app market is projected to reach $722.4 billion at a growth rate of 28.9% by 2032 (Allied Market Research, 2023). Leading this growth is the Asia-Pacific region, holding the dominant market share (Allied Market Research, 2023). This presents a promising opportunity for businesses to expand their offerings by capitalizing on this disruptive trend. While super apps have become a digital norm in Asian countries, exemplified by platforms such as WeChat in China, Grab and Shopee in Southeast Asia, they have yet to gain a place in the Western world given the cultural underpinnings, regulatory environments, and privacy concerns (Pearce et al., 2022). As a vivid example, Uber maintains separate applications for car-hailing and food delivery (Uber Eats), reflecting Western consumers' preference for specialized platforms. While the convenience of one-stop applications is appealing in Asian cultures characterized by the mobile-first population, Western consumers have historically favored specialized web-based platforms such as Facebook for messaging and Amazon for e-commerce since the early days of Internet adoption. Mobile applications only emerged later as supplementary tools to these websites. Furthermore, the regulations around data privacy and competition, such as the General Data Protection Regulation (GDPR) in Europe and various antitrust laws in the United States, also hinder the deployment of a one-fit-all app.

This further necessitates exploring the expectations and requirements for mobile apps in different cultural, economic, and regulatory contexts. This research is set against the backdrop of Vietnam's dynamic digital landscape and growing young population to explore the set of evaluation dimensions of Gen Z regarding adopting super apps. The potential findings can be generalized to service providers looking to enhance their app design, launch, or expand their offerings in similar cultural and economic settings.

1.2. Research Motivation

1.2.1. Business Economic Motivation

Mobile services are now commonplace; businesses are no longer debating whether or not to operate via an app but how promptly they can capitalize on and delight app users (Na, 2011). *The primary challenge* for mobile service providers in an increasingly saturated and competitive market is convincing users of the app's value and integrating it into their daily routines. Defining the dimensions by which users evaluate mobile apps and how these influence their adoption, use, and continued use is imperative for businesses to stand out and stay competitive with their mobile services design. The rise of super apps offers businesses opportunities to expand service offerings and generate additional revenue streams. However, the challenge intensifies for app platforms with multiple services to effectively and comprehensively communicate their full range of offerings and value constellation to users. However, there is limited knowledge of how users perceive this app concept, which specific characteristics of this app technology drive their adoption over single-use apps, and what concerns are associated with this new offering.

Another significant challenge is responding to the potential differences between customer segments. To compare the adoption of technologies between two or more consumer groups, age is considered the most widely used demographic variable (Burton-Jones & Hubona, 2006; Morris & Venkatesh, 2000), particularly generational differences, which is an informative age-related factor. There is a need to elaborate on Gen Z because they are the most influential and, for now, the fastest-growing customer segment in the mobile services industry. As a born-digital generation, Gen Z has the highest adoption rate of mobile apps among age groups (Sözer, 2019). They are expanding rapidly and taking over 23% of the worldwide population to soon become the most significant cohort of consumers with rising purchasing power (GfK, 2023). Moreover, Gen Z is a dynamic and demanding segment; their views and behaviors drastically force businesses to enter unearthed areas (EY, 2023). Thus, it is insightful to identify the expectations of this generation, particularly to determine if there are differences in how they perceive and evaluate mobile applications. This study, hence, aims to address the identified gaps and provide app developers and marketers with insights into strategically developing their super apps offering:

Firstly, this study identifies evaluation dimensions that Gen Z utilizes to assess super apps. This will provide actionable insights into capturing and catering to the needs of Gen Z.

Secondly, this study informs businesses of the potential differences among generational groups. This provides valuable insights for strategizing app design to meet the expectations and preferences of each generation.

1.2.2. Academic Motivation

An extensive body of research has explored the use and adoption of mobile applications across various industries and sectors, such as entertainment, mobile banking, health services, and tourism. However, there is limited knowledge of multi-purpose platforms, especially the drivers of super apps usage and adoption in Gen Z. Super apps function as an ecosystem of multiple services under one umbrella, possessing distinctive characteristics compared to single-purpose apps and presenting a more complex technology to study. Technology acceptance models, which include dimensions such as perceived usefulness and ease of use, provide a general assessment of adoption intention. However, these models are inadequate for evaluating sophisticated technology as super apps. Thus, it is imperative to explore more specific dimensions for studying super apps and trait-based constructs for understanding Gen Z, given their dynamic characteristics and technology exposure. Despite this need, existing research predominantly extends technology acceptance models rather than developing respective models. For instance, Sözer (2019) extends the Technology Acceptance Model (TAM) with perceived security, privacy, design, ubiquity, and compatibility. Many studies have extended the Unified Theory of Acceptance and Use of Technology (UTAUT) with common constructs such as perceived risks (Axcell & Ellis, 2023; Hapsari et al., 2023; M. P. Nguyen et al., 2023; Nur & Panggabean, 2021; Wei et al., 2021; Wissal et al., 2021), perceived security, safety (M. P. Nguyen et al., 2023; Nguyen, 2023), trust (Alfa'izy et al., 2023; Nguyen et al., 2022), or promotional activities (Lisana, 2024; Wei et al., 2021).

Therefore, *the first research gap* highlights the necessity for developing evaluation dimensions to understand how super apps' characteristics correspond to the desired expectations and demands of Gen Z. Furthermore, most studies consider age as a moderating factor or focus specifically on a particular generation. However, it is also essential to compare differences among generational groups to explore whether there are variations in mobile service adoption across these groups. For example, Ruangkanjanases and Wongprasopchai (2021) studied the adoption of mobile banking apps in Thailand and found differences between Gen Y and Gen Z. The study used multiple regression analysis separately for each generation, revealing that compatibility, self-efficacy, and perceived usefulness were significant factors for both generations. At the same time, social influence was only significant for Gen Z. Williams (2021) conducted a multiple-group analysis to compare the behavioral intention to use social commerce between Gen X and Gen Y, finding that convenience was non-significant for Gen Y. Hence, *the second research gap* is that these studies typically compare only two groups, necessitating a more holistic view studying the differences across three generations—Gen X, Y, and Z—and the magnitude of these differences. Therefore, this research will address the identified gaps as follows:

Firstly, the research aims to define a set of trait-based dimensions matching the characteristics of super apps and the mobile application usage and behavior of Gen Z. These dimensions will be empirically validated to determine the specific evaluation criteria that Gen Z employs when considering their intention to use such applications.

Secondly, this research will compare the differences between Gen Z and the two previous generations (Gen X and Gen Y) regarding the identified app dimensions using the Multi-group Analysis approach. This comparison will help to understand the differences in consumer group assessments and the magnitude of these differences, providing a comprehensive view of how each generation evaluates and adopts super apps.

1.3. Problem Statement

Customers evaluate services based on dimensions that vary according to the specific industry, type of service, expectations, and segments. Gen Z, born in a fully-fledged technological world, would possess distinctive characteristics, attitudes, and behaviors in using and adopting technology. Hence, the primary objective of this research is to develop trait-based evaluation dimensions used by Gen Z in assessing super apps and to analyze the impact of these dimensions on their intention to use and adopt. Specifically, the dimensions are developed from the characteristics of super apps and Gen Z's usage behaviors. The secondary objective is to identify and compare the generational differences among Gen X, Y, and Z in evaluating and adopting super apps. This study aims to derive significant academic and business insights by addressing these research questions. The findings will provide actionable recommendations for super app providers and marketers to enhance and tailor the app design to the expectations of different generation demographics. To accomplish the objectives mentioned above, the author aims to address the following research questions:

- Research Question 1 (RQ1): What are the mobile application dimensions that correspond to the traits of Gen Z?
    - Sub-question 1: How does Gen Z perceive these dimensions?
    - Sub-question 2: How do these mobile application dimensions and perceptions affect their intention to adopt and continue using the app?
- Research Question 2 (RQ2): Are these trait-based mobile application dimensions and perceptions also relevant for Gen X and Y, or are they unique to Gen Z?

1.4. Research procedure and methodology

The research will follow a 7-step procedure utilizing quantitative research methods. This includes a questionnaire survey built from a conceptual framework and empirical tests using Structural Equation Modeling-Partial Least Squares (SEM-PLS) and Multi-group Analysis (MGA) to achieve academic and business objectives. Initially, a comprehensive examination of the existing literature on technology acceptance models, mobile application adoption, characteristics of super apps, and the profile of Gen Z will be undertaken. These aspects will be deeply examined to identify potential dimensions and construct a conceptual framework. Subsequently, a questionnaire survey will be administered to collect data from super app users in Vietnam. The gathered survey data will be subjected to empirical testing to determine the significance of these dimensions on Gen Z's intention to use the app and the potential generational differences. Finally, the results will be discussed and compared with previous literature to derive academic implications and findings. This research also provides actionable insights that can guide service providers in developing and improving mobile service applications. **Table 1.1** outlines the end-to-end research procedure.

Table 1.1. Procedure for conducting research

<table>
<tr><th colspan="6">Step 1: Review general technology acceptance and mobile app adoption dimensions.</th></tr>
<tr><td colspan="2">Identify key super app dimensions.</td><td colspan="2">Literature review on the technology acceptance model.</td><td colspan="2">Literature review on mobile application and super apps adoption.</td></tr>
<tr><th colspan="6">Step 2: Identify Gen Z usage behaviors and characteristics</th></tr>
<tr><td colspan="3">Literature review on mobile application and super app adoption of Gen Z.</td><td colspan="3">Review consumer market research and reports about Gen Z consumer characteristics.</td></tr>
<tr><th colspan="6">Step 3: Identify the desired app dimensions of Gen Z users.</th></tr>
<tr><td colspan="6">(I) Trait-based app dimensions: Translate Gen Z usage behaviors and super app characteristics into corresponding app dimensions.</td></tr>
<tr><td colspan="6">(II) User perceptions: Identify Gen Z users’ perceptions regarding the app dimensions.</td></tr>
<tr><td colspan="6">(III) Conceptual framework: Design the framework based on trait-based app dimensions and user perceptions to hypothesize their influences on the intention to use and adopt super app.</td></tr>
<tr><th colspan="6">Step 4: Collect the data</th></tr>
<tr><td colspan="6">A questionnaire survey is utilized to collect data from the users of super app in defined settings.</td></tr>
<tr><th colspan="6">Step 5: Validate the identified app dimensions and user perception.</th></tr>
<tr><td colspan="3">(I) Gen Z Analysis
Empirically test the identified app dimensions and user perceptions to conclude the significant ones using SEM-PLS.</td><td colspan="3">(II) Multi-group Analysis (Gen X, Y, Z)
Empirically compare the identified app dimensions and user perceptions across generations using Bootstrap MGA.</td></tr>
<tr><th colspan="6">Step 6: Finalize evaluation dimensions.</th></tr>
<tr><td colspan="6">The statistically significant constructs will be included in the final evaluation framework.</td></tr>
<tr><th colspan="6">Step 7: Implications and recommendations</th></tr>
<tr><td colspan="6">Based on the findings, provide academic implications and actionable recommendations for super app providers and marketers to improve and adapt their service strategies.</td></tr>
</table>

Source: *Self-derived data.*

With the research procedure as proposed, the author presents this topic through a six-chapter thesis with the respective chapters as follows:

Chapter 1: An introduction to the research topic.

Chapter 2: Concepts, related theories, and literature review.

Chapter 3: Research Design.

Chapter 4: Results.

Chapter 5: Discussion.

Chapter 6: Conclusion, recommendations, and limitations of the research.

1.5. Contribution of the research

This research contributes a new framework for predicting technology adoption, specifically tailored to the characteristics of super app and Gen Z's usage patterns. Based on the combination of these traits, the study formulates evaluation dimensions that Gen Z uses to assess the adoption and usage of super apps: multi-service offerings, consistent transactions, integrated UI/UX, social benefits, and social influence. The research also offers new insights into how dimensions of super apps and usage behaviors differentially affect the adoption and use across Gen X, Y, and Z. This nuanced perspective refines and enriches existing theories related to the adoption of mobile services. Furthermore, the identified dimensions and their impact on Gen Z's usage and adoption of super apps can serve as a framework for future research, enabling scholars to explore other factors that might influence the adoption of super apps. Moreover, by understanding and navigating these findings and their implications, businesses can better design their apps to attract and engage users.

CHAPTER 2: CONCEPTS, RELATED THEORIES AND LITERATURE REVIEW

Chapter 2 will introduce the research subject and provide a comprehensive review of technology acceptance models and prior research on mobile app adoption to identify relevant constructs for studying Gen Z and super apps. This chapter will also evaluate the characteristics of super apps and the usage behaviors of Gen Z, integrating these insights with constructs from existing models to design a conceptual framework. This framework will serve as the basis for hypothesizing the potential influences of the identified constructs on Gen Z's intention to use and adopt super apps. These hypotheses will then be empirically tested in Chapter 3.

2.1. Mobile application

Mobile applications are software programs designed to run on mobile devices and perform specific functionalities or services to fulfill user requirements (Islam et al., 2010). Mobile applications range from productivity and entertainment apps to utilities, games, and more. Consumers have undergone significant behavioral changes as they can efficiently perform tasks and get services over the screen. Mobile applications' convenience and various functions have been shown to influence their use and diffusion (Yim et al., 2016) and profoundly transform their expectations regarding their mobile devices (Tang, 2019). The surge in mobile application usage has substantially reshaped the service industry landscape, presenting novel opportunities and intricate challenges for businesses across diverse sectors (Sridevi & Chand, 2020). Their impact extends beyond individual users, influencing the nature of the businesses as they need to adopt new strategies, marketing activities, and promotional channels to sell their products and services (Cheung & To, 2017). Hence, businesses should reflect users' desired expectations and motivations and factors that affect the adoption of mobile applications to stay competitive in the mobile services industry. Many businesses did this by augmenting their core services by extending the functionality with multiple value-added services or enhancing features such as social integration, personalization, support center, privacy, and data management options. However, there is a limited understanding of consumer perceptions regarding these adaptations, including their perceived value and how it affects their intentions and behaviors concerning mobile application usage. Indeed, mobile application users' profiles exhibit distinct characteristics shaped by various factors such as age, education level, or cultural dynamics. These demographic factors can significantly impact user preferences, behaviors, digital literacy, and receptiveness to innovative features and functionalities within mobile applications, consequently influencing the measurement of user evaluation to formulate corresponding business strategies.

2.2. What is a “super app”?

Super app technology

Super apps can be regarded as service extensions of traditional single-serviced applications that introduce new complementary or supporting services to the original offerings. These services may belong to the same industry or expand into others, creating an ecosystem or value constellation wherein multiple functionalities are integrated within a unified platform. Leveraging shared data, user base, and complementary values across multiple services, super apps aim to enhance convenience and efficiency for users. Users benefit from the convenience of performing multiple tasks within a single app, eliminating the need to switch between multiple applications for each task. Simultaneously, app providers capitalize on this seamless user experience by diversifying and expanding their service offerings, leveraging available user data to generate additional sources of income for their businesses. Originating from China, this concept has proliferated throughout Asian countries, exemplified by prominent platforms such as WeChat, Alibaba, LINE, KakaoTalk, Shopee, Grab, and GoJek. Initially, these apps began as single-purposed platforms with a core function, such as social media and communication (WeChat, LINE, KakaoTalk), e-commerce (Alibaba, Shopee), or ride-hailing platforms (Grab, GoJek). Over time, they evolved into multifaceted platforms offering diverse services that enhance convenience and provide seamless experiences by leveraging shared data and user behavior insights. The growth of super apps, particularly in Asian markets, has been remarkable, driven by factors such as high mobile penetration rate, mobile-first dynamics, and government regulatory environment (Easen, 2021). However, this trend is unlikely to be replicated in Western countries in the near future, primarily due to regulatory barriers and cultural differences (Rudegeair & Peter, 2023). For instance, Elon Musk's plan to introduce a super app model in the United States has encountered challenges, partly due to regulatory concerns surrounding user data sharing - a critical aspect of establishing a super app ecosystem (Rudegeair & Peter, 2023). In contrast to Asian populations, Western consumers are more accustomed to web-based platforms and may view mobile applications as supplementary rather than integral to their digital experiences. Additionally, heightened concerns over privacy and personal data further complicate the adoption of super apps in Western markets (Rudegeair & Peter, 2023). Super apps, yet, continue to dominate the digital landscape in Asia. It is projected that 50% of the region’s population will use super apps by 2027 (Law, 2023). Consequently, there is a pressing need to delve deeper into the adoption of super apps in Asian markets, elucidating the key dimensions driving their adoption beyond cultural, technological, and regulatory contexts.

Super App characteristics

Mobile applications are deemed super apps if they fulfill specific criteria, including offering multiple services within a single platform, providing a unified app for accessing all services, ensuring a consistent transactional experience across services, and enabling data sharing among different service offerings (Pearce et al., 2022). Meanwhile, Ipsos straightforwardly defined a super app as a mobile service application providing more than three digital services (Ipsos, 2022). A notable example of a super app is WeChat, which consolidates various services, including social media networking, digital payments, online retail, and transportation solutions.

Table 2.1. Super App Dimensions

<table>
<tr><th>Super App Dimensions</th><th>Description</th><th>Reference</th></tr>
<tr><td>Multi-service</td><td>Offering multiple services across/within industries</td><td rowspan="4">(Pearce et al., 2022)</td></tr>
<tr><td>Single app for all services</td><td>Single point of entry</td></tr>
<tr><td>Consistent transacting experience</td><td>In-house payment platform</td></tr>
<tr><td>Data sharing across services</td><td>Share data across services (and often with third-party service developers)</td></tr>
<tr><td>User experience</td><td>Uniform and individual user experience</td><td>(Baquero & Patricia, 2021)</td></tr>
</table>

Source: *Self-derived data.*

2.2.1. Theoretical background - Technology acceptance models

Prior research has put forth models and theories pertaining to the adoption and acceptance of technology and innovation. This session aims to comprehensively analyze the four widely applied models utilized in prior research to predict the acceptance of new technology. This would form an argument for proposing a new framework in the latter stages of this research.

2.2.2. Theory of Planned Behavior (TPB)

The Theory of Planned Behavior (TPB) is a psychological model initiated by (Ajzen, 1985), which was the extension of the Theory of Reasoned Action (TRA). Both models address the predictability of change in human behavior. TRA was designed with two core constructs: attitude toward behavior and subjective norm. Attitude toward a behavior is defined as "an individual's positive or negative feelings about performing the target behavior" (Fishbein & Ajzen, 1975, p. 216) or referred to as the evaluative effect, while the subjective norm is "the person's perception that most people who are important to him think he should or should not perform the behavior in question." (Fishbein & Ajzen, 1975, p. 302). Acknowledging that behavior is not always voluntary and controlled, (Ajzen, 1991) expanded the TRA model by including perceived behavioral control, "the perceived ease or difficulty of performing behavior" (Ajzen, 1991, p. 188). The construct is the degree to which the individual perceives personal control over the behavior. TPB posits that individuals are inclined to adopt a behavior if they perceive that engaging in the behavior will result in valued outcomes or if individuals, whose opinions they value believe that they should undertake the behavior and feel they possess the necessary resources to perform it.

Despite being widely applied in the information systems (IS) field to predict diverse behaviors in response to different technologies, TPB is not a conclusive model and should be included with additional constructs to enhance understanding of complex human behavior, such as habits and emotions as moderators (Jokonya, 2017).

2.2.3. Technology Acceptance Model (TAM)

Technology Acceptance Model (TAM), developed by (Davis, 1989), is one of the first models to study technology acceptance (TA) specifically in an IS setting. TAM navigates and predicts the utilization of new information technology (Marikyan & Papagiannidis, 2020). The model identifies perceived ease of use and usefulness as two fundamental determinants of user acceptance. Hence, TAM is more straightforward than other technology acceptance models. Perceived ease of use is "the degree to which a person believes using a particular system would be free of effort" (Davis, 1989, p. 320), while perceived usefulness is "the degree to which a person believes that using a particular system would enhance his or her job performance" (Davis, 1989, p. 320). These two factors are affected by external variables, such as social, cultural, and political factors (Hewavitharana et al., 2021), while influencing attitude and behavioral intention. Attitudes refer to an individual's overall evaluation or feeling towards a particular technology, while behavioral intention is the probability of a person adopting the technology (Chen et al., 2017). TAM's simplicity and efficacy have made it a cornerstone in studying user acceptance of various technologies. The model's influence has extended into diverse fields, including business, education, healthcare, and beyond.

Nevertheless, TAM is tailored for professional and work-related contexts where individuals are required to use the technology as part of their professional duties rather than voluntarily *adopting it as consumers. The simplicity of the models exposes several drawbacks in measuring the acceptance of technology, such as not reflecting social influences (Ghazizadeh et al., 2011).*

2.3. Diffusion of Innovation Theory (DOI)

The Diffusion of Innovation Theory (DOI) put forth by Rogers (1962) originated from social science theories. It describes the diffusion of new ideas over time through a group of people or social system, leading to the adoption of new ideas, behaviors, or products (Rogers, 1962). Ideas adoption is considered a non-simultaneous process, with one being more likely to adopt than the other, differentiated with distinct characteristics. Rogers (1962) classified individuals into five categories based on their willingness to adopt new ideas: innovators, early adopters, early majority, late majority, and laggards. Innovators are willing to take risks and require minimal persuasion to adopt new ideas or technologies. Early adopters, on the other hand, are influential individuals who are open to change. The early majority consists of individuals who need concrete evidence and proof before adopting new ideas or technologies. The late majority is characterized by skepticism and tends to adopt new ideas or technologies only after observing others doing so. Laggards, on the other hand, are individuals who resist change and require evidence and external pressure to adopt new ideas or technologies. Rogers (1962) defined factors to measure the degree of diffusion: compatibility, relative advantage, complexity, compatibility, trialability, and observability. Later on, in application in the information systems field, Moore and Benbasat (1991) built upon Roger's (1962) innovation adoption theory and introduced additional constructs to study technology acceptance: relative advantage, ease of use, image, visibility, compatibility, results demonstrability, and voluntariness of use. They defined relative advantage as how an innovation is perceived to be superior to its predecessor, ease of use as the perceived difficulty in using the innovation, image as the visibility of others using the system, compatibility as alignment with existing values and experiences, results demonstrability as the tangibility and communicability of innovation results, and voluntariness of use as the innovation being a voluntary choice.

DOI serves as a complementary theoretical foundation for developing a model to assess the adoption of mobile applications in this study, specifically focusing on the shared diverse traits of a population, such as generational differences in embracing new ideas or innovations.

