Scan it - get it: A study on the socio-demographic characteristics of consumers using qr codes

Tara – al: Qr kod kullanan tüketicilerin sosyo-demografik özellikleri üzerine bir inceleme

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A B S T R A C T

The present study examined the usage of QR codes among consumers from different demographic groups (gender, generation, marital status, work, income, education, experience with QR codes, QR code usage frequency, QR code risk perception) within the framework of the Technology Acceptance Model (TAM). An online survey was used in the research methodology. A total of 556 individuals aged 18 and above residing in Türkiye were included in the study. The data obtained were utilized to analyze the effect of the perceived usefulness and perceived enjoyment dimensions of the TAM on QR code usage attitude and intention to use, accomplished through the use of structural equation modeling. The findings showed that user experience and security perception influence QR code usage. Additionally, the study demonstrated that perceived enjoyment positively affects the intention to use QR codes, whereas perceived usefulness has no effect on the intention to use QR codes. It is imperative to develop security measures, conduct awareness studies, and enhance consumers' perceptions of trust in QR codes to facilitate the widespread acceptance of QR codes.

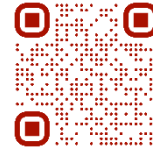**Keywords:** QR Code, Consumer Behavior, Technology Acceptance Model (TAM).

Jel Classification: M30, M31.

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Ö Z

Bu çalışmada, Teknoloji Kabul Modeli (TAM) çerçevesinde farklı demografik gruplardan (cinsiyet, kuşak, medeni durum, çalışma durumu, gelir durumu, eğitim düzeyi, QR kod kullanma deneyimi, QR kod kullanma sıklığı, QR kod risk algısı) tüketiciler arasında QR kod kullanımı incelenmiştir. Araştırma verisi online anket ile toplanmıştır. Araştırmaya 18 yaş ve üzerinde olan Türkiye'de ikamet eden toplam 556 birey dâhil edilmiştir. Elde edilen veriler ile yapısal eşitlik modellemesi kullanılarak TAM'ın algılanan fayda ve algılanan eğlence boyutlarının QR kod kullanma tutumu ve kullanma niyeti üzerindeki etkisi analiz edilmiştir. Bulgular, kullanıcı deneyiminin ve güvenlik algısının QR kod kullanımını etkilediğini göstermiştir. Ayrıca çalışma, algılanan eğlencenin QR kod kullanma niyetini olumlu yönde etkilediğini, algılanan faydanın ise QR kod kullanma niyetini etkilemediğini ortaya koymuştur. Çalışma QR kodların yaygın kabul görmesini kolaylaştırmak için güvenlik önlemlerinin geliştirilmesi, farkındalık çalışmalarının yapılması ve tüketicilerin QR kodlara olan güven algısının arttırılması zorunluluğunu göstermektedir.

Anahtar Kelimeler: Qr Kod, Tüketici Davranışları, Teknoloji Kabul Modeli (TKM).

Jel Sınıflaması: M30, M31.

1. Introduction

Marketing is basically the art of communicating with consumers. Listening to the consumer, understanding their needs and personalizing products/services according to them are indispensable tasks of marketing. With the rapid advancement of technology, consumer preferences and requirements are constantly undergoing changes. In addition, the needs and demands of individuals born in specific periods and exposed to common social phenomena differ among themselves. While consumers have diverse demands and needs, they tend to share a common objective of maximizing benefits. Social media platforms contribute to this by making information, services, and communication more accessible and immediate. One of the tools that enhances this convenience is the QR code, which facilitates seamless interactions, such as accessing information quickly, placing orders, and minimizing paper use. These features align with the growing consumer desire for speed and ease, which social media platforms also promote. The increased visibility and sharing of QR codes on social media platforms have further accelerated their adoption in daily life. As consumers encounter QR codes on platforms like Instagram, Facebook, and Twitter, businesses have integrated them more frequently into their operations. As a result, QR codes are becoming a familiar tool, and the need for smartphones with built-in code readers has risen accordingly (Kaspersky, 2020).