2.3.1. Unified Theory of Acceptance and Use of Technology (UTAUT)

Venkatesh et al. (2003) proposed the Unified Theory of Acceptance and Use of Technology (UTAUT) via a thorough review and consolidation of the used constructs in earlier research. The final model consists of four fundamental constructs: performance expectancy, effort expectancy, social influence, and facilitating conditions directly affecting technology acceptance (Venkatesh et al., 2003). Moreover, gender, age, experience, and voluntariness of use are also incorporated as the moderators of the relationship of those four constructs with usage intention and behavior. The original model addressed the utilitarian value, which is the extrinsic motivation of users within an organizational context. Later on, as technology advances and serves a variety of users, individual motivation should also be considered. Hence, the intrinsic motivation to use technology is incorporated. Hedonic value, price value, and habit were added and regarded as UTAUT2 (Venkatesh et al., 2012). The extended model had an R^2 of 74%, higher than the original UTAUT of 69% (Venkatesh et al., 2003). Both models have a substantially high number of academic citations over the last decade, more than 49,000 for the original and 15,000 for the extension.

Hence, several researchers have systematically reviewed studies in various UTAUT applications to examine the model's relevance and predictability.

UTAUT has become the most renowned and developed model for technology acceptance. Khechine et al. (2016), through a meta-analysis of UTAUT-applied studies from 2003 to 2013, concluded the UTAUT's strength in model explanation. The study also found that performance expectancy, effort expectancy, and social influence are key common factors explaining information systems or technology adoption. Williams et al. (2015) reviewed UTAUT literature and found that significant constructs in most studies are performance expectancy and behavioral intention.

Table 2.2. Summary of construct and moderators of discussed theories

Theory	Construct	Moderators	Reference
Theory of Planned Behavior (TPB)	Attitude, Subjective Norm, Perceived Behavioral Control	-	(Ajzen, 1985)
Technology Acceptance Model (TAM)	Perceived Ease of Use Perceived Usefulness	-	(Davis, 1989)
Diffusion of Innovation Theory (DOI)	Compatibility, Relative Advantage, Complexity, Compatibility, Trialability, Observability	-	(Moore & Benbasat, 1991)
Unified Theory of Acceptance and Use of Technology (UTAUT)	Performance expectancy, Effort expectancy, Social Influence, Facilitating Conditions	Experience Voluntariness Gender Age	(Venkatesh et al., 2003)
UTAUT2 (construct in addition to UTAUT)	Hedonic value, Price Value, Habit	Experience Voluntariness Gender Age	(Venkatesh et al., 2012)

Source: *Self-derived data.*

2.3.2. The relevance of existing models to this research

These four models have been widely used in the study of technology adoption. Nevertheless, as technology develops rapidly, the digital landscape has significantly diverted from the early days when existing technology adoption models were formulated. These models were first conceptualized when personal ownership of technological devices was relatively uncommon, and the technology itself was in its nascent stages, primarily designed for individual user interactions. The research settings predominantly emphasized organizational utilization rather than consumer adoption. Therefore, the original models may not be as robust and appropriate in predicting technology adoption in today's technology-driven environment. In particular, super apps are significantly more complex and widely used in social environments than in specific professional contexts. Hence, the traditional models may require adaptation to capture users' motivations and behaviors adequately. This necessitates the development of a more relevant model and the incorporation of new constructs that influence the adoption decisions in the current technological context for better predictability. Röcker (2010) also determined that traditional technology acceptance models have limited applicability to predict future technologies and proposed the need to identify new criteria and incorporate specific characteristics of future technologies.

2.4. Generational theory

The generational cohort was first devised by Inglehart (1977) to categorize the population into different groups. The idea of generational theory is that a cohort of people within a particular age share the experiences that shape them into certain personality traits and important commonalities that are distinctive compared to other age cohorts (Okros, 2019). Various authors utilize the definition of Okros (2019) to analyze and decipher the reasons behind shared characteristics within an age group. In contrast, others conclude that beyond experiences, similar characteristics are formed from the impacts of critical events and environments that a particular age group is exposed to. Strauss-Howe Generation Theory (2009) defines a generation that lasted 20 years, during which historical and socioeconomic factors mold people in this time with different attitudes and perceptions about the world. Similarly, Parry and Urwin (2011) defined generation as "a set of historical events and related phenomena that creates a distinct generational gap". Some other theories and frameworks are considered to look into other factors beyond what was proposed by Strauss and Howe (2009), such as the time interval effects – the gap between the first year and last year of a generation; family values (Agati, 2011) and cultural and geographical factors. However, for the focus of this study, it is reasonable to classify generations according to the time they are born and the effect of the historical, socioeconomic, and digital environment to capture the distinction in technology adoption. Various research may differ in the names and birthtime designated to each generation; however, most defined the Baby Boomers as those born between 1944 and 1960, Gen X between 1961 and 1980, and Gen Y between 1981 and 2000. The most recent generation - Gen Z, was born between 1995 and 2012 (Seemiller & Grace, 2017).

2.4.1. Differences in personality traits among cohorts

Baby Boomers generation, born post-World War II during the booming birth rate and raised during economic prosperity, is characterized as idealistic, optimistic, self-confident, and communicative (Lissitsa & Laor, 2021). When it comes to technology, baby boomers experienced analog technology and were described as the "television generation". As technological immigrants, they are not involved with technology and lag behind the later generations (Berraies et al., 2017). Gen X navigated the social and economic changes of the late 20th century, with economic downturns and social uncertainty. This generation is more pessimistic, skeptical, and socially insecure (Barford & Hester, 2011). Millennials, or Gen Y, emerging in the age of economic growth, globalization, technological advancement, and the Internet, are often perceived as "tech-savvy" and more confident and optimistic. Gen Z, growing up in a digitally connected world marked by rapid change and uncertainty, is characterized as digital natives, socially connected and influenced (Francis & Hoefel, 2018), individualistic (Tolstikova et al., 2021), yet an anxious generation (Luttrell & McGrath, 2021). They are adaptable and cannot live without smartphones and social media (Artese, 2019). These generational traits, deeply rooted in their formative years' unique historical and socio-economic contexts, contribute to the diversity of perspectives and preferences observed across different age cohorts. Moreover, digital disruptions and technology development also amplify these differences.

Given the discussed generation theory and the level of technology interaction that is distinctive to each generation, Gen Z, born in a fully-fledged technological world, would possess distinctive characteristics, attitudes, and behaviors in using and adopting technology.

2.5. Existing literature on predicting mobile application adoption

Tam et al. (2018) were the first to combine the confirmation and satisfaction constructs from the Expectation Confirmation Model (ECM) with the UTAUT2 model to study mobile app continuance. They determined that model predictability improves by adding new constructs, finding that satisfaction, habit, performance expectancy, and effort expectancy are primary factors influencing mobile app usage. Similarly, Kang (2014) suggested integrating pertinent concepts into the original technology adoption model, provided the conceptual framework remains theoretically sound. The study concluded that combining motivational elements (entertainment, social utility, and communication) with UTAUT variables (performance expectancy, effort expectancy, and social influence) offers a more comprehensive understanding of mobile app usage. The findings indicate that effort expectancy, ease of use, and entertainment are crucial in determining continued app usage. These studies focus on the general adoption of mobile applications, while numerous other studies delve into specific domains such as tourism, banking, payment, food delivery, and education. Chopdar et al. (2018) investigated the adoption of mobile shopping apps by expanding the UTAUT2 model with perceived privacy and security risks as additional factors. Their findings revealed that privacy and security concerns affect the intention to use mobile apps differently across cultures. Yu (2012) studied mobile banking applications using an extended UTAUT2 model. They found that social influence, perceived financial cost, performance expectancy, and perceived credibility significantly influence intention, with behavioral intention and facilitating conditions significantly affecting usage behavior. Furthermore, gender and age were identified as moderators impacting the effects of certain factors on behavioral intention and adoption behavior. Muñoz-Leiva et al. (2017) and Albashrawi and Motiwalla (2017) also examined mobile adoption in the banking sector using extended TAM models with perceived risks and other factors. Both studies found that the primary constructs of TAM (perceived usefulness and ease of use) are key factors influencing the intention to use mobile banking. However, while Muñoz-Leiva et al. (2017) found that perceived risks do not impact usage intention, Albashrawi and Motiwalla (2017) identified perceived risks as deterrents to usage intention. Similarly, Al-Jabri and Sohail (2012) found a negative relationship between perceived risk and intention to use, adopting the DOI framework. Chao (2019) studied the intention to use m-learning among university students by combining UTAUT with five additional variables: mobile self-efficacy, perceived enjoyment, satisfaction, trust, and perceived risk. The research demonstrated that student satisfaction is the critical factor influencing their behavioral intentions toward mobile learning, and perceived enjoyment significantly affects perceived ease of use, enjoyment, and satisfaction. Most studies employ external variables as the original models cannot accommodate the context-specific, industry-diverse purposes of study and the evolution of consumer behavior. Molina-Castillo and Meroño-Cerdan (2014) reviewed studies using TAM at a meta-analysis level, concluding that the model is insufficient in predicting mobile app usage intention. The UTAUT model is the most popular for studying mobile applications because it comprehensively covers critical constructs from eight renowned technology acceptance models. Tamilmani et al. (2018) systematically reviewed existing literature using UTAUT models to predict mobile application adoption. Their findings highlighted that effort expectancy (perceived ease of use) is the most commonly used construct. In contrast, performance expectancy (perceived usefulness), trust, and habit are the most influential predictors of consumers' behavioral intention to adopt mobile applications. Behavioral intention emerged as the strongest predictor of actual use behavior. They also noted that moderating factors such as age are often omitted from models due to the complexity of many UTAUT constructs.

Table 2.3. Summary of findings of mobile applications adoption studies

Authors	Context	Model/ Theory	Sample / Method	Construct	Non-significant
(Kang, 2014)	Usage intention of mobile apps	UTAUT	788 users of apps/PLS-SEM	Entertainment, Social Utility, Communication, Performance Expectancy, Effort Expectancy, Social Influence	Entertainment, effort expectancy
(Tam et al., 2018)	Continuance intention of mobile apps	UTAUT	304 respondents/ PLS-SEM	Confirmation, Satisfaction, Performance Expectancy, Effort Expectancy, Facilitating Conditions, Hedonic Motivation, Price Value, Habit, Social Influence	Facilitating Conditions, Social Influence, Price value
(Chopdar et al., 2018)	Cross-country consumer adoption of mobile shopping apps	UTAUT2	5000 samples/PLS-SEM	Performance Expectancy, Effort Expectancy, Social Influence, Facilitating Conditions, Hedonic Motivation, Price Value, Habit, Security Risk, Privacy Risk	Facilitating Condition, Social Influence
(Oliveira et al., 2016)	Adoption and intention to recommend mobile payment	UTAUT2, DOI	789 samples/SEM	Performance expectancy, Effort expectancy, Social Influence, Facilitating conditions, Hedonic motivation, Private value, Innovativeness, Compatibility, Perceived technology security	Effort expectancy, Facilitating conditions, Hedonic motivation, Prive value
(Albashrawi & Motiwalla, 2017)	Usage and recommendation intention of mobile payment	TAM	486 mobile banking users/SEM	Privacy, Personalization, Perceived Usefulness, Perceived Ease of use, Customer Satisfaction	Privacy, Personalization
(Muñoz-Leiva et al., 2017)	Usage intention of mobile banking apps	TAM	103 electronic banking users/SEM	Perceived ease of use, Perceived usefulness, Social Image, Trust, Perceived risk	Perceived Usefulness, Perceived Risk
(Al-Jabri & Sohail, 2012)	Usage intention of mobile banking apps	DOI	330 users/Regression Analysis	Relative Advantage, Complexity, Compatibility, Observability, Trialability, Perceived risk	Complexity, Trialability
(Chao, 2019)	Usage intention toward using m-learning in higher education	UTAUT	1,562 university students/PLS	Effort Expectancy, Perceived Enjoyment, Performance Expectancy, Perceived Risks, Mobile Self-efficacy, Satisfaction	Effort expectancy

Source: *Self-derived data.*

The existing body of research extensively employs traditional models of technology and innovation acceptance to predict individual adoption of mobile applications, incorporating additional factors and moderators to enhance model relevance for the current technology context.

2.6. Existing literature on predicting super app adoption

Salehi et al. (2023) investigate the factors influencing the adoption and utilization of super apps, specifically examining hedonic (enjoyment), utilitarian (quality, variety of services), and social benefits. The study suggests that the quality of super apps impacts their adoption indirectly through satisfaction, while social benefits directly influence adoption through engagement. Zhu et al. (2023), in examining service extensions within super apps, asserted that users' attitudes towards such expansions significantly impact their intentions to use these platforms. Interestingly, they found that users may not necessarily prefer highly integrated apps, as sharing user data across services within super apps raises privacy concerns. They advocate for the implementation of data guidelines to ensure the separate treatment of user data for different services within the app. Han and Cho (2015) conducted an exploratory study on the social discussion of the super app KakaoTalk, revealing significant user concerns regarding privacy protection, particularly related to personal information. Hasselwander (2024) investigates the drivers and strategies behind companies transforming their digital platforms into super apps. The study suggests a lack of profound understanding of super app users and characteristics, necessitating further investigation.

Despite the popularity of super apps in Asia, research on super apps remains limited, with significant gaps in understanding customer evaluation and perceptions towards adopting this disruptive innovation. Further research is necessary to fully comprehend the factors influencing super app adoption, especially considering the demographics of super app users.

2.7. Mobile application adoption in the context of Gen Z

Several research studies have examined the factors influencing Gen Z's intention to use mobile applications. Windasari et al. (2022) investigated the adoption of mobile payment applications among Gen Z using an expanded UTAUT model. Their findings indicate that performance expectancy, social influences, facilitating conditions, perceived enjoyment, and trust significantly affect the behavioral intention to use mobile payments in online transactions. In contrast, effort expectancy did not show a statistically significant impact. However, Puiu et al. (2022) and Sözer (2019) found ease of use to be a significant determining factor in their studies. Wei et al. (2021) explored the factors influencing Gen Z's behavioral intention to adopt mobile payment services in Taiwan, employing the UTAUT model and incorporating perceived risk and promotional activities. The results indicated that social influence and promotional activities significantly impact behavioral intention, while financial/privacy and psychological/social risks are significant deterrents. Similarly, Axcell and Ellis (2023), one of the rare qualitative studies using UTAUT2, found that privacy is a crucial concern when considering additional factors. Ruangkanjanases and Wongprasopchai (2021), studying mobile banking app adoption in Thailand, concluded that compatibility is the most significant factor. They also found that social influence significantly affects app adoption for Gen Z but not for Gen Y. Given their upbringing in the era of technology and social media, Gen Z's decision-making process is profoundly influenced by social factors. Family members, friends, celebrities, and influencers (Puiu et al., 2022; Verma et al., 2021) can significantly shape their purchasing decisions and propensity to explore new experiences. Moreover, Gen Z is highly attuned to new trends and actively engages with popular content (Tolstikova et al., 2021). Therefore, leveraging social media platforms can enhance celebrities' influence on Gen Z and increase their intention to adopt the apps (Verma et al., 2021).

2.8. Proposed framework

As discussed, traditional technology acceptance models have existed for two decades. Thus, they are deemed insufficient to predict the current acceptance of technology, especially for complex and disruptive innovations such as super apps. However, several constructs from these models remain relevant due to their high significance levels across various studies, including effort expectancy, performance expectancy, social influence, perceived risks, and behavioral intention from the UTAUT models. Recent studies have expanded the original models with additional factors relevant to their specific contexts. The most common factor incorporated is perceived risks, added across sectors, not limited to general studies. Research focusing on Gen Z has confirmed the robustness of these constructs. Despite their relevance, traditional models and factors fail to fully understand and predict Gen Z's intention to adopt mobile applications. Demographic characteristics such as age are often considered moderating factors to provide more insights. However, only a few studies have considered the impact of personal characteristics on mobile application adoption. Weimann and Brosius (1994) suggested that personal characteristics could influence adoption decisions. Vishwanath (2005), in his study on global and context-driven behavior, recommended considering personality factors to predict innovativeness. The Big Five personality traits - extraversion, conscientiousness, agreeableness, and neuroticism - are commonly applied in this research. Agyei et al. (2020) identified that agreeableness, conscientiousness, and openness to new experiences significantly influence users' intention to adopt mobile banking through perceptions of usefulness and ease of use. Lane (2012) investigated individual preferences for smartphone applications using these traits, finding that extroverted ones placed higher importance on gaming applications but considered productivity applications less critical. Xu et al. (2016) also used the Big Five personality traits in a large-scale approach to predict app adoption via a machine learning model. However, while the Big Five personality traits cover general traits and their impact on app adoption, they do not fully explain how specific characteristics form dimensions and expectations regarding mobile applications.

Therefore, this study proposes a framework to determine the criteria that Gen Z considers when adopting and using super apps. It is formulated by reviewing the characteristics of Gen Z while considering the robust constructs of traditional technology acceptance models.

2.8.1. Gen Z, technology and consumer behaviors

Understanding Gen Z's distinctive characteristics, values, and preferences - a cohort deeply intertwined with technology, is crucial for predicting their expectations and adoption of mobile applications. Often referred to as "digital natives," Gen Z is marked by a pervasive online presence, epitomized by the Fear of Living Offline (FOLO) phenomenon. This generation seamlessly integrates digital technologies into various facets of daily life, including work, shopping, learning, and socializing, operating within a comprehensive online ecosystem (McKinsey, 2023). Gen Z is tech-savvy and highly proficient in using digital technologies, particularly smartphones, mobile applications, and social media. This generation exhibits multitasking tendencies, seamlessly navigating between different sites, apps, and social media feeds concurrently (Bulut & Maraba, 2021; McKinsey, 2023; Wood, 2013). With smartphones becoming ubiquitous, they are performing daily tasks over the screen effortlessly via mobile applications. They care about ease of use and demand intuitive and user-friendly experiences (PwC, 2020; Serxner, 2023; Sözer, 2019). Gen Z is the primary user of Fintech services, demonstrating the highest adoption rate and a strong inclination towards fast, seamless e-payment systems that offer high ease of use (Abu Daqar et al., 2021). This trend is underscored by their preference for swift, effortless, and user-friendly payment experiences (EY, 2023; Pardo, 2023). Luttrell and McGrath (2021) described that losing the smartphone is like losing a limb for Gen Z. Therefore, looking ahead, their lifestyle is increasingly shaped by the technological ecosystem facilitated through their mobile phones. In contrast to previous generations, Gen Z prioritizes individual values and personal identity (McKinsey, 2023; Tolstikova et al., 2021), as they actively seek products, services, and content that resonate with their personalities and interests (McKinsey, 2023). Additionally, technology accessibility has fostered more individualistic learning and communication styles among Gen Z (Chicca & Shellenbarger, 2018). Digital communication platforms serve as crucial outlets for self-expression, with online communities playing a significant role in shaping personal branding and identity (Francis & Hoefel, 2018; Tolstikova et al., 2021). Personalization appeals to Gen Z, extending to products and services that allow tailored experiences (Francis & Hoefel, 2018; Puiu et al., 2022; Rue, 2018). Gen Z listens to product recommendations from family, friends, influencers, and celebrities, all of whom strongly influence their decisions (Axcell & Ellis, 2023; Lisana, 2024; M. P. Nguyen et al., 2023; Oliveira et al., 2016; Verma et al., 2021; Wei et al., 2021; Windasari et al., 2022). Furthermore, as Gen Z has witnessed high-profile data breaches and security issues, these have raised awareness about the vulnerability of personal information online (Marlatt, 2022), leading to increased concerns about privacy (Francis & Hoefel, 2018). Nevertheless, when presented with incentives, they are inclined to provide their data in exchange for reciprocal value (Colborn, 2023; FreedomPay, 2023). Drawing from prior research on the adoption of mobile apps among Gen Z and their profile, the main characteristics are outlined in **Table 2.4**.

Table 2.4. Summary of Gen Z Characteristics

Characteristics	Description	Reference
Multitasking Behavior	They are multi-taskers who prefer doing many things at the same time.	(Bulut & Maraba, 2021; McKinsey, 2023; Wood, 2013)
Preference for ease of use	They value ease of use and intuitive and user-friendly app experiences.	(PwC, 2020; Serxner, 2023; Sözer, 2019)
Effortless payment	They prefer a quick, seamless, easy payment experience and highly intend to adopt a digital wallet.	(Abu Daqar et al., 2021; EY, 2023; Pardo, 2023)
Individualistic Values	They prefer quality and services offering personalization that aligns with their unique personalities and interests.	(Francis & Hoefel, 2018; Puiu et al., 2022; Rue, 2018)
Socially connected	They are highly active on social media and value online communities.	(Francis & Hoefel, 2018)
Influenced by social opinions	They seek advice and are influenced by validation from families, friends, social influencers, and celebrities.	(Axcell & Ellis, 2023; Lisana, 2024; M. P. Nguyen et al., 2023; Oliveira et al., 2016; Verma et al., 2021; Wei et al., 2021; Windasari et al., 2022)
Privacy Concerns	They care about privacy and security.	(Francis & Hoefel, 2018; Marlatt, 2022)
Open to data exchange	They tend to be more careful yet open to sharing their data when offered incentives.	(Colborn, 2023; FreedomPay, 2023)

Source: *Self-derived data.*

2.8.2. Trait-based app dimensions

Gen Z's characteristic traits, identified in previous research, are mapped to corresponding mobile app dimensions that align with five established super app criteria: multi-service, single app for all services, consistent transacting experience, data sharing across services, and user experience (Baquero & Patricia, 2021; Pearce et al., 2022). These criteria form a set of evaluation dimensions that Gen Z uses to assess the adoption of super apps.

The *multitasking behavior* of Gen Z is accommodated by the multi-service criteria of super apps, which provide a variety of services within a single platform. This feature aligns with Gen Z's preference for performing various tasks simultaneously in one place, enabling them to shop, hail a ride, message, and pay within the same ecosystem. Salehi et al. (2023) found a positive association between the variety of services provided by super apps and users' intention to adopt them, indicating that diverse services enhance user satisfaction and engagement.

An integrated User UI/UX design addresses preference for ease of use. The unified experience offered by super apps ensures consistency across services, allowing users to perform tasks efficiently and navigate seamlessly, potentially encouraging adoption. Serxner (2023) and Huang et al. (2019) also suggested that user experience significantly influences consumer behavioral intentions toward mobile app usage.

Effortless payment experiences, tied to consistent transaction processes, are crucial. Super apps often use in-house payment platforms or exclusive partnerships with banks to facilitate transactions for all services. Integrated digital wallets, such as WeChat Pay, ShopeePay, Grab Moca, and ZaloPay, enable contactless and swift payments, eliminating the need to input payment information repeatedly. Given Gen Z's inclination towards digital wallets, this feature is essential in their evaluation criteria for mobile app adoption.

The *socially connected nature* of Gen Z is reflected in the app's social benefits feature. Applications that facilitate seamless connections with social media networks and easy interaction within their social circles can drive usage. The social influence element captures the influence of social opinions, where family members or social circles significantly impact their intention to adopt or use certain services. Apps featuring content and promotions endorsed by social influencers and celebrities resonate well with Gen Z users (Verma et al., 2021; Wei et al., 2021).

Addressing *individualistic values* is achieved through app personalization, a feature at which super apps excel. By leveraging data sharing across various services, super apps can tailor the user experience to individual needs, aligning with Gen Z's inclination towards self-expression and personalized content. Ideal apps for this demographic should empower users to customize layouts, features, functionalities, and content according to their preferences.

Privacy concerns are notable among Gen Z, negatively impacting their adoption of mobile applications. Super apps must address these concerns to drive adoption intentions. While Gen Z is cautious about data privacy, they may be more willing to share their information if provided with incentives such as promotions or discounts. This willingness is particularly relevant for super apps, where data sharing across services is crucial for personalized service delivery. Transparent data policies and incentives can alleviate privacy concerns and increase adoption rates.

The summary of app characteristics delineation is presented in the table below:

Table 2.5. Trait-based app dimension translated from Gen Z characteristics

Gen Z Characteristics	App Dimensions
Multitasking Behavior	Multi-service
Preference for ease of use	Integrated UI/UX
Effortless payment	Consistent transaction
Individualistic Values	Personalization
Socially connected	Social benefits
Influenced by social opinions	Social influence
Privacy Concerns	Privacy
Open to data exchange	Data Sharing

***Source**: Self-derived.*

2.8.3. Conceptual model

The first part of research question 1 (RQ1) thoroughly examined the super app dimensions that resonate with Gen Z traits through an extensive literature review. This review identified eight key app characteristics - multi-service, integrated UI/UX, consistent transactions, personalization, social benefits, social influence, privacy, and data sharing - that Gen Z uses to adopt super apps. Building on this foundation, the next phase of RQ1 will involve hypothesizing and testing Gen Z's perceptions of these app dimensions and their influence on the intention to adopt mobile applications. This step includes constructing a conceptual model based on the insights from RQ1-1. The evaluation dimensions are hypothesized to influence user perceptions, such as perceived convenience, perceived connection, and perceived risks, affecting their intention to adopt the mobile application. Additionally, satisfaction will be measured as a mediating construct to understand its direct effects on app adoption and usage, examining how perceptions of convenience, connection, or risks impact user satisfaction. After completing and validating this model, the second research question (RQ2) will be addressed. RQ2 aims to test the robustness of the model by comparing different generational cohorts, confirming its effectiveness in analyzing how Gen Z evaluates super apps.

2.8.3.1. Perceived Convenience

Convenience was initially introduced in marketing literature concerning product categories (Copeland, 1923). In the service industry, convenience, often called "service convenience," encompasses consumers' perceptions of the time and effort associated with purchasing or using a service. Perceived convenience has been utilized as a significant predictor for the adoption of mobile services in several studies (Chang et al., 2012; de Kerviler et al., 2016; Gao et al., 2015; Hsu & Chang, 2013; Shaw & Sergueeva, 2016; Williams, 2021). Time and effort are frequently addressed in the literature as the primary dimensions of convenience (Berry et al., 2002). It represents opportunity costs that can hinder consumers from engaging in alternative activities (Bivens & Volker, 1986). Previous scholars have proposed various dimensions and components to assess convenience in the broader service context. Colwell et al. (2008) identified five types of service convenience: decision convenience, access convenience, transaction convenience, benefit convenience, and post-benefit convenience. Among these, access, search, and transaction convenience are significant dimensions relevant to predicting service adoption, which can be related to the current study's focus on mobile services. (Berry et al., 2002) defined these three components as below:

Access convenience pertains to the speed and ease of requesting and receiving a service.

Search convenience denotes perceived time and effort in searching for a product.

Transaction convenience is defined as consumers' perceived expenditure of time and effort to complete a transaction.

Three super app attributes - multi-service, integrated UI/UX design, and consistent transaction - collectively contribute to the perceived convenience by saving users' time and effort. The variety of services within a single app offers an integrated platform, significantly enhancing convenience by reducing the need to switch between apps to perform different services. This minimizes the search and learning costs typically associated with searching and using separate apps for different purposes. Integrating multiple services within a single app streamlines the user experience with a uniform design that facilitates easy and user-friendly navigation and enhances the overall perception of the app's UI/UX. Additionally, incorporating consistent payment options such as digital wallets for all the services within the super app ecosystem saves time and effort in managing transactions across multiple separate apps. Therefore, perceived convenience is enhanced through seamlessly integrated interfaces and consolidated payment, which is made possible by grouping many services in one app. The user experience enhanced by integrated UI/UX and consistent transactions reduces access, search, and transaction efforts, thereby improving perceived convenience. These three dimensions, subsequently, can indirectly influence the intention to adopt and use super apps through the convenience they provide.

H1-b: Multi-service positively influences the perception of consistent transactions.

H2: Integrated UI/UX positively influences the perceived convenience of super apps.

H3: Consistent transaction positively influences the perceived convenience of super apps.

H4-a: Integrated UI/UX mediates the relationship between multi-service and perceived convenience

H4-b: Consistent transaction mediates the relationship between multi-service functionality and perceived convenience

H5: Perceived convenience positively influences the adoption and use of super apps.

H6-a: The multi-service on the use and adoption of super apps is mediated by integrated UI/UX and perceived convenience

H6-b: The multi-service on the use and adoption of super apps is mediated by consistent transaction and perceived convenience

H7-a: Perceived convenience mediates the relationship between integrated UI/UX and the perceived convenience

H7-b: Perceived convenience mediates the relationship between consistent transactions and perceived convenience

2.8.3.2. Perceived Connection

Establishing a sense of connection and relevance in service offerings can cultivate emotional bonds with customers, thus strengthening their motivation to adopt and engage with services. Gogan et al. (2018) discovered that fostering a sense of community within apps fosters attachment and reinforces users' commitment to the platform. Similarly, Salehi et al. (2023) highlighted the social integration of mobile applications to generate social benefits for users by creating online communities where users can interact, engage, and share experiences. They further observed the impact of these social benefits on user satisfaction, ultimately leading to the adoption of super apps. Another influential factor in forming this connection is social influence, wherein users may feel connected to a mobile application when it receives validation from family members and peers or is endorsed by social groups or influencers they admire. This influence, drawn from the UTAUT model and supported by previous Gen Z mobile app adoption studies, significantly impacts users' decisions to adopt and utilize mobile applications. Therefore, combining social benefits and influence is expected to foster a perceived connection with the app, increasing its adoption and usage among users.

H3-a: Multi-service positively influences the perceived connection toward super apps.

H8: Social benefits positively influence the perceived connection toward super apps.

H9: Social influence positively influences the perceived connection toward super apps.

H10: Perceived connection positively influences the adoption of super apps.

H11-a: Social benefits positively influence the adoption and use of super apps through perceived connection.

H11-b: Social influence positively influences the adoption and use of super apps through perceived connection.

2.8.3.3. Perceived Risks and personalization as moderator

Perceived risks, a prevalent construct in studies on mobile application adoption, often demonstrate a negative relationship with users' adoption intentions. Among these risks, privacy and data-sharing concerns are particularly prominent, driven by the sensitive and personal nature of the information users share with service providers. This information includes contact details, photos, microphone access, camera usage, location data, payment information, billing addresses, and phone numbers. Potential data leaks or misuse for malicious purposes exacerbate these concerns and might prevent consumers from adopting mobile applications. Super apps, which leverage extensive user personal data and behaviors to generate insights and improve services, naturally face heightened privacy concerns. These concerns can significantly influence user attitudes toward these apps (Zhu et al., 2023). Super app providers, thus, encounter a paradox wherein users desire personalized and seamless experiences but are reluctant to disclose their personal data. This phenomenon, termed by Awad and Krishnan (2006) as the personalization-privacy paradox, suggests that customers are less likely to engage in personalized services when they are more aware of privacy and information-sharing issues. Personalization is "the ability to provide content and services tailored to individuals based on knowledge about their preferences and behaviors" (Adomavicius & Tuzhilin, 2005, p. 84). The relationship between privacy concerns and personalization is complex. Lee and Rha (2016) described this tension as benefits versus risks or gains versus losses. Users face cognitive conflict considering the privacy calculus of trading the benefits for the risks of sharing their data. Nevertheless, many users are more concerned about privacy and personal information-sharing benefits than the risks themselves (Fu et al., 2023; Lee & Rha, 2016). They are willing to trade their personal information for personalization if companies are transparent about data usage or if users have control over their data (Accenture, 2022). Additionally, offering value exchanges (Rodenhausen et al., 2022), such as monetary incentives or improved app services, can make users more willing to share their information (Chorppath & Alpcan, 2012). Smith et al. (1996) described that users' decisions to disclose personal information depend on the trade-off between benefits and risks within the personalization-privacy paradox. In this research context, personalization is conceptualized as users' ability to control their privacy and data-sharing preferences, such as customizing how their data is used and shared and choosing what information to share with service providers. Consequently, the question arises as to whether the degree of personalization that users can control can moderate perceived risks to positively influence mobile app adoption. This inquiry is particularly relevant for super apps, where data sharing across services is essential to creating a personalized and integrated ecosystem. Therefore, understanding the moderating effects of personalization on privacy and data sharing concerns about users' intentions to use super apps is crucial.

H12: Perceived risks negatively influence the adoption of super apps.

H13: Personalization moderates the relationship between the perceived risks and the adoption of super apps.

2.8.3.4. Users Satisfaction

Satisfaction is critical in marketing and business, measuring consumers' experiences with a product or service. User satisfaction has been identified as a critical construct in assessing the effectiveness of information systems (IS) within behavioral intention research (Melone, 1990). In the mobile applications industry, user satisfaction is typically conceptualized as a subjective evaluation of the application's performance against users' expectations. Theofanos and Stanton (2012) defined user satisfaction as "the degree to which the product meets the user's expectations, or the level of comfort the user experiences—a subjective response." Consequently, user satisfaction is a vital element in assessing the success of a mobile application. High satisfaction levels significantly influence the intention to adopt and continue to use mobile applications (Malik & Rao, 2019; Oghuma et al., 2016; Tam et al., 2018; Tsai et al., 2020). Several factors affect user satisfaction with mobile apps, subsequently impacting the intention to use mobile apps. Qaishammouri et al. (2020) found that perceived security, information technology awareness, and subjective norms indirectly influence user satisfaction through attitudes. Kim and Park (2011) identified stability, usability, timeliness, accuracy, enjoyment, reactivity, and empathy as significant determinants of user satisfaction. Al-Maskari and Sanderson (2010) revealed that user satisfaction can be influenced by system effectiveness, user effectiveness, user effort, and user characteristics and expectations. Therefore, common factors affecting satisfaction, and thus the intention to use, include performance expectancy (perceived usefulness), effort expectancy (perceived ease of use, usability), and perceived playfulness (enjoyment, engagement). This research examines the impact of perceived risks, convenience, and connection on user satisfaction and the mediating effects of user satisfaction between these factors and intention to use and adopt mobile applications.

H14: User satisfaction positively influences the use and adoption of super apps.

H15: Perceived convenience positively influences user satisfaction.

H16: Perceived connection positively influences user satisfaction.

H17: Perceived risks negatively influence user satisfaction.

H18-b: Satisfaction mediates the relationship between perceived convenience and the use and adoption of super apps

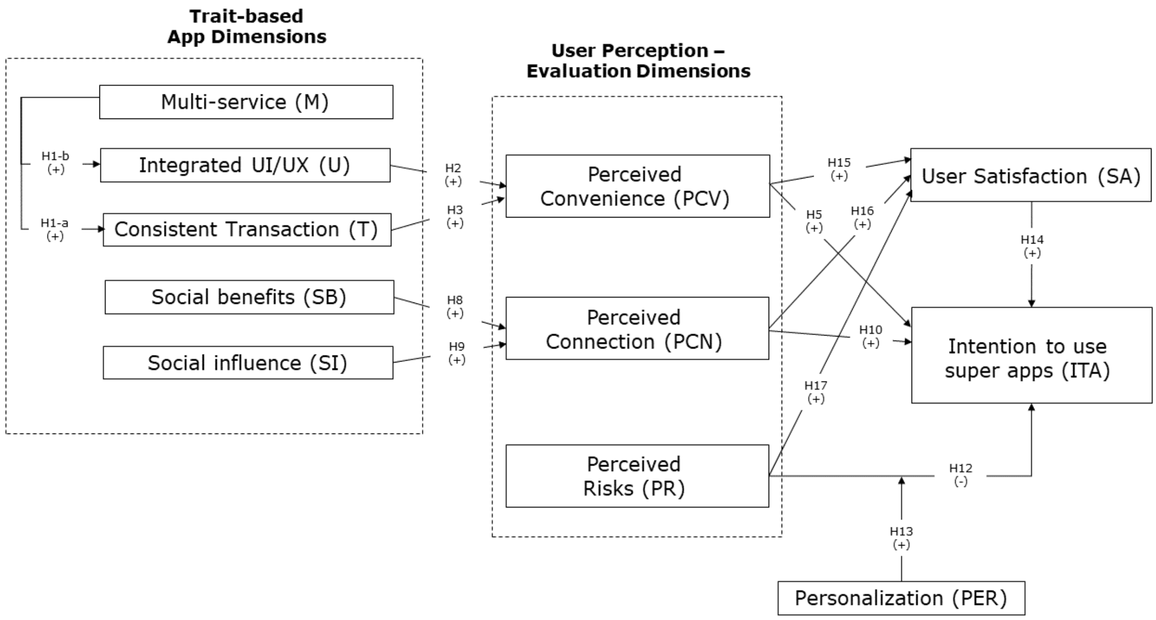
H18-b: Satisfaction mediates the relationship between perceived connection and the use and adoption of super apps

H18-c: Satisfaction mediates the relationship between perceived risk and the use and adoption of super apps

2.9. Conceptual model

The final conceptual model visualizing the hypothesized relationships between variables is summarized in **Figure 1**.

Figure 1. Conceptual model



Source: *Self-drive*

Note: *The hypothesis illustrated in the figure are direct effects*

2.9.1. Model Comparison

RQ 2 (RQ2) seeks to determine whether the dimensions derived from specific traits of Gen Z, along with their perceptions of these dimensions, significantly influence their decision to adopt and if these influences are uniquely pertinent to this generation. To explore and confirm this, the conceptual model delineated earlier will be applied and empirically tested across Gen X, Gen Y, and Gen Z. This analysis aims to compare and assess the differences and the statistical significance of each construct about the intention to adopt super apps. Based on this investigation, the following hypothesis is formulated:

H19-a: Gen X perceives and evaluates the adoption and use of the super apps differently compared to Gen Z

H19-b: Gen Y perceives and evaluates the adoption and use of the super apps differently compared to Gen Z

Table 2.6 summarizes all the hypotheses discussed in previous sessions, which will be empirically tested in the following chapter.

Table 2.6. Summary of Hypothesis

Item	Path	Hypothesis
Direct effects		
H1-a	M->U	Multi-service positively influences the perception of integrated UI/UX.
H1-b	M->T	Multi-service positively influences the perception of consistent transactions.
H2	U->PCV	Integrated UI/UX positively influences the perceived convenience of super apps.
H3	T->PCV	Consistent transaction positively influences the perceived convenience of super apps.
H5	PCV->ITA	Perceived convenience positively influences the adoption and use of super apps.
H8	SB->PCN	Social benefits positively influence the perceived connection toward super apps.
H9	SI->PCN	Social influence positively influences the perceived connection toward super apps.
H10	PCN->ITA	Perceived connection positively influences the adoption of super apps.
H12	PR->ITA	Perceived risks negatively influence the adoption of super apps.
H13	PERxPR->ITA	Personalization moderates the relationship between perceived risks and the adoption of super apps.
H14	SA->ITA	User satisfaction positively influences the use and adoption of super apps.
H15	PCV->SA	Perceived convenience positively influences user satisfaction.
H16	PCN->SA	Perceived connection positively influences user satisfaction.
H17	PR->SA	Perceived risks negatively influence user satisfaction.
Indirect effects		
H4-a	M->U->PCV	Integrated UI/UX mediates the relationship between multi-service and perceived convenience.
H4-b	M->T->PCV	Consistent transaction mediates the relationship between multi-service and perceived convenience.
H6-a	M->U->PCV->ITA	The multi-service on the use and adoption of super apps is mediated by integrated UI/UX and perceived convenience.
H6-b	M->T->PCV->ITA	Consistent transactions and perceived convenience mediate super apps' multi-service use and adoption.
H7-a	U->PCV->ITA	Perceived convenience mediates the relationship between integrated UI/UX and perceived convenience.
H7-b	T->PCV->ITA	Perceived convenience mediates the relationship between consistent transactions and perceived convenience.
H11-a	SB->PCN > ITA	Social benefits positively influence the adoption and use of super apps through perceived connection.
H11-b	SI->PCN > ITA	Social influence positively influences the adoption and use of super apps through perceived connection.
H18-b	PCV->SA->ITA	Satisfaction mediates the relationship between perceived convenience and the use and adoption of super apps.
H18-b	PCN->SA->ITA	Satisfaction mediates the relationship between perceived connection and the use and adoption of super apps.
H18-c	PR->SA->ITA	Satisfaction mediates the relationship between perceived risk and the use and adoption of super apps
Multi-group comparison		
H19-A	-	Gen X perceives and evaluates the super apps' adoption and use differently than Gen Z.
H19-b	-	Gen Y and Gen Z perceive and evaluate the adoption and use of the super apps compared to Gen Z.

Source: *Self-drive*

CHAPTER 3: RESEARCH DESIGN

This chapter establishes the framework for the subsequent empirical tests, divided into three main sections. The first section details the research method, setting, subject, and measurement constructs, providing a comprehensive overview of the research design. The second section covers data collection and sample size, explaining the data gathering procedures, sources, and participants. The final section discusses data analysis, outlining the statistical techniques for preparing and analyzing the dataset. This preparation sets the groundwork for the hypothesis testing analyses in Chapter 4.

3.1. Research Methodology

This research adopts a quantitative approach to explore the two research questions (RQs) identified in Chapter 1:

(1) Impact of trait-based dimensions and user perceptions on the use and adoption of super apps: How do mobile application dimensions and user perceptions affect their intention to adopt and continue using the app?

(2) Differences across generations: Are these trait-based dimensions and perceptions also relevant for Gen X and Y, or are they unique to Gen Z?

A survey-based design is implemented to execute this research. Likert-scale items will be used to measure the extent of agreement or disagreement with statements regarding the app dimensions, user perception, and intention to use. Additionally, demographic information such as education level, occupation, location, and usage patterns are collected to understand the sample population's characteristics better. The collected data will be analyzed using the SEM-PLS model to investigate the intricate relationships between the trait-based app dimensions, users' perceptions, and intentions to adopt super apps. SEM-PLS is commonly used to study technology acceptance and the adoption of mobile applications. It was chosen for this research due to its robustness in handling complex model structures and has been widely used in previous research on mobile app adoption. SEM-PLS is also highly suitable for the proposed conceptual model, which involves multiple variables with direct, indirect, and moderating effects. Moreover, the MGA will be used to compare the differences among generational groups. This research will follow the procedure of carrying out the MGA approach proposed by Cheah et al. (2023) with five steps: (1) Data Preparation by Generating Data Groups, (2) Measurement of Model Assessment, (3) Assess the Measurement Invariance Test, (4) Determine the Goals of Analysis, (5) Analyze and Interpret the MGA test. These steps will be discussed in detail, along with execution, in the following chapters.

3.1.1. Research Setting

Super app is a prominent trend in Asia. Particularly in Vietnam, a study by Visa revealed that one in every three Vietnamese respondents preferred using multi-purpose apps (Visa, 2023). This widespread adoption of super apps is amplified by an open regulatory environment, robust technological infrastructure, and a young, tech-savvy population. Notably, approximately 21.1% of Vietnam's population is aged between 10 and 24 years, with around 19% (about 13 million individuals) belonging to Gen Z (Kuermayr & Le, 2023; UNFPA, 2023). With an Internet penetration rate expected to reach 79% - roughly 77.93 million online users by 2023 (V. T. L. Nguyen et al., 2023) and nearly 98% mobile phone ownership which is dominated by smartphones (Statista, 2023), Vietnam is primarily a mobile-first market. Cashless payments are also increasing rapidly in Vietnam, with 70% of users employing online or in-app mobile wallet payments, a rise of 32% from 2021 (Visa, 2023).

Grab, MoMo m-service, Shopee, and Zalo are leading super app players in Vietnam, offering avariousservices within a single platform. These services include ride-hailing, food delivery, digital payments, and e-commerce, seamlessly integrating into the daily routines of Vietnamese users. Consider a typical day in the life of a Vietnamese user deeply integrated with super apps. Their day might begin with booking a morning commute to work via GrabBike. By lunchtime, they order foods and do the groceries for the evening through ShopeeFood. ThrougThey use Shopee's e-commerce platform throughout the day e various purchases. All the payment transactions within the Shopee ecosystem are facilitated by ShopeePay – an integrated in-app wallet. As the day winds down, they manage household finances by paying for electricity, water, and insurance bills, all through MoMo. Planning ahead, they book weekend movie tickets for themselves and their friends, and conveniently organize the payments, allowing everyone to pay their share directly through MoMo. The day concludes with watching product livestreams and short videos on Shopee before heading to bed. Given these dynamics, Vietnam presents an ideal setting to explore Gen Z's perceptions and intentions towards super app platforms.

3.1.2. Super App Selection

Shopee emerges as one of the top super apps in Southeast Asia, particularly in Vietnam, based on user evaluations across dimensions such as user experience, engagement, awareness, and usefulness (Ipsos, 2022). Originating as an e-commerce platform, Shopee has swiftly diversified its offerings, including food delivery (ShopeeFood) and digital wallet services (ShopeePay). Founded in Singapore in 2015, Shopee has rapidly expanded its regional presence. It became Southeast Asia and Taiwan's most prominent e-commerce operator in 2023, with a staggering gross merchandise value of $47.9 billion, commanding a substantial 63% market share in Vietnam alone (MomentumWorks, 2023). Since its market entry in 2016, Shopee has gained significant traction in Vietnam, drawing in approximately 52.5 million monthly visits and securing its position as the go-to online marketplace for Gen Z consumers. (Aspin, 2021; Nguyen, 2020).