Although it was only developed in 1994, QR codes, which can be placed on all kinds of written and visual communication tools such as posters, billboards, television commercials, menus, packaging, and web pages. For example, QR codes can be used on restaurant menus to access digital menus, or QR codes can be placed on product packaging to provide users with detailed information about the product. In this respect, QR codes find their place in all areas of marketing, from product information to after-sales services. Despite their compact dimensions, QR codes possess extensive versatility and can be deployed across diverse offline and online settings. This versatility makes them a valuable tool for businesses, particularly in marketing. By combining physical and digital resources, businesses can effectively reach their target audience. Thus, businesses can direct consumers from any traditional newspaper page (Medya Radar, 2012), printed magazine (Hegde, 2023), brochure ("Seat QR code," n.d.), billboard ("TikTok," n.d.), business card, or product packaging (Vall, 2023), social media (Recipe London, 2023) to product features, websites, commercial films, and account numbers. Also, they can even offer special offers to consumers by placing a QR code in the commercial film (Kişin, 2022) published in visual media. This approach allows for the integration of physical and digital marketing elements, enabling a wider reach of consumers through a unified communication effort. A mobile phone or tablet equipped with a QR code reader program is all that is required. Customers can efficiently access additional product information, such as instructions, tips, store details, and potential discounts, through the convenience of scanning QR codes. However, for customers to embrace mobile technologies, they must first possess the necessary technical equipment, like a smartphone capable of scanning QR codes. QR codes afford customers greater autonomy compared to SMS messages, as they can choose when and whether to engage with them (Atkinson, 2013).

According to the Technology Acceptance Model (TAM), the ease of use and knowledge of a particular technology determine its usage. This theory is quite consistent with consumer use of QR codes in marketing. Perceived benefits, usefulness, ease of use, and attitudes toward the technology

influence consumers' intentions to use QR code technology. If QR codes are perceived as easy to use or enjoyable, consumers are more likely to adopt the technology. Proper guidance on the use of QR codes can lead to a promising future for their application in the retail environment (Nath & Varghese, 2020: 829).

There is a significant amount of research in the literature on QR codes used in different contexts and for different purposes. It is seen that these studies address QR codes under many different headings, such as usage areas (Fitriyah et al., 2023), usage targets (Stojanović et al., 2023), how it works (Rouillard, 2008), and with which technologies it can be used (Fong et al., 2019). Similarly, there are many studies on QR codes in the field of marketing. These studies focus on the use of QR codes by businesses (Trivedi et al., 2020). However, in order for QR codes to provide the expected benefit, i.e., customer value, it should first be understood for what purpose consumers use QR codes and how they perceive them. For this reason, understanding how personality traits and the social, economic, and cultural influences consumers are exposed to shape their perspectives and expectations regarding QR codes is the first step in effectively using QR codes in marketing communication studies..

Demographic characteristics have a direct impact on purchasing decisions. The use of QR codes also depends on consumer preference in a market with many alternative technologies. Due to their benefits and ease of use, QR codes have a high capacity to strengthen marketing communication. Despite the existing research, there is insufficient literature that clarifies how QR codes influence consumer buying attitudes. For this reason, this study aims to explore the use of QR codes in terms of socio-demographic characteristics within the framework of the consumers' Technology Acceptance Model (TAM). Additionally, the study aims to determine consumers' attitudes towards QR codes and their intention to use them by considering the dimensions of perceived usefulness (PU) and perceived enjoyment (PE). This comprehensive approach will help identify the factors influencing QR code usage and provide insights for effective marketing strategies.

2. Conceptual Framework

To understand the differentiated consumer purchasing behaviors with the development of digital marketing, it is essential to consider the impact of various factors. Digital marketing tools, such as influencer marketing, machine learning, data privacy in online advertising, and the influence of metaverse platforms on marketing mix decision-making, have significantly altered consumer behavior. Additionally, the shift to multi-channel marketing due to changes in mobile marketing and advertising content has also impacted consumer purchasing behavior. A prominent example of how digital tools enhance consumer interaction is the integration of QR codes into marketing strategies. QR codes allow brands to offer quick access to information, special offers, or product details with a simple scan, bridging the gap between physical and digital marketing. They are often used in online and offline campaigns shared on social media platforms, making it easy for consumers to transition from an advertisement or post to a brand's website or store. This facilitates a more seamless shopping experience, contributing to changes in consumer behavior, especially in mobile marketing.