Momo was initially established as an online payment solution. It later transformed into a lifestyle hub with over a hundred "mini-program" embedded within the app, offering a variety of services, including money transfer, bill payment, consumer finance, insurance, e-commerce, shopping, and transportation (AgileTech, 2020). By 2022, Momo acquired over 31 million users, more than 50,000 local partners and 140,000 nationwide payment points (Momo, 2023). It has become the leading digital wallet service in Vietnam with a 68% market share in the fintech industry (Duong, 2023). Momo, hence, is the preferred platform for Vietnamese consumers seeking easy and secure digital payment option.

Both Shopee and Momo are multi-service platforms, offering users access to more than three services within a single app, streamlining the user experience and eliminating the need to download multiple applications. Additionally, both apps ensure a seamless transaction experience by integrating consistent payment systems across various services, enabling users to conduct transactions effortlessly. By utilizing data shared across services, these platforms provide personalized recommendations and tailored experiences based on user preferences and behaviors. Furthermore, Momo and Shopee prioritize an integrated user experience, ensuring consistency in interface and functionality across all services. Thus, given their adherence to the super app dimension, these two super apps serve as optimal choices for examining super app adoption among Gen Z in the Vietnamese context.

Table 3.1. Super App Selection

Super App Dimensions	Momo	Shopee
Offering multiple services across/within industries (≥3)	✓ *Money transfers, bill payments, consumer finance, insurance, e-commerce, shopping, and transportation*	✓ *E-commerce, food delivery, digital wallet*
Single point of entry	✓	✓
In-house payment platform	✓ *Momo Wallet*	✓ *ShopeePay*
Share data across services	✓	✓
Uniform and individual user experience	✓	✓

Source: *Self-derived.*
Note: *Dimensions are adopted from Pearce et al. (2022), Ipsos (2022) and Baquero and Patricia (2021)*

3.1.3. Questionnaire Design

The survey consists of a self-administered questionnaire divided into two sections. The first section aimed to gather data on eight trait-based app dimensions and three user perceptions relevant to adopting super app. The second section collected demographic information from respondents and their usage patterns related to super app. The main constructs in the study were measured using a seven-point Likert scale, ranging from "strongly disagree" (1) to "strongly agree" (7). In contrast, demographic information was collected as categorical data through multiple-choice questions. The survey is initially developed in English, then, were translated into Vietnamese and back-translated to English to ensure reliability and bilingual accuracy. Disparities between the two versions were addressed during the double-back translation. The survey included total 11 variables: eight trait-based app dimensions, four user perception variables, and one intention to adopt variable, determined through existing research and literature review. The final survey has a 35-item Likert scale main constructs questionnaire and a 5-item demographic multiple-choice questionnaire, as detailed in **Appendix 1**. A pilot survey was tested with 10 mobile app users to verify the survey's clarity and validity before its official distribution for data collection.

3.2. Data collection

Data was collected over a period of three weeks, spanning from 12 April 2024 to 26 April 2024, through a survey questionnaire administered via Qualtrics. A force response mechanism is applied for all survey questions while building the survey, thus, there is no missing values in the data set. The survey was distributed through various social media platforms, including Facebook, Instagram, and LinkedIn, as well as university connections, specifically targeting respondents in Vietnam. These platforms were selected for their convenience and effectiveness in reaching the desired demographic of super app users, allowing access to a diverse and representative sample. To increase the response rate, it is made clear that respondents know about the goal and value of the research as well as the data sharing and privacy options. Furthermore, to expand the number of respondents for the study, the survey was also shared among five university professors in Vietnam to cascade to their students.

3.2.1. Sampling method

This study employs a non-probability sampling method, specifically the convenience sampling technique through online platforms. Convenience sampling is chosen for its practicality and suitability in efficiently capturing the target population within this research context. Given the widespread usage of mobile devices and digital platforms among Vietnamese users, this method allows for rapid and cost-effective recruitment of respondents.

3.2.2. Sample size

Various rules of thumb for SEM sample sizes have been proposed, such as a minimum of 100 or 200 (Boomsma, 1982; 1985), or five to ten cases per variable (Bentler & Chou, 1987; Kline, 2011; Nunnally, 1967). Particularly in information systems, the 10-times-rule is commonly used (Kock & Hadaya, 2018). However, Wolf et al. (2013) demonstrated that a one-size-fits-all sample size rule is not an effective estimation method. They advised considering multiple factors, such as the number of indicators, factors, and the magnitude of the loadings, noting that the more variables, the smaller sample sizes needed. For instance, their findings indicated that three factors with six to eight indicators require at least 100 samples, whereas 150 samples are needed for three indicators with the same loading of 0.8. Thus, previous rules of thumb are not advisable; instead, the sample size should be tailored to the specific complexities of the model used in the study. Although several tools exist for calculating sample size, the model from Soper (2024), which builds on Westland's (2010) work is particularly tailored for SEM. According to this calculator, a structured model with 11 latent and 35 observed variables, aiming for a statistical power of 0.8 at a significance level of 0.05, requires at least 175 respondents (**Appendix 2**).

3.3. Data Analysis

The survey questionnaire was conducted as previously described. In this section, the data processing and preparation necessary for hypothesis testing will be discussed. The first part of this session will present descriptive statistics to outline the basic features of the dataset. The second part will analyze the quality and effects of the constructs, which lay the foundation for the SEM-PLS, followed by the MGA for generational groups comparison. The data analysis step will help elucidate the relationships among constructs and latent variables to provide more insights into the patterns and the results of empirical tests in the later chapter.

3.3.1. Initial data cleaning

The survey gathered total 489 responses through a forced-response mechanism, ensuring no missing values. The initial cleaning filters out respondent that use neither of the super apps, and retains respondents familiar with both or either Shopee or Momo. This reduces the valid responses to 382. Moreover, responses from participants who indicated familiarity with both apps were separated into two distinct observations, resulting in a total of 559 observations. Further data cleaning involved calculating the standard deviation for each construct-related questionnaire. Any observations with a standard deviation of zero, indicating consistent or straight-line answer, should be eliminated. After this adjustment, the final dataset comprised 446 observations. In handling group data, Henseler et al. (2016) emphasized the need for consistent treatments across all groups, especially in detecting outliers. Following this, multivariate outlier tests are conducted separately for three generational groups. Two statistical tests are applied to each group to ensure the dataset's reliability and the absence of collinearity. The Mahalanobis distance test is used to identify significant statistical differences between individual observations and the overall sample pattern. Then, a Chi-square distribution test is carried out using the results of the Mahalanobis distance test to check if the differences are statistically significant compared to expected distributions. Observations with a probability value less than 0.001 are considered highly significant and should be excluded from further analysis. This criterion refines the dataset, resulting in a final sample of 359 observations from 258 respondents, which exceeds the minimum sample size required (**Table 3.2**).

3.3.1.1. Data Analysis Method

The data will be analyzed using SEM-PLS model with SmartPLS 4 software, implementing the bootstrap method for hypothesis testing. Firstly, the conceptual model will be tested for Gen Z data to address hypotheses 1 through 18. Then, MGA will be used to compare Gen Z with previous generations. This address hypothesis 19 by evaluating and contrasting the significance of specific paths among three generational groups. The analysis will follow the five-step procedure proposed by Cheah et al. (2023), given the similarities in conditions and model assessments between single and multiple group bootstraps.

3.3.1.2. Step 1 - Data preparation by generating data groups

In Cheah et al.'s (2023) proposed procedure, the first step is defining the groups for comparison. Prior to conducting the survey, it was determined that the research would focus on the generational differences in super app adoption, explicitly examining the contrasts among Gen Z, Gen Y, and Gen X. Accordingly, the groups identified for analysis were Gen X, Y, and Z, categorized in the survey data as numeric responses 1, 2, and 3, respectively. In handling group data, Henseler et al. (2016) emphasized the need for consistent treatments across all groups, especially in detecting outliers.

Table 3.2. Data Preparation

Index	Value
# of participants	489
# of participants use neither of the apps	107
# of participants use both apps	177
# of participants use only Momo	16
# of participants use only Shopee	189
# of observations	559
# straight-line answer	113
# of outliers	90
# of qualified respondents	**258**
# of qualified observations	**356**

***Source**: Self-derived*

Following this, multivariate outlier tests are conducted separately for three generational groups. Two statistical tests are applied to each group to ensure the dataset's reliability and the absence of collinearity. The Mahalanobis distance test is used to identify significant statistical differences between individual observations and the overall sample pattern. Then, a Chi-square distribution test is carried out using the results of the Mahalanobis distance test to check if the differences are statistically significant compared to expected distributions. Observations with a probability value less than 0.001 are considered highly significant and should be excluded from further analysis. This criterion refines the dataset, resulting in a final sample of 359 observations from 258 respondents, which exceeds the minimum sample size required.

Demographics Analysis

Table 3.3 presents the demographic breakdown of our research sample. Gen Z accounts for the largest segment of respondents, which reflects the popularity of super apps among this generation cohort. Conversely, Gen X has the fewest respondents. Most respondents have attained secondary education, with over 50% holding higher education degrees. Given the nature of the age range, 50% of Gen Z respondents are students, and only 30% are employed, in contrast to Gen X and Y, where over 90% are working professionals. Most participants reside in suburban and urban settings in 25 out of a total of 63 provinces in Vietnam. This indicates a geographically diverse sample.

Table 3.3. Demographics of respondents

	Complete (n=258)		**Gen Z (n=158)**		**Gen Y (n=65)**		**Gen X (n=35)**	
	Frequency	*%*	*Frequency*	*%*	*Frequency*	*%*	*Frequency*	*%*
Education								
< High school	2	0.8	1	0.6	1	1.5	0	0
High school	81	31.4	79	50	1	1.5	1	2.9
College degree	57	22.1	30	19	17	26.2	10	28.6
Bachelor's degree	89	34.5	41	25.9	38	58.5	10	28.6
Master's degree	28	10.9	6	3.8	8	12.3	14	40
Doctoral Degree	1	0.4	1	0.6	0	0	0	0
Occupation								
Student	98	38	98	62	0	0	0	0
Employed full-time	111	43	29	18.4	54	83.1	28	80
Employed part-time	30	11.6	24	15.2	5	7.7	1	2.9
Self-employed	11	4.3	4	2.5	5	7.7	2	5.7
Unemployed	3	1.2	2	1.3	1	1.5	0	0
Retired	5	1.9	1	0.6	0	0	4	11.4
Location								
Urban	76	29.5	52	32.9	18	27.7	6	17.1
Sub-urban	181	70.2	106	67.1	47	72.3	28	80
Rural	1	0.4	0	0	0	0	1	2.9
Daily time spent using the mobile app								
Less than 1 hour	45	17.4	24	15.2	12	18.5	9	25.7
1 to 3 hours	89	34.5	47	29.7	28	43.1	14	40
4 to 6 hours	78	30.2	56	35.4	16	24.6	6	17.1
6 to 8 hours	27	10.5	17	10.8	7	10.8	3	8.6
More than 8 hours	19	7.4	14	8.9	2	3.1	3	8.6

Source: *Self-Derived Frequency Results from SPSS*
Note: **n is the number of respondents*

Regarding mobile app usage, Gen Z demonstrates the highest engagement, with 35.4% using apps for 4 to 6 hours daily and 8.9% for more than 8 hours. This extensive usage contrasts sharply with the patterns of Gen X and Y. Specifically, 25.7% of Gen X individuals use apps for less than an hour daily, and only 17.1% use them for 4 to 6 hours. Gen Y shows moderate usage, with 43.1% spending 1 to 3 hours daily on apps and only 3.1% exceeding 8 hours. Since this data is categorical and represented by counts and frequencies, comparing frequency percentages alone might not fully capture the differences between generational groups. Therefore, a non-parametric test is needed to compare the proportions of each generation's responses regarding hours spent on mobile applications. In this case, a pairwise proportion test was conducted using R-studio to calculate pairwise comparisons between proportions.

The results, shown in **Table 3.4**, indicate a statistically significant difference in the time spent on mobile applications between Gen Z and Gen X, Gen Y for all categories of hours spent. Specifically, significant differences were found between Gen Z and Gen Y for 4 to 6 hours and more than 8 hours of usage. However, there was no significant difference between Gen X and Gen Y. These statistical results support the descriptive data, confirming a notable difference in app usage across generations. Gen Z spends more time on mobile applications than Gen Y and Gen X. More Gen Z respondents reported using apps for more than 4 hours daily.

Table 3.4. Pairwise Proportion Test

p-value	Less than 1 hour	1 to 3 hours	4 to 6 hours	6 to 8 hours	More than 8 hours
Gen Z vs Gen Y	0.200	0.113	**<0.001**	0.199	**0.018**
Gen Z vs Gen X	**0.044**	**0.000**	**<0.001**	**0.011**	**0.046**
Gen X vs Gen Y	1.000	0.135	0.17	1.000	1.000

Source: *Self-Derived results from R-studio; the calculation is in* ***Appendix 6***

Descriptive and Distribution Analysis

Table 3.5 reveals distinct preferences for super app features across generations. The multi-service feature of super apps shows a declining appreciation with age as Gen Z rates it highest (5.30 ± 1.079), Gen Y slightly lower (5.102 ± 1.393), and Gen X the lowest (4.55 ± 1.508). Concerns over privacy and data risks also diminish with age, with Gen Z expressing the most concern (5.61 ± 1.126). All groups highly rate the integrated interface and consistent transaction, yet it is most favored by Gen Z (5.424 ± 1.096; 5.659 ± 1.062).

Table 3.5. Descriptive Statistics & Data Distribution

Constructs	Complete (n=356)		Gen Z (n=227)		Gen Y (n=86)		Gen X (n=43)	
	mean	*std*	*mean*	*std*	*mean*	*std*	*mean*	*std*
M	5.161	1.243	5.298	1.079	5.102	1.393	4.552	1.508
U	5.314	1.268	5.424	1.096	5.157	1.539	5.035	1.419
T	5.603	1.143	5.659	1.062	5.605	1.193	5.337	1.384
SB	4.037	1.782	3.855	1.703	4.419	1.877	4.326	1.839
SI	4.783	1.250	4.781	1.222	4.930	1.301	4.453	1.244
PER	4.990	1.125	5.007	1.156	5.001	1.144	4.813	0.938
PCV	5.376	1.122	5.339	1.126	5.477	1.076	5.303	1.300
PCN	4.616	1.389	4.467	1.355	4.907	1.524	4.860	1.166
PR	5.447	1.138	5.615	1.126	5.281	1.038	4.847	1.187
SA	5.370	1.243	5.361	1.177	5.349	1.437	5.279	1.352
ITA	5.406	1.077	5.365	1.056	5.373	1.142	5.489	1.213
MULTITASK	4.339	1.481	4.128	1.551	4.860	1.311	4.256	1.382
SOCIAL	5.219	1.234	5.167	1.250	5.395	1.144	4.919	1.466
INDIV	5.430	1.103	5.476	1.114	5.424	1.080	5.012	1.218
TRANS	5.702	1.118	5.758	1.158	5.692	0.977	5.174	1.434

Source*: Self-Derived frequency results from SPSS*
Note*: *n is the number of responses, M: Multi-service, U: Integrated interface, T: Consistent transaction, SB: Social benefit, SI: Social influence, P: Privacy & Data risks; PER: Personalization; PCV: Perceived Convenience, PCN: Perceived Connection, PR: Perceived risks, SA: Satisfaction; ITA: Adoption and use of super app*

Interestingly, Gen Z perceives fewer social benefits from the super app than previous generations, with their mean rating falling below the overall mean. However, if only the mean values are considered, it is inadequate to confirm the difference between groups. Therefore, a one-way ANOVA test is utilized to compare means between groups and verify which construct will have generational differences. The ANOVA results in **Table 3.6** show a significant difference in the M, PR, PCN, and SB constructs (p-value < 0.05), while the rest are non-significant. This confirms overall differences between generational groups in their evaluation of M, PR, PNC, and SB. Subsequently, a Tukey Honest Significant Difference (HSD) post-hoc test is conducted to identify which groups differ for multiple comparisons. The results show a significant difference in the M construct between Gen X and Gen Y, with Gen Y perceiving more multi-service functionality in super apps on average than Gen X, indicating that younger generations find super apps more multifunctional. However, no significant difference was found in M between Gen Z and the other generations. For the PR construct, the mean for Gen Y is significantly higher than for Gen X and Gen Z, reaffirming the earlier interpretation of the mean values. In the PCN and SB constructs, Gen Y rates these dimensions significantly higher than Gen Z. These findings indicate that while specific features like multifunctionality, social features, and privacy concerns vary, super apps' core functionality and perceptions are consistently perceived across generations. These results provide an overview of the data characteristics and lay the groundwork for deeper empirical investigation in subsequent chapters.

Table 3.6. One-way ANOVA Results

ANOVA Test

Construct	Sum of Squares	Mean Square	F	Sig.
M	20.522	10.261	6.844	0.001
PR	24.258	12.129	9.708	<.001
PCN	14.862	7.431	3.885	0.021
SB	23.613	11.807	3.766	0.024

Tukey's HSD

Construct	(I)	(J)	Mean Difference (I-J)	Sig.
M	1	2	-.549*	0.044
PR	1	3	-.768*	<.001
PR	2	3	-.333*	0.050
PCN	2	3	.439*	0.033
SB	2	3	.564*	0.033

***Source**: Self-Derived Frequency Results from SPSS*

***Note:** Gen X =1, Gen Y = 2, Gen Z = 3*

M: Multi-service, U: Integrated interface, T: Consistent transaction, SB: Social benefit, SI: Social influence, P: Privacy & Data risks; PER: Personalization; PCV: Perceived Convenience, PCN: Perceived Connection, PR: Perceived risks, SA: Satisfaction; ITA: Adoption and use of super app

Correlation Analysis

Table 3.7 presents the correlation matrix for the constructs of three generational groups using the bivariate Pearson Correlation. According to Schober et al. (2018), a correlation value below 0.1 is negligible, 0.1 to 0.39 is weak, 0.4 to 0.69 is moderate, 0.7 to 0.89 is strong, and greater than 0.9 is very strong. For Gen Z and Gen Y, ITA has the strongest correlation with SI (0.604 and 0.635, respectively); and with PCV for Gen X (0.769), while the relationship with the other formative factors is moderate. Notably, for Gen Z, the correlation between PR and all other variables is non-significant except for PCV and T, but these values are very weak (0.156 and 0.056, respectively). Similarly, PR shows significant yet weak correlations with ITA and SA for Gen Y, all below 0.39. In contrast, PR has a moderate relationship with U and T for Gen X. This pattern is intriguing and warrants a more profound exploration in interpreting the model results later. PCV demonstrates a moderate correlation with its formative constructs M, U, and T (0.445, 0.537, and 0.517) across all groups. Similarly, PCN moderately correlates with its formative constructs SI and SB (0.554 and 0.419) for all groups. Additionally, the relationships among M, U, T, SI, and SB range from moderate to substantial for all generational groups.

Table 3.7. Correlation Matrix

	PER	M	U	T	SI	PR	PCV	PCN	ITA	SA
Gen Z										
M	.307**									
U	.469**	**.649****								
T	.277**	**.520****	**.547****							
SI	.451**	.419**	.368**	.393**						
PR	.311**	0.018	0.129	.184**	0.056					
PCV	.414**	.445**	**.537****	**.517****	.463**	.156*				
PCN	.319**	.279**	.331**	.359**	**.554****	-0.055	.454**			
ITA	.415**	.465**	.378**	.366**	**.604****	0.052	**.536****	.473**		
SA	.441**	.314**	.485**	.310**	.374**	0.068	**.565****	.368**	**.598****	
SB	.238**	.193**	.314**	.301**	.349**	0.047	.334**	.419**	.263**	.244**
Gen Y										
M	.343**									
U	.444**	**.739****								
T	.420**	**.625****	**.650****							
SI	.497**	.376**	.484**	**.501****						
PR	0.207	0.155	0.164	.360**	0.185					
PCV	.402**	.339**	.441**	**.581****	**.606****	0.005				
PCN	**.555****	.439**	**.532****	**.521****	**.708****	0.045	**.769****			
ITA	.381**	.473**	**.596****	**.568****	**.635****	.359**	**.536****	**.571****		
SA	.373**	.491**	.409**	**.547****	.332**	.360**	.276*	.348**	.438**	
SB	.351**	**.514****	.469**	.419**	**.583****	0.166	.396**	**.525****	.414**	0.161
Gen X										
M	.498**									
U	.478**	**.751****								
T	**.621****	**.653****	**.782****							
SI	**.599****	.456**	.473**	**.604****						
PR	.327*	0.282	**.506****	.476**	0.108					
PCV	**.586****	.482**	**.504****	**.562****	.306*	.316*				
PCN	.435**	0.103	0.172	0.187	.370*	0.086	.492**			
ITA	**.673****	.360*	.365*	.479**	.315*	0.286	**.764****	**.511****		
SA	.438**	.372*	0.295	.465**	0.219	0.183	**.781****	.349*	**.706****	
SB	.327*	.359*	.481**	.423**	**.512****	0.229	0.215	0.083	0.169	0.029

Source*: Self-Derived Frequency Results from SPSS*
Note: *M: Multi-service, U: Integrated interface, T: Consistent transaction, SB: Social benefit, SI: Social influence, P: Privacy & Data risks; PER: Personalization; PCV: Perceived Convenience, PCN: Perceived Connection, PR: Perceived risks, SA: Satisfaction; ITA: Adoption and use of super app*

3.3.1.3. Step 2: Measurement model assessment

According to the procedure outlined by Hair et al. (2022); Hair et al. (2020), the measurement model assessment should be conducted using a two-step approach. Initially, the focus is on validating the measurement model, which involves assessing the reliability and validity of the constructs. This includes checks for internal consistency, convergent validity, and discriminant validity, ensuring that the scales accurately measure the constructs they are intended to represent. Once the measurement model is validated, the analysis proceeds to the structural model. This second step examines the relationships and causal paths between the constructs defined in the conceptual framework. The objective is to test the hypothesized relationships and determine the strength and significance of each path in the model.

Evaluation of the Measurement Model

As delineated in the paper of Hair et al. (2022); Hair et al. (2020), different criteria apply to reflective and formative constructs when assessing measurement models. For reflective measurement models, the evaluation includes assessing indicator loadings, Cronbach’s Alpha (CA), Composite Reliability (CR), Average Variance Extracted (AVE), and the Heterotrait-Monotrait ratio (HTMT). These criteria collectively ensure that each indicator adequately reflects the underlying construct, focusing on internal consistency, reliability, and convergent and discriminant validity. Formative measurement models require a different set of assessments. It is crucial to address multicollinearity through the Variance Inflation Factor (VIF) to ensure that the indicators do not correlate, thus ensuring the integrity of the model. Additionally, the significance of each indicator's outer weights is examined to determine their contribution to the construct. Discriminant validity is then assessed using correlations between the construct and others in the model (inner construct correlations) and the HTMT criterion to evaluate distinctiveness from other constructs.