Personalization has been an integral part of one-to-one marketing since the early days of commerce. However, in today's vast marketplace, personalized marketing relies on data-driven approaches to engage with customers on a more individual level, even if the interaction lacks the familiarity of traditional, face-to-face encounters. Despite this shift towards a more impersonal form

of personalization, it remains a necessary strategy when targeting large customer bases comprising countless individuals or even vast numbers of clients. In these cases, it is important to have a clear understanding of the characteristics and the intentions of consumer categories. In this context, QR codes play an important role in facilitating personalized experiences by providing tailored offers or exclusive content based on user data, often integrated into social media and mobile marketing campaigns.

2.1. Generations

The term 'generation' commonly refers to individuals born during a specific period and indicates the probability of individuals sharing similar experiences. This assumption is based on the idea that they share common characteristics due to exposure to similar historical, political, and cultural events. In marketing literature, various terms are used to describe categories that focus on specific characteristics or are born in specific periods. These terms include generational groupings such as the Generation C (Connected generation) (Friedrich et al., 2011), Generation M (Mobile generation) (Naz et al., 2023), or Xennials (Generation X to Millennials) (Dorie & Loranger, 2020) that indicate more specific subgroups or focus on specific characteristics. However, the main generations that are generally accepted and widely used are Generation Alpha, Generation Z, Generation Y (Millennials), Generation X, Baby Boomers, and The Silent Generation. While these groups represent broad categories, it's important to note that Generation C and two others specifically profile digital consumers. The birth year intervals of these generations differ in the marketing literature due to the distinct historical and cultural contexts that shape each generation's values, attitudes, and behaviors. This distinction is crucial, as they refer to different concepts in marketing literature, with significant implications for marketing strategies that highlight the importance of understanding and catering to the diverse preferences of each group.

Businesses must think and act multidimensionally when communicating with different generations of consumers. Multigenerational marketing is complex and requires a nuanced approach that recognizes each generation's unique attributes and habits that shape their buying preferences (Williams & Page, 2011: 1). Understanding these differences is essential to creating effective marketing strategies that resonate with each group's specific preferences. These distinctions are especially visible in multi-channel behavior, with considerable variances in shopping channel utilization and purchase volumes between generations (Dorie & Loranger, 2020: 395). The study focuses exclusively on five fundamental generations. Generation Alpha, although active consumers, is not included in this study due to their lack of autonomy to earn and spend money. The age grouping discussed by William and Page (2011) is used for marketing purposes, despite references to different date ranges in the literature.

2.2. Quick Respond (QR) Codes

QR codes, originally designed for managing the production of automotive components, have now found widespread application across various sectors, including transportation, the food industry, wholesale, and retail (Tahara et al., 2023: 259; Zapryanov & Nikolova, 2023: 1).

Figure 1: QR Code

Figure 3: LogoQ Code

Figure 4: Frame QR

Source: Scandit, (n.d.)

Source: Denso Wave Incorporated, (n.d.)

Source: Denso-Wave, (n.d.).

Figure 2: iQR Code

Figure 5: Logo Diffusion

Source: T Communications, (n.d.)

Source: Top QR Art, (2023)

QR codes are two-dimensional codes that have the ability to store data. The information capacity of a QR code varies depending on its version. It can store various data types, such as a URL that leads to a website, text, email, or Wi-Fi connection. (Cauley et al., 2023: 165). With the widespread use of QR Codes, new variations have been developed to meet specific needs. First of all, micro QR Codes have emerged. These codes are a code structure small enough to be printed on a very small area. In 2008, the iQR Code emerged, which, despite its large encoding capacity, has a small footprint and allows the use of rectangular code modules. Over time, users have increasingly demanded higher levels of privacy, security and data protection. In response to these demands, Frame QR was introduced in 2014 to provide a more secure way to share information (Denso Wave Incorporated, n.d.). Another type is color QR codes, which allow businesses to distinguish the code even without scanning it (LogoQNet, n.d.). This type, called Logo Q, makes the QR code unique (Nath & Varghese, 2020: 827). Finally, artistic QR codes that contain a picture or illustration unlike standard QR codes have emerged (Metin, 2023). These QR codes, created using stable diffusion, one of the artificial intelligence models, can look like a work of art (Diffusion, n.d.). They can also contain the logo of the brand holistically.