All the constructs proposed in the conceptual model of this research are measured as reflective models. However, even with a theoretical foundation for the conceptual models addressed in Chapter 3, Cheah et al. (2023) suggested that it is necessary to re-verify the nature of the constructs (either formative or reflective) and to prevent model misspecification by running a confirmatory tetrad analysis (CTA-PLS). This analysis is particularly pertinent for constructs with at least four measurement items; thus, five constructs, M, P, SI, T, and U, are tested. The results from the CTA-PLS, showing p-values (at a 99% confidence interval) that are non-significant for more than 80% of the iterations, confirm that these constructs are optimally measured as reflective constructs, reinforcing the accuracy of the model specification. The reflective constructs across generational cohorts (Gen Z, Gen Y, Gen X) will first be assessed using factor loadings, and the complete dataset will be evaluated using Cronbach's Alpha (CA), composite reliability (rho_c), and average variance extracted (AVE).

All the first-order loadings of all constructs across inspected groups are higher than 0.6, indicating that the observed indicators have a strong relationship with the latent construct (**Appendix 3**). A loading of 0.70 means that the construct explains about 49% of the variance in the indicator. The results in **Table 3.8** demonstrate robust internal consistency and reliability for all constructs across each group, with CA and CR values exceeding the established thresholds of 0.6 and 0.7, respectively. Specifically, CA values ranged from 0.605 to 0.928, indicating strong internal consistency, while CR values from 0.790 to 0.949 highlighted high reliability. Furthermore, the AVE results confirm adequate convergent validity for all constructs, with all values meeting or surpassing the 0.5 threshold. However, constructs such as multi-service in Gen Z and personalization in Gen X were noted to hover close to this lower boundary.

The results collectively affirm the measurement model's robustness, suggesting that the constructs are well-defined and the indicators substantially explain the variance within the constructs. The strong results across different generational groups reinforce the model's appropriateness for subsequent analyses, including structural model assessment and hypothesis testing within the study.

Table 3.8. Reliability and Convergent Validity

Item	Gen Z			Gen Y			Gen X		
	CA	*CR*	*AVE*	*CA*	*CR*	*AVE*	*CA*	*CR*	*AVE*
M	0.678	0.802	0.505	0.857	0.903	0.700	0.847	0.895	0.682
U	0.793	0.866	0.620	0.928	0.949	0.823	0.865	0.907	0.709
T	0.779	0.859	0.606	0.889	0.924	0.753	0.902	0.932	0.774
SI	0.738	0.835	0.561	0.859	0.903	0.703	0.835	0.879	0.647
PR	0.902	0.924	0.709	0.812	0.866	0.565	0.920	0.936	0.747
PER	0.694	0.824	0.612	0.650	0.808	0.587	0.605	0.790	0.557
PCV	0.758	0.861	0.675	0.839	0.904	0.760	0.865	0.917	0.787
PCN	0.835	0.901	0.752	0.908	0.942	0.844	0.888	0.931	0.817
ITA	0.729	0.847	0.650	0.847	0.907	0.765	0.907	0.942	0.843

Source: *Self-Derived Frequency Results from SPSS*
Note: *CA: Cronbach's Alpha, CR: Composite Reliability, AVE: Average Variance Extracted, M: Multi-service, U: Integrated interface, T: Consistent transaction, SB: Social benefit, SI: Social influence, P: Privacy & Data risks; PER: Personalization; PCV: Perceived Convenience, PCN: Perceived Connection, PR: Perceived risks, SA: Satisfaction; ITA: Adoption and use of super app*

Furthermore, the HTMT ratio evaluates discriminant validity, ensuring that constructs do not overlap. The HTMT method compares the correlations between indicators across different constructs with the average correlation of indicators within the same construct. The results illustrated in **Appendix 4** indicate that all HTMT values fall below the 0.90 threshold, suggesting adequate discriminant validity. This supports the conclusion that each construct is genuinely distinct from others, affirming the validity of all the reflective constructs within the model.

3.3.1.4. Step 3: Assess measurement invariance using MICOM

Cheah et al. (2023) highlight the importance of using the Measurement Invariance of Composite Models (MICOM) procedure within SEM-PLS to test for group invariance before proceeding with MGA. Measurement invariance assesses whether a construct is measured consistently across different groups, which is critical for making valid cross-group comparisons, as emphasized by (Henseler et al., 2016). Without establishing invariance, observed differences across groups could be attributed to measurement artifacts rather than actual differences in the constructs, such as specific response styles (Henseler et al., 2016). This step is crucial to ensure that the observed relationships and effects are genuine and not due to variations in how constructs are interpreted or operationalized across groups. The paper also recommends adjusting the conventional p-value to Sidak's and/or Bonferroni's p-value (from 0.05 to 0.0169524) to address any family-wise error issues.

The MICOM test is executed following a three-stage procedure with these adjusted p-values: configural invariance, compositional invariance, and equal distribution of mean values and variances of composites. The first stage verifies that the constructs are configured similarly across groups, ensuring that the structural or model setup is consistent. This stage is a prerequisite for proceeding as the subsequent steps are interdependent; if the first stage does not yield meaningful results, the subsequent stages cannot be effectively conducted. In this research, the same conceptual model is used for all groups, and identical indicators, data treatment, and algorithm settings are maintained, ensuring consistency in data processing across all groups. The second stage involves checking for compositional invariance to ensure that the composition of each composite - how different indicators or items are weighted to form a composite construct - is consistent across groups. If a composite does not exist consistently across all groups, then the multigroup analysis would not be meaningful (Henseler et al., 2016).

The results in **Table 3.10** indicate that all permutation p-values are non-significant (p-value > 0.1695), suggesting that partial measurement invariance is established. These results qualify the data for the third stage. In steps 3a and b, several significant p-values across groups suggest unequal mean values and variances of composites, indicating that full measurement invariance with equal mean values and variance is not met. Consequently, the data from the three groups cannot be pooled into one dataset to increase the statistical power and generalizability of the model; instead, the model should be estimated separately for each group. Although pooling data from multiple groups can help control for group differences and account for variability within the data, in this case, the partial measurement invariance still permits the comparison of standardized coefficients of the structural model across groups.

3.3.1.5. Step 4: Determine the goal of the analysis

Building on the results of measurement invariance from step 3 and adhering to the prescribed procedures in the referenced paper, the analytical path must be carefully chosen. Initially, the Non-Parametric Distance-Based Test (NDT) is conducted to determine if there are differences across groups based on the complete structural model. If the NDT approach yields a non-significant result, group comparison is rejected, necessitating a re-evaluation of the theoretical justification (Hair et al., 2022). The test results indicate that while dG is non-significant, dL is significant; however, according to Cheah et al. (2023), the significance of one of these two criteria is sufficient to compare the path coefficients across groups.

Table 3.9. NDT Approach

H0: Model-implied indicator covariance matrix is equal across groups			
Distance measure	Test statistics	p-value	Decision
dG	4.4194	0.001	Reject
dL	17.8091	0.104	Do not reject

Source: *Self-Derived Results from R-Studio; the calculation is in* ***Appendix 7***
Note: *dL: average squared Euclidean distance (dL), dG: average geodesic distance*

Given that the primary objective of this analysis is to uncover generational differences in how trait-based dimensions influence the perception, adoption, and usage of mobile applications, it becomes imperative to examine specific path coefficients across these groups. This further analysis

Table 3.10. Measurement Invariance (MICOM)

Generation	Construct	Configural Invariance	Compositional Invariance		Partial Measurement Invariance	Equal Mean Value		Equal Variance Value		Full Measurement Variance
			c=1	p-value		Differences	p-value	Differences	p-value	
Gen Z vs Gen X	ITA	Yes	0.996	0.679	Yes	0.000	0.555	0.062	0.452	Yes
	M	Yes	0.996	0.638	Yes	0.001	**0.000**	0.048	**0.029**	No
	PCN	Yes	0.998	0.400	Yes	0.006	0.085	0.041	0.182	Yes
	PCV	Yes	0.999	0.319	Yes	0.005	0.690	0.059	0.377	Yes
	PER	Yes	0.999	0.278	Yes	0.003	0.340	0.044	0.072	Yes
	PR	Yes	0.987	0.852	Yes	-0.001	**0.000**	0.045	0.678	Yes
	SA	Yes	0.998	0.634	Yes	0.000	0.745	0.059	0.436	Yes
	SB	Yes	1.000	0.292	Yes	0.001	0.102	0.032	0.342	Yes
	SI	Yes	0.999	0.336	Yes	0.001	0.158	0.046	0.854	Yes
	T	Yes	0.996	0.906	Yes	0.007	0.086	0.069	0.205	Yes
	U	Yes	0.998	0.076	Yes	-0.001	**0.043**	0.055	0.122	Yes
Gen Z vs Gen Y	ITA	Yes	0.996	0.983	Yes	0.001	0.956	0.018	0.532	Yes
	M	Yes	0.996	0.357	Yes	-0.002	0.194	0.019	**0.035**	No
	PCN	Yes	0.999	0.666	Yes	0.001	**0.013**	0.016	0.188	Yes
	PCV	Yes	0.999	0.214	Yes	-0.003	0.561	0.023	0.797	Yes
	PER	Yes	0.986	0.067	Yes	0.002	0.998	0.021	0.897	Yes
	PR	Yes	0.923	0.936	Yes	0.003	**0.009**	0.015	0.632	Yes
	SA	Yes	1.000	0.552	Yes	0.004	0.952	0.015	0.115	Yes
	SB	Yes	1.000	0.278	Yes	0.002	**0.013**	0.010	0.104	Yes
	SI	Yes	0.996	0.417	Yes	-0.002	0.307	0.020	0.388	Yes
	T	Yes	0.998	0.469	Yes	0.001	0.698	0.030	0.479	Yes
	U	Yes	0.999	0.741	Yes	0.000	0.095	0.021	**0.011**	No

Source: *Self-Derived Results from SmartPLS 4* should involve examining and comparing the strength of specific path coefficients and evaluating quality criteria such as the coefficient of determination, mean R-square, and effect size (f^2). These assessments are essential for a comprehensive understanding of the underlying dynamics within the structural model and can provide insight into the robustness and relevance of the proposed relationships. This holistic approach ensures that all potential influences and relationships are thoroughly explored and understood, thus enriching the overall analysis and findings of the study.

3.3.2.5. Step 5: Analyze and interpret the test

In previous steps, the reliability of the construct, convergent validity, and MICOM were rigorously tested to ensure the robustness of the measurement model. In step 5, the structural model is evaluated to address the hypotheses proposed in the previous chapter. Initially, it is crucial to address collinearity issues as they can significantly impact the assessment of the structural model and the statistical outcomes of the tests. For this purpose, VIFs are employed to ensure the validity of the model evaluation. Additionally, quality criteria such as R^2, f^2, and Q^2 *values* will be evaluated to validate the structural integrity of the model further. Subsequently, a separate bootstrapping process for the Gen Z dataset will be conducted to test the proposed hypothesis concerning the factors influencing Gen Z's adoption and use of super apps. This bootstrapping analysis will help determine the significance and magnitude of the path coefficients precisely for the Gen Z group. The MGA approach will be applied across all three generational groups—Gen Z, Gen X, and Gen Y—to identify their differences. This comparative analysis is vital for understanding whether the influences of specific variables are consistent across generations or if they vary significantly. The bootstrap and bootstrap MGA results will be thoroughly analyzed and discussed in Chapter 4.

CHAPTER 4: RESULTS

This chapter explores the empirical findings from the hypothesis testing conducted with the SEM-PLS and MGA approaches on the conceptual models. Firstly, the primary aim is to thoroughly investigate the relationships in the models, focusing specifically on how Gen Z adopts and utilizes super applications. Following this, the MGA results will reveal whether there are generational differences in the dimensions and perceptions that influence super app adoption.

4.1. Gen Z bootstrapping results

Initially, key model assessment metrics, such as R^2 (coefficient of determination), Q^2 (predictive relevance), and the effect size - f^2 are evaluated to gauge the robustness and explanatory power of the model. The findings indicate that the model exhibits strong explanatory power and predictive relevance. Notably, the R^2 values for all constructs exceed 0.25, as detailed in **Table 4.1**, with ITA demonstrating an R^2 value of 0.455. This value significantly surpasses the moderate threshold of 0.25, suggesting that the independent variables in the model account for nearly 45.5% of the variance in ITA, a clear indicator of robust model fit. Furthermore, the Q^2 values for all variables above zero indicate that the model holds predictive relevance for the constructs considered. This implies that the model is not only capable of explaining the data well but also possesses the ability to predict future outcomes effectively. This comprehensive evaluation underscores the validity of the structural model in understanding the factors driving the adoption and usage of super apps among the targeted demographic.

Table 4.1. Explanatory power and Predictive relevance

Gen Y	R^2	Threshold	Q^2	Threshold
ITA	0.455	> 0.25 (moderate)*	0.279	> 0 (good)
PCN	0.362		0.348	
PCV	0.364		0.198	
SA	0.323		0.125	
T	0.291		0.273	
U	0.454		0.444	

Source: *Self-Derived Frequency Results from SmartPLS 4*
Note: *Reported R^2 is adjusted R^2. The threshold used is proposed by Hair et al. (2011); Hair et al. (2013) for R^2, and Hair et al. (2017) for Q^2*

Table 4.2 and **Table 4.3** summarize the direct and indirect effects of the structural models concerning the proposed hypothesis. Firstly, the effect sizes f^2 of the direct paths within the model are evaluated. Cohen (1988) defines thresholds for categorizing effect sizes as small, medium, and large if the values exceed 0.02, 0.15, and 0.35, respectively. In this analysis, all variables demonstrate at least a small effect size (f^2 > 0.02). Notably, satisfaction's impact on the adoption and use of super apps (f^2=0.150) is categorized as moderate, while the influence of perceived convenience and connection (f^2=0.039 and f^2=0.060) is relatively small. PCV and PCN both positively influence SA. However, PCV has a much higher effect size on SA (f^2=0.280 vs f^2=0.027). Notably, multi-service exhibits large effect sizes on integrated UI/UX (f^2=0.838) and consistent transaction (f^2=0.417), indicating that the comprehensive service offerings of a super app substantially enhance both the user interface and transaction consistency, which are crucial aspects of user experience. This is strongly supported by the bootstrapping results, where the relationship between multi-service and integrated UI/UX shows a robust positive beta coefficient (β

= 0.675) with a highly significant p-value (p < 0.000), thereby supporting the hypothesis that multi-service functionality significantly enhances UI/UX. A similar pattern is supported for the impact of multi-service on consistent transactions (β = 0.543) with the same significance level.

Direct effects

Out of the 14 direct effect hypotheses, 11 are supported by the results. Both integrated UI/UX and consistent transactions significantly enhance the perceived convenience of super apps, as evidenced by strong beta values and significant p-values (< 0.001). As expected, social benefits and social influences are powerful drivers of perceived connection, yet social influence has a more significant impact (f^2=0.300, β=0.255 vs f^2=0.089, β=0.467). The positive perceptions of super apps in terms of convenience and connection do influence the adoption and use by Gen Z. Yet, their impact is more pronounced on satisfaction, particularly for convenience, underlining their role in driving satisfaction with super apps. However, perceived risks present a notable deviation. The effects of perceived risks on both the adoption and use of super apps and on user satisfaction show non-significant p-values (p=0.670 and p=0.921, respectively), suggesting that perceived risks neither deter the adoption and use of super apps nor significantly impact user satisfaction among Gen Z. Additionally, with personalization intended as a moderator, it is expected that higher levels of personalization might alter the relationship between perceived risks and super apps adoption. However, given that the primary relationship is already non-significant, the role of personalization as a moderator becomes inherently challenging to detect or prove significant.

Table 4.2. Hypothesis Testing Results (Direct Effects)

H	Path	β	t-value	p-value	2.5 %	97.5 %	VIF	f^2	Hypothesis confirmation
Direct effects									
H1-a	M -> U	0.675	14.774	0.000	0.583	0.761	1.000	0.838	Supported
H1-b	M -> T	0.543	7.794	0.000	0.402	0.672	1.000	0.417	Supported
H2	U -> PCV	0.353	5.087	0.000	0.214	0.487	1.426	0.139	Supported
H3	T -> PCV	0.338	4.290	0.000	0.171	0.481	1.426	0.127	Supported
H5	PCV -> ITA	0.191	2.910	0.004	0.063	0.318	1.737	0.039	Supported
H8	SB -> PCN	0.255	4.227	0.000	0.132	0.369	1.148	0.089	Supported
H9	SI -> PCN	0.467	8.408	0.000	0.362	0.579	1.148	0.300	Supported
H10	PCN -> ITA	0.207	2.733	0.006	0.056	0.353	1.353	0.060	Supported
H12	PR -> ITA	-0.027	0.426	0.670	-0.152	0.095	1.220	0.001	Not Supported
H13	PER x PR -> ITA	-0.028	0.485	0.628	-0.106	0.118	1.155	0.002	Not Supported
H14	SA -> ITA	0.362	4.541	0.000	0.196	0.510	1.644	0.150	Supported
H15	PCV -> SA	0.494	7.274	0.000	0.354	0.619	1.305	0.280	Supported
H16	PCN -> SA	0.150	2.436	0.015	0.028	0.271	1.269	0.027	Supported
H17	PR -> SA	-0.007	0.099	0.921	-0.131	0.125	1.049	0.000	Not Supported

Source: *Self-Derived Results from SmartPLS 4*
Note: *Bootstrapping sample = 10,000*

Indirect effects

Regarding the indirect effects within the structural models, the results largely support the hypotheses (10/11), except for those involving perceived risks. Specifically, since perceived risks do not impact satisfaction, it follows logically that the pathway from satisfaction to the adoption and usage of super apps would also remain unaffected by risks. Hypotheses H4-a, H4-b, H6-a, and H6-b concerning multi-services are all supported and highlight the mediating role of UI/UX and transaction consistency. This mediation suggests that the multi-service nature of super apps enhances interface and transaction experiences, boosting perceived convenience and ultimately fostering app adoption and usage. Similarly, integrated UI/UX and consistent transactions, social benefits, and social influence indirectly affect app adoption through perceived convenience and connection respectively. Furthermore, it is noteworthy that the beta coefficients for the indirect paths involving perceived convenience (β = 0.191 vs. β = 0.179) and connection (β = 0.207 vs. β = 0.054) on app adoption via satisfaction are lower than those for their direct paths. This difference is attributed to the compounded effects of mediation, which typically reduce the magnitude of direct effects. This suggests that users who perceive the app as convenient or feel a strong sense of connection within it are more likely to continue using it, regardless of their level of satisfaction.

In summary, the results confirm that if Gen Z perceives convenience and connection in super apps, these perceptions lead to satisfaction and motivate continued use. Conversely, perceptions of risk do not significantly impact their decisions or satisfaction. The findings underscore that the app dimensions that positively influence Gen Z's perceptions of convenience and connection also indirectly influence their intention to adopt and use super apps.

Table 4.3. Hypothesis Testing Results (Indirect Effects)

H		**Path**	**β**	**t-value**	**p-value**	**2.5 %**	**97.5 %**	**VIF**	f^2
Indirect effects									
H4-a	M -> U -> PCV	0.239	5.098	0.000	0.147	0.330	-	-	Supported
H4-b	M -> T -> PCV	0.183	3.566	0.000	0.088	0.288	-	-	Supported
H6-a	M -> U -> PCV -> ITA	0.045	2.572	0.010	0.014	0.083	-	-	Supported
H6-b	M -> T -> PCV -> ITA	0.035	1.990	0.047	0.008	0.075	-	-	Supported
H7-a	U -> PCV -> ITA	0.067	2.596	0.009	0.021	0.121	-	-	Supported
H7-b	T -> PCV -> ITA	0.064	2.164	0.030	0.015	0.130	-	-	Supported
H11-a	SB -> PCN -> ITA	0.053	2.607	0.009	0.015	0.094	-	-	Supported
H11-b	SI -> PCN -> ITA	0.097	2.306	0.021	0.023	0.186	-	-	Supported
H18-b	PCV -> SA -> ITA	0.179	3.530	0.000	0.084	0.283	-	-	Supported
H18-b	PCN -> SA -> ITA	0.054	2.187	0.029	0.009	0.107	-	-	Supported
H18-c	PR -> SA -> ITA	-0.002	0.096	0.923	-0.050	0.047	-	-	Not Supported

Source: *Self-Derived Results from SmartPLS 4*
Note: *Bootstrapping sample = 10,000*

4.2. Multi-group analysis

Comparison of standardized coefficients of the structural model across groups

To address the hypothesis H19-a and H19-b, the MGA will be conducted to identify whether there are differences between Gen Z and Gen X, Y. Similarly, VIF is the initial step for assessing multicollinearity within MGA, ensuring that the statistical estimations are robust and reliable. All VIFs across the generations are below the threshold of 3.3 (**Appendix 5**), except for PCV vs ITA in the Gen Y group, which has a VIF of 3.856. However, since a VIF under 5 is still considered acceptable (Marcoulides & Raykov, 2019). It can be confirmed that there is no severe multicollinearity among the constructs, which will not compromise the validity of the model. The next stage involves comparing the bootstrapping results across data groups to observe cross-group differences in the significance and magnitude of path coefficients. When a path is significant in one group but not in another, it indicates that there are notable differences between the groups. Specifically, this analysis has revealed that Gen Z differs from Gen X and Y in several aspects.