The diversification of QR codes is primarily driven by their ability to attract more consumer attention. QR codes allow consumers to access specific e-content, e-shops, or other cyber marketing environments. For instance, a costumer browsing clothes may notice a QR code on a t-shirt and scan it out of curiosity. After scanning, the customer can view more detailed information about the garment, explore similar items, or even make an immediate purchase. This offers consumers an interactive and convenient way to engage with products, helping brands increase sales and customer engagement.. Additionally, QR codes facilitate the provision of extensive information to consumers that cannot fit on a single sheet of paper. These codes are also useful for tracking customer response or a specific activity. As a result, QR codes are used by businesses to monitor product and service

performance and obtain real-time statistics on user insights. This data can be used to make better marketing and customer management decisions (Berger, 2022).

The most important advantage of QR codes for consumers is to save them from the tiresome effort of entering and searching for information (Maqbool & Iqbal, 2022). However, the adoption of QR codes by consumers has taken longer than marketers anticipated. This is mainly due to the perception that QR codes do not provide additional value to the customer. Therefore, it is the responsibility of marketers to inform customers about the actions required to access QR code content.   The primary motivation for scanning a QR code is to acquire information. When planning a QR code, it is important to encourage curiosity as curious customers are more likely to scan the code (de Sá Santos Sousa, 2021: 6–7).

Today, QR codes are utilized by consumers for a myriad of reasons as shopping, accessing supplementary online content, redeeming discount vouchers, and engaging with social media platforms. With the ubiquity of mobile devices, QR codes become as effective marketing tools, especially among college students and youth, allowing businesses who effectively utilize QR codes to gain a competitive advantage compared to businesses who don't (Demir et al., 2015: 405). With nearly every consumer owning a cell phone from a young age, QR codes are an inexpensive and easy way to communicate and compete. QR codes can enable more effective communication between consumers and businesses, providing access to services, product information, discounts and detailed information about businesses. In this regard, Cata et al. (2013) studied the importance of QR codes in the world of mobile marketing. According to their study, the use of QR codes for marketing purposes can lead to the best results in interactive communication, which involves a hybrid approach, while interactive communication applications, such as when consumers scan a QR code to watch a product demo video or read customer reviews, serve informational purposes when consumers need more detailed information.

Numerous studies have examined the use of QR codes by consumers, highlighting their cost effectiveness and interactive advantages in the marketing field of marketing. Shin et al. (2012) indicate that the quality of QR codes affects the user's intentions and behaviors towards the use of QR codes. Ngo and Nguyen's (2021) research indicates that social norms, perceived ease of use, and perceived security influence customers' intention to use QR codes. Specifically, attitude mediates the impact of these factors on intention to use. A study was conducted with 1005 Indonesian university students to examine their digital knowledge levels, considering that young people tend to adopt technology more than older people. The study found that 78.91% of the participants adopted QR codes (Sitinjaka & Koesrindartoto, 2019). According to Sago's (2011) study, although students are aware of QR codes, the level of adoption of QR codes is low. Demir et al. (2015) found that QR codes are remembered by students with product packaging and medicine boxes. An interesting observation in the study is that male students show a higher adoption level of QR codes compared to their female counterparts. While 50% of male students embraced QR codes, the adoption rate among female students was only 37.4%. Nath and Varghese's (2020) research showed that there is no gender difference in the use of QR code technology. Male and female readers use QR codes equally, although their usage patterns differ. Despite this, QR technology seems to attract more interest among female readers, as 43% of women frequently use QR codes. Consumers find QR codes useful in shortening transaction times, they also indicate that businesses that use such innovations stand out in their food and beverage business preferences (Tazefidan, 2020). Additionally, QR codes

displayed in outdoor advertisements are interesting to consumers (Toktamış, 2021: 39). Although consumers may find the use of QR codes simple, useful, and even necessary, they are still primarily associated QR codes with banking and restaurant-menu services (Atsan et al., 2023).

QR codes are crucial in marketing as they offer significant advantages in meeting consumers' demands for quick, effective, and engaging marketing communication. Effectively utilizing the first five seconds to capture the attention of postmodern consumers is a vital factor in today's competitive marketing landscape. In the postmodern marketing era, where traditional and digital marketing intertwine, businesses need to employ phygital marketing strategies, which integrate physical and digital experiences to create seamless consumer interactions and enhance overall engagement, to engage consumers. Integrating traditional and digital methods through smartphones and QR codes while communicating with consumers provides an effective means of both attracting consumer interest and facilitating quick shopping (Odabaşı, 2021: 26). This approach enables businesses to offer consumers a valuable experience in terms of time savings and brand loyalty.

2.3. Technology Acceptance Model (TAM)

TAM, developed by Fred Davis in the late 1980s, focuses on individual users' acceptance of information technology. It is a psychological model that explains how users come to accept and use a new technology. According to TAM, an individual's behavioral intention (BI) to use a technology is primarily influenced by their perceived ease of use (PEOU) and perceived usefulness (PU) (Davis, 1989). PU refers to an individual's belief regarding the advantages they may gain from using a technology. PEOU, on the other hand, refers to the belief that the new technology will make their work easier, leading individuals to prefer it over the technology they currently use (Albero et al., 2011). In essence, TAM aims to comprehend and predict the acceptance of technology, namely attitude to it, by individual users (Davis, 1989). Attitude refers to a learned tendency to exhibit positive or negative reactions towards a specific object. While individuals' positive reactions to a new technology are based on PU and PEOU, it is important to identify other factors that may affect these two dimensions (Cabero Almenara et al., 2016). Factors that influence technology adoption include gender, age, culture, education level, professional experience, personal disposition towards innovation, and trust (Afsay et al., 2023; Albero et al., 2011; Cho & Sagynov, 2015; Hsiao et al., 2021; Pratiwi & Dewi, 2018; Teo & Noyes, 2011). In other words, consumers' attitudes towards technology are influenced by their demographic characteristics.

H$_1$: PU of QR code use differs in terms of consumers' demographic characteristics.

TAM, from a marketing perspective, is a marketing tool used to predict how consumers will adopt and use a product or service. By considering these factors, marketers can develop effective strategies to promote their products, influence customers, and encourage innovation adoption. TAM has been applied to various marketing contexts, including mobile telecommunications (Wang et al., 2008), digital marketing (Susanti & Astuti, 2019), online shopping (Won et al., 2023), and e-service systems (Lin et al., 2007). These studies consistently have found that PU and PEOU are crucial factors in determining technology acceptance. Various studies have examined TAM from a marketing perspective and have found that consumers adopt TAM for both utilitarian and hedonic reasons. According to Moon and Kim (2001: 218), while PEOU and PU provide extrinsic motivation for consumers, perceived enjoyment (PEN) provides intrinsic motivation. Davis (1989) stated that ease

of use and usefulness are the primary reasons individuals turn to new technologies. However, Carroll and Thomas (1988) suggested that, in addition to perceived usefulness, perceived enjoyment is also directly related to technology acceptance. After this suggestion, Davis et al. (1992) found that individuals prioritize utility over enjoyment in a study of computer use. Subsequent studies have shown that perceived usefulness and perceived enjoyment together affect the intention to use (ITU) technology (Lee et al., 2006; Moon & Kim, 2001; Van Der Heijden, 2003).

H₂: PU of QR code use has positive effect on consumers' attitude of using it.

H₃: PU of QR code use has positive effect on consumers' ITU.

For some consumers, purchasing can be considered a hedonic behavior (Joo, 2014: 149). Phygital marketing communication, using technology such as QR codes, wearable technologies, and online shopping from the store, in particular, emphasizes consumer-oriented and pleasurable aspects of the process. It is important to note that PEN may vary based on consumers' socio-demographic characteristics. The PEN and the level of finding QR codes enjoyable and willing to use them during shopping may differ based on variables such as age, gender, income status, and frequency of using e-commerce. The pleasure and positive emotions derived from the hedonic aspects of technologies inherently drive users to adopt or persist in their usage behaviors (Won et al., 2023: 1115). The literature suggests that TAM is grounded in behavioral, attitudinal, and perceptual relationships (Kim & Woo, 2016; Sang Ryu & Murdock, 2013; Won et al., 2023).