Table 4.4. Bootstrapping results of three generational groups

		Gen X			Gen Y			Gen Z		
Effect	**Path**	***β***	**t**	**p**	***β***	**t**	**p**	***β***	**t**	**p**
Direct	M -> T	0.675	8.070	**0.000**	0.635	6.819	**0.000**	0.543	7.794	**0.000**
	M -> U	0.787	15.198	**0.000**	0.757	10.069	**0.000**	0.675	14.774	**0.000**
	T -> PCV	0.462	1.586	0.113	0.509	3.705	**0.000**	0.338	4.290	**0.000**
	U -> PCV	0.135	0.612	0.541	0.114	0.913	0.361	0.353	5.087	**0.000**
	PCV -> ITA	0.263	1.212	0.226	0.246	1.899	0.058	0.191	2.910	**0.004**
	SB -> PCN	-0.148	1.071	0.284	0.142	1.456	0.145	0.255	4.227	**0.000**
	SI -> PCN	0.489	3.350	**0.001**	0.650	7.810	**0.000**	0.467	8.408	**0.000**
	PCN -> ITA	0.169	1.210	0.226	0.316	2.173	**0.030**	0.207	2.733	**0.006**
	PR -> ITA	-0.006	0.048	0.962	0.289	1.673	0.094	-0.027	0.426	0.670
	PER -> ITA	0.236	1.699	0.089	0.026	0.211	0.833	0.111	1.703	0.089
	PER x PR -> ITA	-0.200	1.491	0.136	-0.045	0.376	0.707	-0.028	0.485	0.628
	SA -> ITA	0.266	1.590	0.112	0.130	1.119	0.263	0.362	4.541	**0.000**
	PCN -> SA	-0.037	0.291	0.771	0.303	2.174	**0.030**	0.150	2.436	**0.015**
	PCV -> SA	0.820	6.335	**0.000**	0.026	0.151	0.880	0.494	7.274	**0.000**
	PR -> SA	-0.009	0.060	0.952	0.355	3.345	**0.001**	-0.007	0.099	0.921
Indirect	M -> T -> PCV	0.312	1.464	0.143	0.323	3.029	**0.002**	0.183	3.566	**0.000**
	M -> T -> PCV -> ITA	0.082	0.914	0.361	0.080	1.583	0.114	0.035	1.990	**0.047**
	M -> T -> PCV -> SA	0.256	1.392	0.164	0.008	0.145	0.885	0.091	3.489	**0.000**
	M -> T -> PCV -> SA -> ITA	0.068	1.030	0.303	0.001	0.101	0.920	0.033	2.627	**0.009**
	M -> U -> PCV	0.106	0.602	0.547	0.086	0.923	0.356	0.239	5.098	**0.000**
	M -> U -> PCV -> ITA	0.028	0.478	0.633	0.021	0.713	0.476	0.045	2.572	**0.010**
	M -> U -> PCV -> SA	0.087	0.620	0.535	0.002	0.093	0.926	0.118	3.987	**0.000**
	M -> U -> PCV -> SA -> ITA	0.023	0.579	0.563	0.000	0.063	0.950	0.043	2.887	**0.004**
	PCN -> SA -> ITA	-0.010	0.277	0.781	0.039	0.886	0.376	0.054	2.187	**0.029**
	PCV -> SA -> ITA	0.218	1.605	0.108	0.003	0.108	0.914	0.179	3.530	**0.000**
	PR -> SA -> ITA	-0.002	0.058	0.954	0.046	0.913	0.361	-0.002	0.096	0.923
	SB -> PCN -> ITA	-0.025	0.727	0.467	0.045	1.118	0.263	0.053	2.607	**0.009**
	SB -> PCN -> SA	0.006	0.221	0.825	0.043	1.168	0.243	0.038	2.003	**0.045**
	SB -> PCN -> SA -> ITA	0.001	0.191	0.848	0.006	0.652	0.515	0.014	1.823	0.068
	SI -> PCN -> ITA	0.083	1.037	0.300	0.205	2.022	**0.043**	0.097	2.306	**0.021**
	SI -> PCN -> SA	-0.018	0.261	0.794	0.197	2.022	**0.043**	0.070	2.297	**0.022**
	SI -> PCN -> SA -> ITA	-0.005	0.243	0.808	0.026	0.843	0.399	0.025	2.088	**0.037**
	T -> PCV -> ITA	0.121	1.001	0.317	0.125	1.680	0.093	0.064	2.164	**0.030**
	T -> PCV -> SA	0.379	1.536	0.125	0.013	0.146	0.884	0.167	4.024	**0.000**
	T -> PCV -> SA -> ITA	0.101	1.124	0.261	0.002	0.102	0.919	0.060	2.874	**0.004**
	U -> PCV -> ITA	0.036	0.494	0.622	0.028	0.700	0.484	0.067	2.596	**0.009**
	U -> PCV -> SA	0.111	0.636	0.525	0.003	0.091	0.927	0.175	3.969	**0.000**

Source: *Self-Derived Results from SmartPLS 4*
Note: *Bootstrapping sample = 10,000*

Table 4.4 underscores the variant paths when comparing Gen Z with Gen X and Y. The results highlight distinct preferences and behaviors across the generations. User satisfaction is positively influenced by both perceived convenience and connection for Gen Z, yet by perceived convenience for Gen X and perceived connection for Gen Y. However, user satisfaction, perceived connection and convenience does not influence Gen X and Gen Y's intention to adopt and use super apps (p-value > 0.05). Noticeably, the perceived risk does not significantly influence the intention to use the app across all generations. However, it paradoxically influences the satisfaction of Gen Z positively (β=0.355, p-value=0.001), which is not observed in other groups and need further investigation.

Statistical robustness of the observed structural differences

After evaluating the differences in the structural model paths across three groups, the results of the bootstrap MGA were analyzed to determine the statistical robustness of the observed structural differences (**Table 4.5**Table 4.5). The results revealed five paths with significant differences. Specifically, a statistical difference (+0.403) in the path from social benefits to perceived connection indicates that perceived connection is enhanced more significantly in Gen Z compared to Gen X. This underscores that Gen Z places greater emphasis on social engagement within super apps, which profoundly impacts their perceived connection. Consequently, the impact of social benefits on app adoption through perceived connection is also more substantial (+0.078) in Gen Z than in Gen X, reinforcing the role of social integration in super app adoption of Gen Z.

The effect of convenience on satisfaction is substantially more substantial in Gen Z than in Gen Y (+0.469). Hence, the mediating role of satisfaction in the relationship from perceived convenience to intention to adopt also proves to be more significant in Gen Z compared to Gen Y (+0.176). Notably, as observed in the previous session, the relationship between perceived risk and satisfaction exhibits an unusual pattern since it is positive for Gen Y while being negative for Gen Z. The potential causes will be discussed in the next chapter, where they will be compared and explained with reference to previous research.

Table 4.5. Bootstrap MGA Results

Hypothesis	Path	Statistical Difference	p-value	Comparison
H8	SB -> PCN	0.403	0.011	Gen Z vs. Gen X
H11-a	SB -> PCN -> ITA	0.078	0.011	Gen Z vs. Gen X
H15	PCV -> SA	0.469	0.011	Gen Z vs. Gen Y
H17	PR -> SA	-0.361	0.006	Gen Z vs. Gen Y
H18-b	PCV -> SA -> ITA	0.176	0.006	Gen Z vs. Gen Y

Source: *Self-Derived Results from SmartPLS 4*
Note: *Bootstrapping sample = 10,000*

The results of the MGA provide empirical support for the two final hypotheses, highlighting observable differences across generational groups. These differences confirm that Gen Z perceives and evaluates the adoption and use of apps distinctly from Gen X and Y. In the subsequent chapter, these empirical findings will be discussed in depth to derive meaningful insights and a deeper understanding of the results.

CHAPTER 5: DISCUSSION

This chapter will delve deeply into the empirical results for Gen Z, alongside the Multi-Group Analysis (MGA) across various generational groups. The discussion aims to extract meaningful insights and implications by comparing these findings with previous studies. This approach will enhance the understanding of the specific dimensions and perceptions that influence super app adoption and usage of Gen Z and discover how these factors differ across generations

5.1. Discussion of Gen Z results

5.1.1. Perceived convenience and its formative dimensions.

The results of Gen Z provide critical insights into their perceptions and evaluations of super apps, particularly highlighting their preferences for a variety of services on the app that is mediated through an integrated interface UI/UX and consistent transactions can significantly influence their adoption intention by reducing the time and effort required.

The relationship between trait-based dimensions and perceived convenience

The significant and strong positive impacts of paths from M to U and M to T indicate that the perception of an integrated UI/UX and consistent transactions is influenced by the variety of services offered by super apps. This supports hypotheses H1-a and H1-b that multi-service functionality positively influences the perception of integrated UI/UX and consistent transactions. Therefore, by offering many services, the super app ecosystem enriches the Gen Z user experience through its seamlessly integrated interface and consolidated payment options. This integration positively influences the perceived convenience of Gen Z by efficiently reducing the time and effort required to switch between apps or learn new procedures for different tasks and to repeatedly enter payment information for various services. This further supports hypotheses H2, H3, H4-a, and H4-b, which suggest that integrated UI/UX and consistent transactions positively influence the perceived convenience of super apps and mediate the relationship between multi-service functionality and perceived convenience. U and T are features that make super apps so convenient, as users can do anything within a highly integrated ecosystem. Gen Z can coordinate multiple activities and tasks simultaneously with other app users without switching back and forth. Similarly, Lai and Liew (2021) also conceptualized perceived convenience as encompassing convenient transactions, a multi-functional design, and a single platform in studying the intention to adopt mobile applications. Hence, the three mobile application attributes: multi-service functionality, integrated UI/UX design, and a consistent transaction process - are crucial factors that directly and indirectly affect perceived convenience.

It can be inferred from the results that convenience is perceived and enhanced when Gen Z has access to various services, an easy-to-use app, and straightforward transactions.

The relationship between perceived convenience and intention to use and adopt

The significant paths from PCV to ITA underscore that perceived convenience is a crucial determinant of adoption intentions for Gen Z. This supports hypothesis H5, which posits that perceived convenience positively influences the adoption and use of super apps. This finding is supported by Sari et al. (2022), who studied Gen Z's adoption of a similar e-wallet application, GoPay, in Indonesia and found that perceived convenience was the top priority for attracting users. However, this contrasts with Alfa'izy et al.'s (2023) findings on Gen Z. Additional support comes from research on mobile payments and mobile commerce not specifically targeting Gen Z. Gao et al. (2015), Williams (2021), and Shaw and Sergueeva (2016) found direct effects of perceived convenience on adoption, while Lai and Liew (2021) and Park et al. (2019) observed indirect effects through perceived security or attitude. This study conceptualizes perceived convenience as a fast, speedy application that helps users save time and effort. Therefore, the findings that convenience influences Gen Z's adoption and usage intention suggest that Gen Z, as digital natives, values efficiency and expects services to be fast and responsive. Hence, super apps like e-wallets such as Momo or e-commerce platforms like Shopee, which provide speedy payments and quick access to multiple services, align perfectly with this generation's expectations.

Therefore, the perceived convenience of super apps that can reduce the time and effort needed to complete tasks is in line with Gen Z's expectations and preferences. This consequently influences their adoption and use of super apps.

The relationship between trait-based dimensions and intention to use and adopt

Moreover, the significant path effects from multi-service functionality, integrated UI/UX, and consistent transactions to the intention to adopt indicate that the convenience created by these traits is crucial for fostering the adoption and usage of super apps by Gen Z. This supports hypotheses H6-a, H6-b, H7-a, and H7-b, which posit that perceived convenience mediates the relationship between these trait-based dimensions (multi-service functionality, integrated UI/UX, and consistent transactions) and the use and adoption of super apps. This finding aligns with Salehi et al. (2023), who noted that the diversity of services in super apps positively influences user adoption and usage through satisfaction and enjoyment. Enhancing the variety of services is key to encouraging super app usage and adoption. Studies by Puiu et al. (2022), Sözer (2019) and Huang et al. (2019) also highlight the importance of a user-friendly interface in adopting super apps among Gen Z. Notably, ease of use is a significant factor affecting the intention to adopt, as found in numerous studies on mobile payment apps, where it is defined as effortless payment. Nur and Panggabean (2021) also found similar results specifically for Gen Z. Given the in-house digital payment or wallet feature of super apps, these findings about ease of use are relevant and reinforce the convenience and comfort that integrated and consistent transactions bring to Gen Z, influencing their adoption intentions.

Therefore, it can be inferred that 3 trait-based dimensions, M, T, and U, are key factors that indirectly drive Gen Z's intention to use and adopt super apps via perceived convenience.

5.1.2. Perceived connection and its formative dimensions

The analysis also underscores the importance of social functionalities of super apps, as demonstrated by the significant effects of social benefits on perceived connection and further on intention to adopt and use through mediated paths.

The relationship between trait-based dimensions and perceived connection

Both social influence and social benefits have a significant impact on perceived connection. This suggests that Gen Z will feel more connected to the application and perceive themselves as part of the community if they experience social benefits, such as the ability to share and connect with friends and app users. Hence, this develops a sense of familiarity and forms social connections inside the app that enhance their perceived connection. Salehi et al. (2023) highlighted the importance of social integration in mobile applications, noting that creating online communities where users can interact, engage, and share experiences generates social benefits for users. Additionally, recommendations and referrals from friends, family, or celebrities further enhance Gen Z's sense of connection to the app since social influence substantially affects perceived convenience more than social benefits. This aligns with the characteristics of Gen Z, as being significantly influenced by trusted ones. Thus, they are more likely to feel connected and familiar with an app when they receive social or celebrity referrals.

It can be inferred from the results that perceived connection is enhanced when Gen Z experiences social benefits and influence from their social circles.

The relationship between perceived connection and usage and intention to adopt

Perceived connection significantly and positively affects the intention to use and adopt super apps among Gen Z, supporting hypothesis H10. When users feel a sense of community or connection with an app, it creates emotional bonds that can drive initial adoption and continued use. This sense of belonging is essential for Gen Z, who value social interactions and maintaining connections with their peers. Furthermore, support and engagement within the app's community provide additional value, encouraging adoption and ongoing use. Gogan et al. (2018) also found that fostering a sense of community within apps enhances attachment and reinforces users' commitment to the platform.

Therefore, Gen Z are more likely to adopt and use super apps if they feel connected or have a sense of community inside the app.

The relationship between trait-based dimensions and intention to use and adopt

The indirect effects of social benefits and social influences on the intention to use and adopt super apps, mediated by perceived connection, are significant. This supports hypotheses H11-a and H11-b, indicating that social benefits (SB) and social influence (SI) positively influence the adoption and use of super apps through perceived connection. This finding aligns with Salehi et al. (2023), who found that social benefits significantly impact super app usage through enhanced user engagement and connection. Social benefits help form emotional connections with the app. For example, on super e-commerce apps like Shopee, Gen Z can share their buying experiences, products, reviews, and comments, fostering community. This is similar to social commerce, where sharing and reviewing shopping experiences create an authentic, reliable community for purchasing decisions. Such engagement and social values influence Gen Z's intention to adopt and use social media. Social influence acts as validation from trusted individuals such as friends, peers, family, or celebrities. The influence of these people who have used or are using the app can significantly impact Gen Z's behavior. For instance, if a group of friends uses the Momo e-wallet to coordinate payments or compete in games within the super app, a group member is more likely to adopt the app due to peer influence and perceived connection. Previous studies have also found a significant impact of social influence on the intention to use super apps among Gen Z in Vietnam (M. P. Nguyen et al., 2023; Nguyen, 2023) and Gen Z in other contexts (Alfa'izy et al., 2023; Nur & Panggabean, 2021; Wei et al., 2021; Windasari et al., 2022).

Therefore, social benefit and influence are essential factors that indirectly drive the intention to use and adopt Gen Z for super apps via perceived connection.

Perceived risk and personalization as moderation

Interestingly, perceived risks were found to have no significant impact on the intention to adopt and use super apps, suggesting that Gen Z may have a higher tolerance for risks. The result does not support hypothesis H12 that perceived risks negatively influence the adoption of super apps and contrasts with the majority of earlier findings that noted significant negative impacts of risks app adoption of Gen Z (Axcell & Ellis, 2023; M. P. Nguyen et al., 2023; Ruangkanjanases & Wongprasopchai, 2021; Wei et al., 2021). However, it finds support from Windasari et al. (2022) and Hapsari et al. (2023). This discrepancy might indicate that although Gen Z is concerned about privacy, yet, the compensating values or security measures might overshadow the associated risks. Chadraba (2021) also found that even though users are aware of the heightened privacy concerns associated with social network services (SNS), the benefits they receive from these platforms outweigh the risks, leading them to continue using and adopting SNS platforms. This phenomenon can be elucidated through Herzberg's two-factor theory. Herzberg et al. (1959) posited that individual motivation is driven by two distinct types of factors: motivators, which lead to satisfaction, and hygiene factors, which prevent dissatisfaction. These factors operate independently, meaning that addressing or resolving issues related to hygiene factors does not necessarily increase overall satisfaction. Instead, it merely prevents dissatisfaction. For instance, perceived risks associated with mobile applications, classified as hygiene factors, may cause dissatisfaction if not appropriately managed. However, mitigating these risks does not inherently enhance satisfaction with the app. Therefore, while Gen Z may perceive risks in using these apps, efforts by app providers to address these concerns are essential to prevent dissatisfaction but do not significantly influence their satisfaction and intention to adopt and use super apps. Moreover, while personalization is believed to moderate the relationship between perceived risks and app usage, its effect was non-significant in this context. This is possibly because the personalization in the investigated apps was not pronounced enough to exert a substantial moderating influence, especially when the original relationship was non-significant. This result does not support hypothesis H13 that personalization moderates the relationship between perceived risks and the adoption of super apps. However, this personalization-privacy paradox was found to be significant by Guo et al. (2015), indicating that higher personalization levels may heighten consumers' privacy concerns. However, Cheng et al. (2020) found that personalization is a significant moderator, not for the relationship between risk and intention to use but for performance expectancy and habit. Previous also studied the direct effect of personalization on intention to adopt and found a significant effect (Liu & Tao, 2022).

It can be inferred from the results that perceived risks are not a key determinant of Gen Z adoption and use of super apps due to potential compensating perceived values.

5.1.3. User Satisfaction

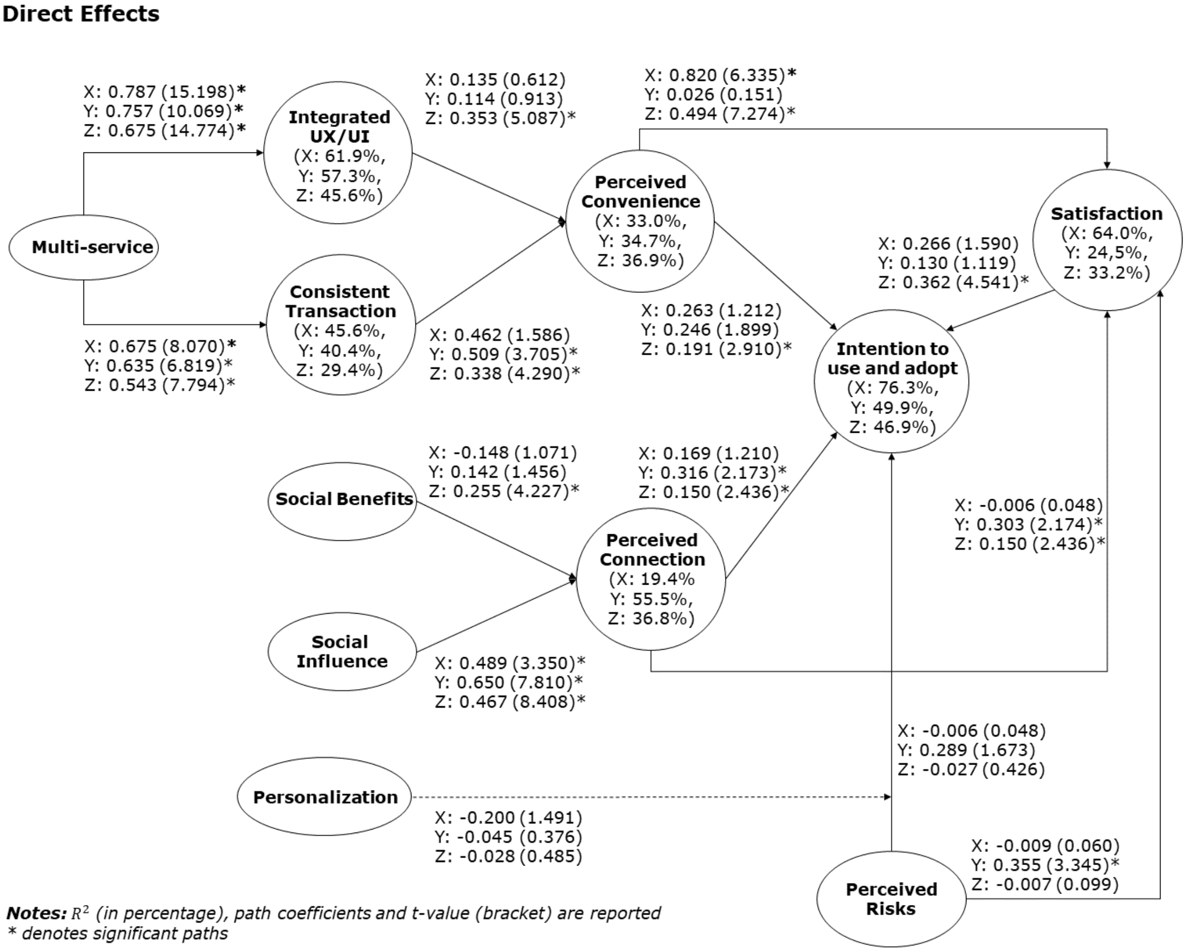
Satisfaction exerts the most substantial impact on the intention to use and adopt super apps, making it a critical criterion for app continued use (Tam et al., 2018). This supports hypothesis H14, which posits that user satisfaction positively influences the use and adoption of super apps. The success of super apps is contingent on user satisfaction, as it enhances both adoption intentions and continued usage (Salehi et al., 2023). This underscores the importance of satisfaction for Gen Z. Several studies adopting the ECM also assert that user cognitive perceptions such as expectations and satisfaction significantly affect their intention to use and adopt technology. Key factors influencing satisfaction, and thereby the intention to use, include performance expectancy (perceived usefulness), effort expectancy (perceived ease of use and usability), and perceived playfulness (enjoyment and engagement). Various researchers corroborate these findings (Malik & Rao, 2019; Oghuma et al., 2016; Tam et al., 2018; Tsai et al., 2020). In this study, perceived convenience and connection have strong and significant positive effects on satisfaction, directly influencing the intention to adopt. This supports hypotheses H15 and H16, which posit that perceived convenience and connection positively influence user satisfaction. However, the direct path from perceived convenience and perceived connection to the intention to use and adopt super apps is also significant. This indicates that users who perceive the app as convenient or feel a strong sense of connection within it are more likely to continue using it, regardless of their level of satisfaction. The influence of convenience on satisfaction is supported by Chotigo and Kadono (2021), who found that convenience has a crucial impact on customer satisfaction. While no studies directly address the impact of perceived connection on satisfaction, social influence is a significant indicator (Chotigo & Kadono, 2021). However, social benefit impacts engagement rather than satisfaction (Salehi et al., 2023). Additionally, trait-based dimensions such as M, T, U, SI, and SB indirectly affect satisfaction through perceived value (connection and convenience). The total effect of these factors on satisfaction is significant, supporting previous findings on the influence of ease of use, usefulness, and social influence via perceived value on satisfaction. Contrary to hypothesis H17, perceived risk does not affect satisfaction. Malik and Rao (2019) also found that perceived security does not impact satisfaction. As explained above with Herzberg's two-factor theory, perceived risks or security are considered hygiene factors; their absence can lead to dissatisfaction, but their presence does not necessarily enhance satisfaction. On the other hand, convenience and connection, along with their associated trait-based dimensions, act as motivators that greatly influence satisfaction with super apps. Consequently, perceived risks do not impact Gen Z's satisfaction with super apps; they are more concerned with functionality and perceived value when it comes to satisfaction. Therefore, while managing perceived risks is essential to prevent dissatisfaction, convenience and connection primarily drive Gen Z's satisfaction and continued use of super apps.