H₄: PEN of QR code use differs in terms of consumers' demographic characteristics.

H₅: PEN of QR code use has positive effect on consumers' attitude of using it.

H₆: PEN of QR code use has positive effect on consumers' ITU.

H₇: Consumers' attitude of using QR codes has positive effect on their ITU

H₈: Attitude has a mediating role in the effect of consumers' PEN of QR code use on their ITU

H₉: Attitude has a mediating role in the effect of consumers' PU of QR code use on their ITU.

Based on the above hypotheses, the researcher illustrates the research model in Figure 6:

Figure 6: Proposed Research Model
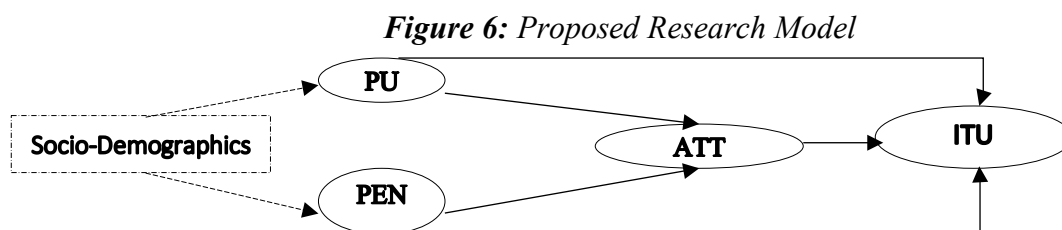
3. Methodology

This study aims to explore consumer attitudes and intentions regarding the use of QR codes, with a particular emphasis on the perceived usefulness (PU) and entertainment value (PEN) aspects of the Technology Acceptance Model (TAM). It also aims to examine these factors across different socio-demographic. Socio-demographic characteristics such as gender, age, education level, income

level, frequency of social media use, e-commerce habits, experience with shopping using QR codes, and QR code risk perception will be considered. The study population consists of individuals over the age of 18 residing in Türkiye. According to the Turkish Statistical Institute (TÜİK, 2023), Türkiye's population is 85,279,553 people. Convenience sampling, a non-random sampling method, was used to select the sample. The sample size formula specified by Yamane (2001) was used (minimum 385). Following the field study, 595 questionnaires were collected. Invalid questionnaires were excluded, leaving 556 questionnaires for analysis.

The research study utilized the online survey method, a quantitative research technique. The questionnaire was divided into two parts. The first part included questions to determine the socio-demographic characteristics of the participants. The second part stated on the Technology Acceptance Model Scale (Avcı, 2017). The scale rates statements on a scale of 1 to 5, ranging from 'strongly disagree' to 'strongly agree'. An ethics compliance report has been obtained for this research regarding the data collection tool used. Prior to the commencement of the study, each participant was required to sign an informed consent form.

This study employed structural equation modeling with SPSS AMOS to examine the causal relationships between four key constructs: PU, PEN, Attitude, and ITU. Additionally, frequency, t-test, and ANOVA analyses were conducted using Excel 2016 and SPSS 20.0.

4. Findings

4.1. Descriptive Statistics

Upon analyzing the demographic characteristics of the participants in Table 1, it was found that 58.3% were female and 58.3% were married. Additionally, 33.1% of the participants belonged to Gen Z, 30.9% to Gen Y, 14% to Baby Boomers, 12.4% to Gen X, and 9.5% to the Silent Generation. Furthermore, 22.7% were unemployed, 21.6% were students, 20.3% were private sector employees, 20% were public sector employees, and 15.5% were retired. 22.3% of the participants had no formal education, 27.5% had completed primary education, 19.1% had completed high school, 17.3% had completed an associate degree, 11.3% had completed an undergraduate degree, and 2.5% had completed a postgraduate degree. In terms of income, 47.8% of participants reported having equal income and expenses, while 34.2% reported having less income than expenses and 18% reported having more income than expenses.