In conclusion, satisfaction is a robust indicator of Gen Z's adoption and usage of super apps, and it is enhanced by perceived connection and convenience, unaffected by perceived risks. Trait-based dimensions also indirectly affect satisfaction through corresponding perceived value.

5.2. Multi-Group Analysis Discussion

The bootstrap results of each generation and bootstrap MGA to compare statistical differences conducted on Gen Z vs Gen Y and X, revealing a difference between generational groups. This supports the hypotheses H19-a and H19-b that Gen X, Y, and Z perceive and evaluate the adoption and use of the super apps differently. **Figure 2** presents the bootstrapping results of three generational groups for direct effects. Intentional behavior is often unpredictable and influenced by numerous factors. Thus, research on this typically faces challenges in achieving high R^2 values. Specifically, the R^2 value is underestimated for research that adopts the Likert scale questionnaire (Owuor, 2001). Ozili (2022) proposed that R^2 value of 10% or higher for social science research if a significant number of the predictors are statistically significant. In this analysis, the R^2 values for the three generational groups, ranging from 19.4% to 76.3%, are considered acceptable. Notably, Gen X group displays much higher R^2 values than Gen Y and Gen Z. While R^2 is commonly seen as an indicator of model fit, it is not always a reliable measure of how well a model fits the data. In particular, the sample size for Gen X (43) is much smaller compared to Gen Y (86) and Gen Z (227). Small sample sizes can cause R^2 values to be biased upwards (Cramer, 1987), leading to overfitting. This means the model may fit the sample data well, resulting in a high R-squared value, but not generalize well to other datasets. Therefore, the higher R^2 value for Gen X does not necessarily indicate that Gen X data fits the model better than the other generations' data, as the smaller sample size may introduce bias.

Figure 2. Structural Model Comparison



Notes: *R^2 (in percentage), path coefficients and t-value (bracket) are reported*
** denotes significant paths*

Source: *Self-derived results from SmartPLS 4*

5.2.1. Generational differences

Perceived Convenience and Perceived Connection

The results indicate that perceived convenience is a key determinant of super app use and adoption for Gen Z but not for Gen X and Gen Y. This finding partially supports the multi-group analysis by Williams (2021), which highlighted generational differences in the path from convenience to the intention to use, showing significance for Gen X but not for Gen Y. Conversely, the influence of perceived connection on the intention to use and adopt super apps is significant for both Gen Y and Gen Z. However, not for Gen X. This discrepancy can be attributed to the higher levels of social connectivity and familiarity with social media, the internet, and digital platforms among Gen Y and Gen Z, making them more likely to feel connected to a mobile application and adopt it compared to Gen X, who have less digital influence. Additionally, these findings suggest that Gen Z are particularly satisfied with the convenience and connection that super apps provide, leading to their adoption and continued use. In contrast, Gen Y and Gen X may have different evaluation criteria and established app usage habits, making either convenience or connection less significant in influencing their satisfaction and adoption decisions. This underscores the importance of considering generational differences when analyzing the factors driving super app adoption.

The trait-based dimensions

The trait-based dimensions are tailored to the characteristics of Gen Z, indicating their distinct impacts compared to previous generations. For all generations, multi-service enhances the integrated UI/UX and consistent transactions, demonstrating that various services uniformly improve user experience. However, the total effect of multi-service functionality does not significantly impact the intention to adopt and use super apps through perceived convenience and integrated UI/UX and consistent transactions for Gen X and Gen Y. This finding highlights that Gen Z uniquely values a diverse range of services within one app, enabling them to perform multiple tasks simultaneously and efficiently through a seamless and integrated user experience. This aligns with their multi-tasking nature, which saves time and effort, leading to perceived convenience and ultimately driving their intention to adopt super apps. In contrast, while Gen Y and Gen X appreciate the enriched user experience from multi-service super apps, it does not directly translate to perceived value or adoption intention. Social benefits do not significantly impact perceived connection or the intention to use super apps for Gen Y and Gen X, emphasizing the differing social needs between Gen Z and older generations. Gen Z, driven by social connections, sharing, FOMO, and FOLO, finds social benefits more influential on their use and adoption intentions. For Gen Y and Gen X, features like sharing, commenting, and connecting with their social circles are less critical, these features are nice to have but not decisive. Conversely, social influence significantly affects both perceived connection and the intention to use and adopt super apps for Gen Y and Gen Z, but not for Gen X. Social influence serves as validation from peers, which is more relevant for Gen Y and Gen Z as these super apps are more prevalent among their generation, fostering a stronger connection to the app and driving adoption. The bootstrap MGA results also reveal a significant difference in the impact of social influence on the intention to adopt between Gen X and Gen Z, with a much stronger effect observed for Gen Z.

User satisfaction

In contrast to Gen Z, the drivers of satisfaction for Gen X and Gen Y differ, focusing on convenience or connection. Gen X are more satisfied with super apps if they perceive them as convenient, as convenience saves time and effort in completing tasks. Conversely, convenience is not significant for Gen Y; their satisfaction is enhanced if they feel more connected to the apps. The bootstrap MGA results also confirm that the impact of perceived convenience on satisfaction is significantly different for Gen Z, where the impact is much stronger. Furthermore, satisfaction does not influence the intention to use and adopt super apps for both Gen X and Gen Y. At the same time; the impact is strong and significant for Gen Z. This indicates that satisfaction is not a critical criterion for Gen X and Gen Y since these groups may have other considerations or primarily use the app for functionality rather than satisfaction.

Perceived Risks

Perceived risks do not impact the intention to adopt and use super apps across all generations. This indicates that regardless of their generation, users do not consider risk a deterrent when adopting or using super apps. Several factors contribute to this phenomenon, including the reputation and security measures communicated by app providers, social references, or other perceived values that might compensate for the potential risks. Notably, awareness and understanding of privacy among Vietnamese users (59%) are higher than in the APAC region (35%), the world average (35%), and most APAC countries (WIN, 2021). As individuals become more aware of privacy concerns and understand how their data is collected and used, they become more wary and concerned about data sharing (Chadraba, 2021). Therefore, the security measures that app providers take to mitigate risks are potentially more important to skeptical Vietnamese users than the risks themselves. Interestingly, Gen Y uniquely responds to perceived risks, showing positive and significant impacts on satisfaction, suggesting that high perceived risks enhance their satisfaction. This contrasts starkly with Gen Z and Gen X, where perceived risks do not significantly influence satisfaction with super apps. Thus, Gen Y weighs risk factors more heavily in their satisfaction judgments than other generations. According to WIN (2021), privacy concerns about sharing information digitally are higher among Gen Y (67%) than Gen Z (60%). The statistical difference from bootstrap MGA results further supports this, indicating that the impact of perceived risk on satisfaction is higher for Gen Y than for Gen Z.

The differences in technological and economic contexts have likely shaped how these generations view technology risks. Being less familiar with digital or privacy risks, Gen X might not factor them heavily into their satisfaction, placing more importance on convenience and ease of use. Gen Z, exposed to rapid technological advancements, is more aware and conscious of perceived risks but more resigned to living with certain digital risks as part of everyday life. Conversely, having witnessed both the rise of the internet and the consequences of digital privacy issues, Gen Y might be more attuned to these risks and thus appreciate when they are effectively managed. A plausible explanation for this seemingly paradoxical result is that Gen Y is typically well-aware about the potential risks associated with using super apps - psychological costs linked to potential security breaches (Broekhuizen & Jager, 2004). Despite these concerns, super app providers actively manage and clearly communicate their risk mitigation strategies, which provides psychological comfort that helps to alleviate the risk perceptions. This dynamic is somewhat similar to scenarios of service failure, where customer satisfaction can unexpectedly increase if a company addresses a service failure with effective and prompt recovery measures. The principle here is that proactive management and transparent communication about security measures can transform potential negative experiences into positive ones, enhancing overall user satisfaction. For instance, e-wallets such as Momo and ShopeePay handle sensitive user data such as bank account details and home addresses. These data are inherently high-risk, but if the associated risks are managed effectively and users are kept well-informed and reassured about privacy and safety measures, it can compensate for potential concerns and increase user satisfaction. Moreover, since the original relationship between perceived risks and intention to adopt is non-significant, it is unclear whether the moderation effects of personalization vary across generational groups.

5.2.2. Partial Measurement Invariance

It is also critical to note that the dataset exhibits partial measurement invariance, which may contribute significantly to the observed variability in the MGA results. This invariance suggests that while some variables maintain consistency across groups, others do not, potentially affecting the findings' interpretability and reliability. Although conclude that while full measurement invariance is not a pre-requisite for multi-group analysis (Robitzsch & Lüdtke, 2023), group comparisons can be meaningless without establishing measurement invariance, and the group differences (Henseler et al., 2016; Jeong & Lee, 2019). If the measures are not invariant, it is not certain that differences between groups are the construct differences or due to differences in measuring the construct. Consequently, this variability also limits the ability to assess moderation effects comprehensively within the dataset (Henseler et al., 2016).

CHAPTER 6: CONCLUSION, RECOMMENDATIONS, AND LIMITATIONS OF THE RESEARCH

This chapter provides a summary of the research models and findings. It further elaborates on the recommendations, implications, and limitations that should be addressed in future research.

6.1. Research conclusion

This research investigates the criteria Gen Z uses to adopt super apps and explores how these criteria differ across generational groups. The evaluation dimensions for app adoption are specifically formulated based on the characteristics of super apps and the usage behaviors of Gen Z. The four primary dimensions of super apps include offering multiple services through a single app, providing a consistent transaction experience, facilitating data sharing across services, and delivering an integrated user experience. Gen Z's usage behaviors are characterized by eight dimensions: multitasking, a preference for ease of use and effortless payments, individualism, social connectivity, influence by social opinions, privacy concerns, and openness to data exchange. Based on the combination of these traits, the study formulates evaluation dimensions that Gen Z uses to evaluate the adoption and usage of super apps: multi-service offerings, consistent transactions, integrated UI/UX, social benefits, and social influence. The research focuses on the influence of these dimensions on the adoption and usage of popular super apps like Momo and Shopee, facilitated through the mediating roles of perceived value, such as convenience and connection, while also considering perceived risks and user satisfaction. The MGA approach is employed to analyze the differences in adoption across generations.

Out of 27 tested hypotheses, 22 were supported, with 21 hypotheses addressing Gen Z demographics and 2 hypothesizing generational differences. The findings demonstrate that all the identified evaluation dimensions significantly and positively influence the use and adoption of super apps for Gen Z. These influences are mediated through perceived convenience and connectivity, emphasizing the importance of these factors in the adoption process. Satisfaction is the most influential factor in their adoption decisions and is significantly driven by convenience and connection. Thus, emphasizing and enhancing these aspects are crucial strategies for attracting and retaining Gen Z users. Perceived risks do not significantly impact Gen Z's adoption and use of super apps, likely offset by compensatory values. Nevertheless, managing these risks as hygiene factors is important to ensure a secure environment within the super app. Similarly, personalization is hypothesized to moderate the relationship between perceived risks and app usage, yet its moderating effect was non-significant. The study also highlights generational differences in evaluating super app adoption. For all generations, features like multi-service functionality enhance the integrated UI/UX and consistent transactions, indicating that a diverse range of services uniformly improves user experience. However, these features do not necessarily translate to perceived convenience for Gen X and Gen Y. Social influences are crucial for perceived connections across all generational groups. However, social benefits are particularly significant for Gen Z, reflecting their highly social characteristics. For Gen X, neither perceived connections nor perceived convenience significantly drive the intention to use, though perceived convenience enhances app satisfaction. For Gen Y, while perceived convenience does not affect the intention to use, perceived connections are pivotal in driving their intention to use and overall satisfaction.

Interestingly, perceived risks do not impact Gen Z or X in terms of satisfaction or usage intentions, but they positively influence Gen Y's satisfaction. These findings suggest that super app providers should consider the distinct characteristics and generational differences when designing their applications.

6.1.1. Academic Implications

This research introduces a new framework for evaluating technology adoption, specifically tailored to the characteristics of super apps and matching Gen Z's usage patterns. Traditional technology acceptance models, such as TAM, TPB, DOI, and UTAUT, proposed over the past two decades, are often insufficient for predicting the acceptance of complex and disruptive innovations like super apps. Although elements like effort expectancy, performance expectancy, social influence, perceived risks, and behavioral intention from the UTAUT models still demonstrate relevance due to their proven significance across various studies, they are yet to completely capture or predict Gen Z's adoption intentions for mobile applications. This study, hence, contributes an evaluation framework that integrates the unique features of super app technology and the specific characteristics of Gen Z users. The evaluative dimensions include essential app features: multi-service functionality, consistent transactions, integrated UI/UX, perceived values (connection and convenience), perceived risks, and satisfaction. Furthermore, the research provides empirical evidence on how different generations perceive, evaluate, and prioritize their expectations and needs concerning mobile applications. This approach significantly enhances the existing literature by providing a deeper understanding of generational differences in technology adoption by employing the MGA method to compare Gen X, Y, and Z. It reveals that features critical to Gen Z might not be as valued by Gen Y and X due to differences in values, technology usage, lifestyles, and economic conditions.

6.1.2. Managerial Implications

For this demographic, emphasizing and enhancing perceived convenience and connectivity is crucial to attract and retain them. Super app providers can boost perceived convenience by expanding the variety of services, keeping Gen Z users actively engaged within their app ecosystems. They should also develop user interfaces and journeys that are intuitive and easy to navigate, allowing for quick access to desired services. Simplifying the transaction process by requiring users to enter payment information only once for all subsequent transactions can significantly enhance convenience. Moreover, incorporating social benefits such as content sharing and user interactions will strengthen the perceived connection.

Understanding generational differences and the shared evaluation dimensions for super app adoption enables app developers and marketers to effectively standardize and tailor their app designs and marketing strategies. This approach ensures that while the super app meets the broad needs of a diverse user base, it also addresses the specific preferences of different age groups. Specifically, dimensions such as multi-service offerings and perceived risks should be standardized in service design and communication. Multi-service offerings significantly improve UI/UX and transaction consistency across all generational groups. This suggests that super apps should continue diversifying, integrating more services into one app, and improving the user experience with seamless UI/UX and effortless transactions. Although perceived risks do not have an impact on super app adoption across generations, issues related to privacy and data sharing should still be managed diligently to ensure a secure environment. Users should be informed about how their data is used and what security measures are in place to protect it. Given that Gen Y is particularly sensitive to perceived risks, enhanced communication efforts about app and data security are necessary to address their heightened concerns.

Other dimensions should be adapted to meet the specific expectations of different generational groups. Super app providers should recognize that while older generations value convenience and reliable experiences, younger generations seek more than just convenience. Enhancing social integration features would particularly resonate with the younger generations, who value social values within the apps. Specifically, for Gen Y and Gen Z, social integration and engagement are essential for attracting and retaining them within the apps. Developing a sense of community, such as Shopee's Orange Family, where users can exchange deals and engage in discussions about the app, or introducing short video features similar to Instagram Reels and TikTok, can integrate the app into younger generations' lifestyle - not just as a service provider, but as a vibrant community. Furthermore, social references from friends, family, celebrities, and Key Opinion Leaders (KOL) are significant, especially for Gen Y and Z. Implementing incentive-based referral programs and endorsements from celebrities or KOLs can greatly influence app adoption intentions.

6.2. Limitations of research

This research encounters several limitations that should be considered when interpreting and applying the results. Firstly, the existing literature on super apps, especially Gen Z and generational groups comparison, is limited. This narrowed the comparison and validation of the findings with prior research. Secondly, the data collection was conducted in Vietnam, posing potential cultural and technological differences that might not reflect global patterns. These regional specifics could influence the implications of technology adoption, limiting the application of these findings to other regions that do not share the same dynamics and cultural context. Thirdly, the study has uneven sample sizes across generational groups. Gen Z has significantly more respondents than other groups. This imbalance raises the risk of overestimating the reported effects for Gen X, with a modest sample size (<50) and high R^2 values. The substantial difference in sample size could weaken the statistical power of the bootstrapping and MGA bootstrapping results and the representativeness of the findings. Finally, the MGA employed in this study was conducted under partial measurement invariance. This indicates that while some measures are consistent across groups, others are not, potentially affecting the overall rigidity of the findings.

6.3. Suggestions for further research on the topic

Several recommendations for future research arise from the limitations and findings of the current study. Firstly, the impact of perceived risks on super app adoption warrants a more thorough examination. Incorporating other risk constructs (financial risks) could better capture the risk perception and better understand how risks affect user behavior across different generational cohorts. Expanding the MGA to include more than two groups at a time could provide a more comprehensive view of the effects, moving beyond pairwise comparisons to encompass broader multi-group dynamics. Regarding the personalization construct, future research could shift its focus from moderating the relationship between perceived risks and intention to adopt to how it enhances other app values, such as perceived convenience, perceived connection, or satisfaction.

This shift could reveal new insights into how personalization contributes to the adoption of super apps. Methodological improvements are also recommended. Increasing the sample size and balancing the sample size across generational groups would enhance the robustness of the study. This ensures that findings are statistically reliable and generalizable to broader populations. The research settings could be expanded cross-country, providing more insights into Gen Z across different cultures and geographical contexts. Additionally, achieving full measurement invariance in the MICOM step of MGA is crucial to strengthen the statistical results and accurately account for moderation effects. This adjustment would improve the reliability of conclusions drawn from the data and ensure that comparisons across groups are valid. Lastly, Gen X and Y exhibit less consistent significance in their responses to app features, suggesting that these groups may prioritize different features due to their varied expectations and technology exposure. This indicates a need to research the app dimensions that resonate and drive the adoption intention of these generations.

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APPENDIX

Appendix 1. Measurement Items - Survey Questionnaire

A. Likert scale questions – Main constructs

No	Constructs	Items	Question	Reference
1	**Multi-service**	M_1	The service range of the super app is exceptionally complete	(Salehi et al., 2023)
2		M_2	I can find any services of other similar super apps in this super app	
3		M_3	There are many services in the super app that perfectly align with my needs	
4		M_4	I save a huge amount of time by using one app for multiple services	
5	**Integrated UI/UX**	U_1	It is extremely useful to access multiple services within the super app without switching between different applications.	Self-developed
6		U_2	I am able to find desired services quickly and effortlessly on the super app	(Beauchamp & Ponder, 2010; Jiang et al., 2013)
7		U_3	The services classification is highly intuitive and extremely easy to follow	
8		U_4	The super app is incredibly user-friendly for using multiple services	
9	**Consistent transaction**	T_1	It is extremely easy to share and coordinate payment with other users on the super app, such as splitting bills	Self-developed
10		T_2	Super apps made it remarkably easy for me to conclude my purchase	(Berry et al., 2002; Jiang et al., 2013)
11		T_3	Digital wallet is significantly simple and convenient	
12		T_4	I save a huge amount of time completing my purchase on super app by inputting my payment information only once and using it for all transactions	
13	**Social benefits**	SB	This super app significantly helps me to keep in touch/share events with friends and family.	(Salehi et al., 2023)
14	**Social influence**	SI_1	People who are important to me think that I should definitely use this super app	(Indrawati & Putri, 2018)
15		SI_2	People who influence my behavior think that I should definitely use this super app	
16		SI_3	It seems like everyone I know is using this super app.	
17		SI_4	The celebrity and influencer endorsements significantly affect my intention to use super app	(Wei et al., 2021)
18	**Perceived Risks**	P_1	I am extremely concerned this super app provider is able to access information about me	(Dinev & Hart, 2004; Smith et al., 1996)
19		P_2	I am deeply worried this super app provider is able to track information about me	
20		P_3	I am extremely concerned this super app will use my personal information for other purposes without my authorization	
21		P_4	I am deeply worried to provide my personal information and data to the super app	
22		P_5	I am extremely concerned that my data is shared across different services within a super app	Self-developed
23	**Personalization**	PER_1	This super app offers highly personalized contents and services based on my preferences or personal interest	(Sheng et al., 2008;

24	**Personalization**	PER_2	This super app offers highly personalized content and services based on my location	Xu et al., 2011)
25		PER_3	I have complete control to customize the features and settings within the super app	Self-developed
26	**Perceived Convenience**	PCV_1	This super app is extremely fast	(Shaw & Sergueeva, 2016)
27		PCV_2	This super app is incredibly convenient	
28		PCV_3	This super app saves me a massive amount of time	
29	**Perceived Connection**	PCN_1	I feel emotionally connected with this super app	(Gao et al., 2009)
30		PCN_2	I clearly feel like a member of the super app community	
31		PCN_3	I profoundly feel a sense of community within the super app	Self-developed
32	**Satisfaction**	SA	I feel very satisfied with the overall experience of using the super app	Self-developed
33	**Adoption and usage of super apps**	ITA_1	I intend to continue using this super app rather than discontinue its use	(Salehi et al., 2023)
34		ITA_2	I will keep using this super app as regularly as I do now	
35		ITA_3	I intend to increase my use of this super app in the future	

Source: *Self-derived*

B. Multiple choice questions - Demographics

Questions	Answer Options
What is your generation?	Gen X (born between 1965 – 1980)
	Gen Y (born between 1981 – 1996)
	Gen Z (born between 1997 – 2012)
	None of the above
What is the highest level of education you have completed?	Less than high school
	High school diploma or equivalent
	Some college or associate degree
	Bachelor's degree
	Master's degree
	Doctoral degree
What is your occupation?	Student
	Employed full-time
	Employed part-time
	Self-employed
	Unemployed
	Retired
In which region do you currently reside?	Option to choose from 64 provinces in Vietnam
How much time do you use mobile application each day?	Less than 1 hour
	1 to 3 hours
	4 to 6 hours
	6 to 8 hours
	More than 8 hours

Source: *Self-derived*

Appendix 2. Sample Size Calculator (Soper, 2024)

A-priori Sample Size Calculator for Structural Equation Models

This calculator will compute the sample size required for a study that uses a structural equation model (SEM), given the number of observed and latent variables in the model, the anticipated effect size, and the desired probability and statistical power levels. The calculator will return both the minimum sample size required to detect the specified effect, and the minimum sample size required given the structural complexity of the model.

Please enter the necessary parameter values, and then click 'Calculate'.

Anticipated effect size:	0.1
Desired statistical power level:	0.8
Number of latent variables:	11
Number of observed variables:	35
Probability level:	0.05

Calculate!

Minimum sample size to detect effect: 2,078

Minimum sample size for model structure: 175

Source: *Results from the Soper's (Soper) online calculator*

Appendix 3. Assessment of Reliability and Convergent Validity

	Gen Z					Gen Y					Gen X				
Item	**FOL**	**CA**	**rho_a**	**rho_c**	**AVE**	**FOL**	**CA**	**rho_a**	**rho_c**	**AVE**	**FOL**	**CA**	**rho_a**	**rho_c**	**AVE**
M		**0.678**	**0.711**	**0.802**	**0.505**		**0.857**	**0.881**	**0.903**	**0.7**		**0.847**	**0.883**	**0.895**	**0.682**
M_1	0.712					0.746					0.837				
M_2	0.643					0.828					0.696				
M_3	0.672					0.900					0.918				
M_4	0.805					0.864					0.837				
U		**0.793**	**0.807**	**0.866**	**0.62**		**0.928**	**0.932**	**0.949**	**0.823**		**0.865**	**0.89**	**0.907**	**0.709**
U_1	0.655					0.897					0.873				
U_2	0.826					0.878					0.880				
U_3	0.842					0.949					0.828				
U_4	0.813					0.904					0.783				
T		**0.779**	**0.802**	**0.859**	**0.606**		**0.889**	**0.893**	**0.924**	**0.753**		**0.902**	**0.913**	**0.932**	**0.774**
T_1	0.651					0.799					0.807				
T_2	0.874					0.901					0.924				
T_3	0.793					0.918					0.894				
T_4	0.779					0.848					0.890				
SB	1.000										1.000				
SI		**0.738**	**0.744**	**0.835**	**0.561**		**0.859**	**0.906**	**0.903**	**0.703**		**0.835**	**0.938**	**0.879**	**0.647**
SI_1	0.791					0.900					0.753				
SI_2	0.827					0.934					0.875				
SI_3	0.700					0.680					0.747				
SI_4	0.667					0.817					0.835				
PR		**0.902**	**0.938**	**0.924**	**0.709**		**0.812**	**0.857**	**0.866**	**0.565**		**0.92**	**1.06**	**0.936**	**0.747**
P_1	0.818					0.825					0.939				
P_2	0.872					0.727					0.902				
P_3	0.798					0.710					0.900				
P_4	0.866					0.775					0.778				
P_5	0.852					0.714					0.789				

(Continued)

PER		**0.694**	**0.73**	**0.824**	**0.612**		**0.65**	**0.694**	**0.808**	**0.587**		**0.605**	**0.61**	**0.79**	**0.557**
PER_1	0.679					0.847					0.754				
PER_2	0.848					0.804					0.799				
PER_3	0.810					0.630					0.682				
PCV		**0.758**	**0.762**	**0.861**	**0.675**		**0.839**	**0.857**	**0.904**	**0.76**		**0.865**	**0.874**	**0.917**	**0.787**
PCV_1	0.793					0.768					0.876				
PCV_2	0.873					0.938					0.911				
PCV_3	0.795					0.899					0.874				
PCN		**0.835**	**0.841**	**0.901**	**0.752**		**0.908**	**0.909**	**0.942**	**0.844**		**0.888**	**0.895**	**0.931**	**0.817**
PCN_1	0.878					0.923					0.877				
PCN_2	0.862					0.939					0.895				
PCN_3	0.861					0.894					0.939				
SA	1.000					1.000					1.000				
ITA		**0.729**	**0.732**	**0.847**	**0.65**		**0.847**	**0.853**	**0.907**	**0.765**		**0.907**	**0.908**	**0.942**	**0.843**
ITA_1	0.757					0.888					0.933				
ITA_2	0.881					0.881					0.926				
ITA_3	0.774					0.854					0.896				

Source: *Self-derived results from SmartPLS 4*
Note: *FOL: First order loading, M: Multi-service, U: Integrated interface, T: Consistent transaction, SB: Social benefit, SI: Social influence, P: Privacy & Data risks; PER: Personalization; PCV: Perceived Convenience, PCN: Perceived Connection, PR: Perceived risks, SA: Satisfaction; ITA: Adoption and use of super app*

Appendix 4. Discriminant Validity using HTMT

Dataset	Construct	ITA	M	PCN	PCV	PER	PR	SA	SB	SI	T	U
Gen Z	**M**	0.556										
	PCN	0.586	0.334									
	PCV	0.731	0.533	0.639								
	PER	0.582	0.471	0.500	0.588							
	PR	0.186	0.167	0.086	0.176	0.381						
	SA	0.644	0.426	0.380	0.583	0.510	0.169					
	SB	0.310	0.323	0.457	0.368	0.327	0.073	0.187				
	SI	0.721	0.540	0.680	0.610	0.650	0.145	0.387	0.475			
	T	0.546	0.721	0.429	0.673	0.477	0.328	0.443	0.366	0.573		
	U	0.533	0.859	0.410	0.600	0.604	0.241	0.464	0.392	0.508	0.731	
	PER x PR	0.239	0.177	0.049	0.266	0.177	0.261	0.189	0.066	0.117	0.265	0.160
Gen Y	**M**	0.413										
	P	0.566	0.118									
	PCN	0.875	0.558	0.555								
	PCV	0.892	0.689	0.602	0.811							
	PER	0.324	0.319	0.15	0.347	0.425						
	PR	0.746	0.398	0.373	0.848	0.553	0.195					
	SA	0.175	0.39	0.127	0.229	0.407	0.237	0.029				
	SB	0.356	0.536	0.41	0.353	0.848	0.177	0.24	0.554			
	SI	0.527	0.742	0.215	0.633	0.823	0.517	0.488	0.438	0.718		
	T	0.412	0.845	0.187	0.57	0.646	0.567	0.311	0.527	0.565	0.881	
	U	0.539	0.51	0.103	0.387	0.442	0.325	0.296	0.301	0.267	0.639	0.551
Gen X	**M**	0.554										
	P	0.643	0.5									
	PCN	0.632	0.395	0.881								
	PCV	0.507	0.464	0.719	0.534							
	PER	0.434	0.197	0.133	0.193	0.339						
	PR	0.477	0.533	0.364	0.3	0.459	0.397					
	SA	0.446	0.556	0.55	0.431	0.437	0.19	0.161				
	SB	0.754	0.447	0.791	0.712	0.651	0.301	0.364	0.629			
	SI	0.661	0.716	0.577	0.672	0.537	0.432	0.584	0.442	0.583		
	T	0.67	0.83	0.581	0.5	0.576	0.199	0.427	0.486	0.546	0.714	
	U	0.121	0.107	0.097	0.061	0.145	0.169	0.269	0.117	0.197	0.145	0.054

Source: *Self-derived results from SmartPLS 4*

Note: *M: Multi-service, U: Integrated interface, T: Consistent transaction, SB: Social benefit, SI: Social influence, P: Privacy & Data risks; PER: Personalization; PCV: Perceived Convenience, PCN: Perceived Connection, PR: Perceived risks, SA: Satisfaction; ITA: Adoption and use of super app*

Appendix 5. Bootstrapping Results of all generational groups

Dataset	Hypothesis	Path	Std Beta	t-value	p-values	2.50%	97.50%	VIF	f-square	Hypothesis confirmation
Direct effects										
Gen Z	H1-a	M -> U	0.675	14.774	**0.000**	0.583	0.761	1.000	0.838	Supported
	H1-b	M -> T	0.543	7.794	**0.000**	0.402	0.672	1.000	0.417	Supported
	H2	U -> PCV	0.353	5.087	**0.000**	0.214	0.487	1.426	0.139	Supported
	H3	T -> PCV	0.338	4.290	**0.000**	0.171	0.481	1.426	0.127	Supported
	H5	PCV -> ITA	0.191	2.910	**0.004**	0.063	0.318	1.737	0.039	Supported
	H8	SB -> PCN	0.255	4.227	**0.000**	0.132	0.369	1.148	0.089	Supported
	H9	SI -> PCN	0.467	8.408	**0.000**	0.362	0.579	1.148	0.300	Supported
	H10	PCN -> ITA	0.207	2.733	0.006	0.056	0.353	1.353	0.060	Supported
	H12	PR -> ITA	-0.027	0.426	0.670	-0.152	0.095	1.220	0.001	Not Supported
	H13	PER x PR -> ITA	-0.028	0.485	0.628	-0.106	0.118	1.155	0.002	Not Supported
	H14	SA -> ITA	0.362	4.541	**0.000**	0.196	0.510	1.644	0.150	Supported
	H15	PCV -> SA	0.494	7.274	**0.000**	0.354	0.619	1.305	0.280	Supported
	H16	PCN -> SA	0.150	2.436	0.015	0.028	0.271	1.269	0.027	Not Supported
	H17	PR -> SA	-0.007	0.099	0.921	-0.131	0.125	1.049	0.000	Not Supported
Gen Y	H1-a	M -> U	0.757	10.069	**0.000**	0.594	0.881	1.000	1.342	Supported
	H1-b	M -> T	0.635	6.819	**0.000**	0.435	0.800	1.000	0.677	Supported
	H2	U -> PCV	0.114	0.913	0.361	-0.137	0.359	1.735	0.011	Not Supported
	H3	T -> PCV	0.509	3.705	**0.000**	0.196	0.731	1.735	0.229	Supported
	H5	PCV -> ITA	0.246	1.899	0.058	-0.003	0.507	2.535	0.048	Not Supported
	H8	SB -> PCN	0.142	1.456	0.145	-0.043	0.343	1.534	0.029	Not Supported
	H9	SI -> PCN	0.650	7.810	**0.000**	0.474	0.804	1.534	0.612	Supported
	H10	PCN -> ITA	0.316	2.173	**0.030**	0.019	0.588	3.229	0.062	Supported
	H12	PR -> ITA	0.289	1.673	0.094	-0.073	0.559	1.208	0.138	Not Supported
	H13	PER x PR -> ITA	-0.045	0.376	0.707	-0.226	0.239	1.177	0.004	Not Supported
	H14	SA -> ITA	0.130	1.119	0.263	-0.076	0.380	1.503	0.022	Not Supported
	H15	PCV -> SA	0.026	0.151	**0.880**	-0.310	0.354	2.404	0.000	Not Supported

(Continued)	H16	PCN -> SA	0.303	2.174	**0.030**	0.037	0.589	2.412	0.050	Supported
	H17	PR -> SA	0.355	3.345	**0.001**	0.162	0.575	1.005	0.166	Supported
Gen X	H1-a	M -> U	0.787	15.198	**0.000**	0.687	0.889	1.000	1.623	Supported
	H1-b	M -> T	0.675	8.070	**0.000**	0.510	0.831	1.000	0.838	Supported
	H2	U -> PCV	0.135	0.612	0.541	-0.322	0.550	2.675	0.010	Not Supported
	H3	T -> PCV	0.462	1.586	0.113	-0.269	0.919	2.675	0.119	Not Supported
	H5	PCV -> ITA	0.263	1.212	0.226	-0.174	0.653	3.856	0.076	Not Supported
	H8	SB -> PCN	-0.148	1.071	0.284	-0.401	0.140	1.273	0.021	Not Supported
	H9	SI -> PCN	0.489	3.350	**0.001**	0.306	0.755	1.273	0.233	Supported
	H10	PCN -> ITA	0.169	1.210	0.226	-0.117	0.451	1.391	0.087	Not Supported
	H12	PR -> ITA	-0.006	0.048	0.962	-0.235	0.267	1.235	0.000	Not Supported
	H13	PER x PR -> ITA	-0.200	1.491	0.136	-0.482	0.022	1.269	0.197	Not Supported
	H14	SA -> ITA	0.266	1.590	0.112	-0.135	0.523	2.796	0.107	Not Supported
	H15	**PCV -> SA**	**0.820**	**6.335**	**0.000**	**0.489**	**1.011**	**1.434**	**1.304**	**Supported**
	H16	PCN -> SA	-0.037	0.291	0.771	-0.287	0.221	1.302	0.003	Not Supported
	H17	PR -> SA	-0.009	0.060	0.952	-0.357	0.289	1.122	0.000	Not Supported
Indirect effects										
Gen Z	H4-a	M -> U -> PCV	0.239	5.098	**0.000**	0.147	0.330	-	-	Supported
	H4-b	M -> T -> PCV	0.183	3.566	**0.000**	0.088	0.288	-	-	Supported
	H6-a	M -> U -> PCV -> ITA	0.045	2.572	0.010	0.014	0.083	-	-	Supported
	H6-b	M -> T -> PCV -> ITA	0.035	1.990	0.047	0.008	0.075	-	-	Supported
	H7-a	U -> PCV -> ITA	0.067	2.596	0.009	0.021	0.121	-	-	Supported
	H7-b	T -> PCV -> ITA	0.064	2.164	0.030	0.015	0.130	-	-	Supported
	H11-a	SB -> PCN -> ITA	0.053	2.607	0.009	0.015	0.094	-	-	Supported
	H11-b	SI -> PCN -> ITA	0.097	2.306	0.021	0.023	0.186	-	-	Supported
	H18-b	PCV -> SA -> ITA	0.179	3.530	**0.000**	0.084	0.283	-	-	Supported
	H18-b	PCN -> SA -> ITA	0.054	2.187	0.029	0.009	0.107	-	-	Not Supported
	H18-c	PR -> SA -> ITA	-0.002	0.096	0.923	-0.050	0.047	-	-	Not Supported
Gen Y	H4-a	M -> U -> PCV	0.086	0.923	0.356	-0.108	0.263	-	-	Not Supported
	H4-b	**M -> T -> PCV**	**0.323**	**3.029**	**0.002**	**0.116**	**0.531**	**-**	**-**	**Supported**
	H6-a	M -> U -> PCV -> ITA	0.021	0.713	0.476	-0.025	0.094	-	-	Not Supported
	H6-b	M -> T -> PCV -> ITA	0.080	1.583	0.114	-0.002	0.195	-	-	Not Supported

(Continued)	H7-a	U -> PCV -> ITA	0.028	0.700	0.484	-0.032	0.127	-	-	Not Supported
	H7-b	T -> PCV -> ITA	0.125	1.680	0.093	-0.003	0.290	-	-	Not Supported
	H11-a	SB -> PCN -> ITA	0.045	1.118	0.263	-0.014	0.139	-	-	Not Supported
	H11-b	**SI -> PCN -> ITA**	**0.205**	**2.022**	**0.043**	**0.011**	**0.414**	**-**	**-**	**Supported**
	H18-b	PCV -> SA -> ITA	0.003	0.108	0.914	-0.053	0.079	-	-	Not Supported
	H18-b	PCN -> SA -> ITA	0.039	0.886	0.376	-0.024	0.151	-	-	Not Supported
	H18-c	PR -> SA -> ITA	0.046	0.913	0.361	-0.027	0.172	-	-	Not Supported
Gen X	H4-a	M -> U -> PCV	0.106	0.602	0.547	-0.258	0.438	-	-	Not Supported
	H4-b	M -> T -> PCV	0.312	1.464	0.143	-0.177	0.694	-	-	Not Supported
	H6-a	M -> U -> PCV -> ITA	0.028	0.478	0.633	-0.076	0.162	-	-	Not Supported
	H6-b	M -> T -> PCV -> ITA	0.082	0.914	0.361	-0.094	0.261	-	-	Not Supported
	H7-a	U -> PCV -> ITA	0.036	0.494	0.622	-0.095	0.199	-	-	Not Supported
	H7-b	T -> PCV -> ITA	0.121	1.001	0.317	-0.136	0.349	-	-	Not Supported
	H11-a	SB -> PCN -> ITA	-0.025	0.727	0.467	-0.108	0.029	-	-	Not Supported
	H11-b	SI -> PCN -> ITA	0.083	1.037	0.300	-0.068	0.253	-	-	Not Supported
	H18-b	PCV -> SA -> ITA	0.218	1.605	0.108	-0.104	0.433	-	-	Not Supported
	H18-b	PCN -> SA -> ITA	-0.010	0.277	0.781	-0.079	0.073	-	-	Not Supported
	H18-c	PR -> SA -> ITA	-0.002	0.058	0.954	-0.098	0.076	-	-	Not Supported
	H4-a	M -> U -> PCV	0.179	4.123	**0.000**	0.093	0.263	-	-	Supported
	H4-b	M -> T -> PCV	0.231	4.826	**0.000**	0.139	0.327	-	-	Supported
	H6-a	M -> U -> PCV -> ITA	0.042	3.011	**0.003**	0.018	0.073	-	-	Supported
	H6-b	M -> T -> PCV -> ITA	0.055	2.916	**0.004**	0.022	0.096	-	-	Supported
	H7-a	U -> PCV -> ITA	0.059	2.975	**0.003**	0.024	0.103	-	-	Supported
	H7-b	T -> PCV -> ITA	0.093	3.107	**0.002**	0.040	0.156	-	-	Supported
	H11-a	SB -> PCN -> ITA	0.048	2.964	**0.003**	0.020	0.082	-	-	Supported
	H11-b	SI -> PCN -> ITA	0.110	3.219	**0.001**	0.051	0.183	-	-	Supported
	H18-b	PCV -> SA -> ITA	0.132	3.665	**0.000**	0.067	0.207	-	-	Supported
	H18-b	PCN -> SA -> ITA	0.041	2.167	0.030	0.008	0.082	-	-	Not Supported
	H18-c	PR -> SA -> ITA	0.034	1.889	0.059	0.005	0.075	-	-	Not Supported

Source: *Self-derived results from SmartPLS 4*
Note: *M: Multi-service, U: Integrated interface, T: Consistent transaction, SB: Social benefit, SI: Social influence, P: Privacy & Data risks; PER: Personalization; PCV: Perceived Convenience, PCN: Perceived Connection, PR: Perceived risks, SA: Satisfaction; ITA: Adoption and use of super app*

Appendix 6. Steps to execute pairwise comparison of proportions & Results (Hours spent across Generation)

```
library(readxl)
library(dplyr)
# Load file and check
file_path <- "C:\\Users\\thaoc\\OneDrive\\Desktop\\Daily usage.xlsx"
data <- read_excel(file_path)
head(data)
# Perform pairwise comparisons of proportions
pairwise_results <- list()
for (hour in unique(data$Hour_choice)) {
  subset_data <- subset(data, Hour_choice == hour)
  subset_table <- table(subset_data$Generation)
  pairwise_test <- pairwise.prop.test(
    x = subset_table,
    n = table(data$Generation),
    p.adjust.method = "bonferroni"
  )
  pairwise_results[[paste("Hour", hour)]] <- pairwise_test
}
pairwise_results
```

```
$`Hour 4`

        Pairwise comparisons using Pairwise comparison of proportions

data:  subset_table out of table(data$Generation)

  1     2
2 1.000 -
3 0.011 0.199

P value adjustment method: bonferroni

$`Hour 2`

        Pairwise comparisons using Pairwise comparison of proportions

data:  subset_table out of table(data$Generation)

  1       2
2 0.13459 -
3 0.00013 0.11300

P value adjustment method: bonferroni

$`Hour 1`
```

```
        Pairwise comparisons using Pairwise comparison of proportions

data:  subset_table out of table(data$Generation)

  1     2
2 1.000 -
3 0.044 0.200

P value adjustment method: bonferroni

$`Hour 3`

        Pairwise comparisons using Pairwise comparison of proportions

data:  subset_table out of table(data$Generation)

  1       2
2 0.17    -
3 1.5e-09 1.3e-05

P value adjustment method: bonferroni

$`Hour 5`

        Pairwise comparisons using Pairwise comparison of proportions

data:  subset_table out of table(data$Generation)

  1     2
2 1.000 -
3 0.046 0.018

P value adjustment method: bonferroni
```

Appendix 7. Steps to execute NDT by Klesel et al. (2019) & Results

```
install.packages("readxl")
install.packages("cSEM")
library(readxl)
GENXYZ <- read_excel("C:\\Users\\thaoc\\OneDrive\\Desktop\\CHECK.xlsx")
View(GENXYZ)
library(cSEM)
model <- "
# Structural Model
M ~ U
M ~ T
U ~ PCV
T ~ PCV
PCV ~ ITA
SBB ~ PCN
SI ~ PCN
PCN ~ ITA
PR ~ ITA
SAA ~ ITA
PCV ~ SAA
PCN ~ SAA
PR ~ SAA
# Composite model
M <~ M1 + M2 + M3 + M4
U <~ U1 + U2 + U3 + U4
T <~ T1 + T2 + T3 + T4
SI <~ SI1 + SI2 + SI3 + SI4
PR <~ P1 + P2 + P3 + P4 + P5
PCV <~ PCV1 + PCV2 + PCV3
PCN <~ PCN1 + PCN2 + PCN3
ITA <~ ITA1 + ITA2 + ITA3
SBB <~ SB
SAA <~ SA
"
# Perform estimation
res_pls <- csem(.data = GENXYZ,.model = model)
# Get summary
```

```
summarize(res_pls)

as.factor(GENXYZ$Generation)

# Solution 1: You can use the.id argument and the original dataset

out <- csem(GENXYZ, model, .resample_method = "bootstrap", .R = 1000, .id = "Generation")

summarize(out)

# Please have a look at the help file of the testMGD function, it has various arguments

# that you can use but in our case we focused on NDT by Klesel et al. (2019)

outMGD = testMGD(out, .R_permutation = 1000, .approach_mgd = 'Klesel')

outMGD
```

```
________________________________________________________________________________
----------------------------------- Overview -------------------------------

	Total permutation runs              = 1013
	Admissible permutation results      = 1000
	Permutation seed                    = 1951380658

	Total bootstrap runs                = NA
	Admissible bootstrap results:

	Group        Admissibles
	1             NA

	Bootstrap seed:

	Group          Seed
	1                 NA

	Number of observations per group:

	Group       No. Obs.
	1           43
	2           86
	3           227
________________________________________________________________________________
--------- Test for multigroup differences based on Klesel et al. (2019) -----

Null hypothesis:

 ┌──────────────────────────────────────────────────────────────────────────
─────────┐
 │                                                                          │
 │   H0: Model-implied indicator covariance matrix is equal across groups.   │
 │                                                                          │
 └──────────────────────────────────────────────────────────────────────────
─────────┘

Test statistic and p-value:

	Distance measure    Test statistic       p-value        Decision
	dG                   4.4194          0.0010          reject
	dL                  17.8091          0.1040     Do not reject
________________________________________________________________________________
```