Table 1: Demographic Characteristics of Participants

Variable (n=556)		n	%	Variable (n=556)		n	%
Gender	Female	324	58.3		Silent Generation	53	9.5
	Male	232	41.7		Baby Boomers	78	14.0
Marital Status	Single	232	41.7	**Generation**	Gen X	69	12.4
	Married	324	58.3		Gen Y	172	30.9
	Private Sector Employee	113	20.3		Gen Z	184	33.1
	Public Sector Employee	111	20.0		Illiterate*	36	6.5
Work	Retired	86	15.5		Literate	14	15.8
	Unemployed	126	22.7		Primary School	88	5.6
	Student	120	21.6	**Education**	Middle School	31	21.9
	Income Less Expenses	190	34.2		High School	122	19.1
Income	Income Equals Expenses	266	47.8		Associate Degree	106	17.3
	Income Exceeds Expenses	100	18.0		Undergraduate	96	11.3

*The survey questions were read to illiterate participants by the researcher or assistants, and their responses were recorded.

According to Table 2, 30.6% of the participants have never shopped online. 24.5% reported using e-commerce less than once a month, while the remaining 44.9% shop online at least once a month. In terms of daily social media usage, 36.9% of participants spend less than 1 hour, 31.7% spend 2-3 hours, 20.5% spend 4-5 hours, and 11% spend 6 or more hours on social media. Although 61.7% of the participants had prior experience with QR codes, only 33.6% had used them for shopping and 54% of them perceive using QR codes as risky.

Table 2: Distribution of Participants' Habits

Variable (n=556)		n	%	Variable (n=556)		n	%
Frequency of e-commerce shopping	Never	170	30.6	Average Daily Time Spent on Social Media Platforms	Less than 1 hour	205	36.9
	Daily	6	1.1		2-3 hours	176	31.7
	Several times a week	38	6.8		4-5 hours	114	20.5
	Once a week	32	5.8		6 hours +	61	11.0
	Once every ten days	23	4.1	QR code usage	No	213	38.3
	Once every fifteen days	41	7.4		Yes	343	61.7
	Once a month	110	19.8	Making a purchase by scanning a QR code	No	369	66.4
	Less frequent	136	24.5		Yes	187	33.6
QR Code Risk Perception	Risk-Free	256	46.0				
	Risky	300	54.0				

According to the findings, it is possible to say that the reasons for not using QR codes were lack of knowledge (56.3%), lack of a suitable QR code scanner application (19.4%), reliability concerns (13.94%) and practicality issues (9.92%). In a study conducted by Avcı (2017), it was found that the primary reason for not using QR codes was a lack of knowledge (85%), followed by being found useless (67%). It can be concluded that knowledge about QR codes has increased over time. The Covid-19 pandemic has led to the mandatory use of QR codes at entrances to public areas, such as shopping malls (Mortimer, Andrade, & Fazal-e-Hasan, 2024). In addition, with the new habits that developed during Covid 19, printed material was removed in many places such as cafes, restaurants, banks where is collective use, and the application of accessing information with QR code has increased instead. These can be expected as the main reasons why QR codes have become more widely known

Table 3: Perceived Risks of Using QR Codes

Risks	n	%
Payments may be made on my behalf, my personal bank account credentials may be stolen	188	33.8
A new contact list can be created on my phone, my device can be used beyond my control	172	30.9
My location could be revealed and my privacy could be compromised	157	28.2
Illegal or inappropriate websites may be opened on my device	125	22.5
My security may be endangered by sending messages or e-mails beyond my control	114	20.5
Can make unwanted calls on my behalf	103	18.5

Additionally, the potential risks associated with the use of QR codes were analyzed (refer to Table 3). The most common three concerns include security risks such as identity theft and theft of personal bank account information (33.8%), creation of a new contact list on the user's device and unauthorized use of the device (30.9%), and more general privacy concerns such as users' location information being disclosed and their privacy being violated (28.2%). Okazaki et al., (2012) found that consumers perceive varying levels of risk when using QR codes depending on the context and purpose of their use. Consumers tend to be more cautious when using QR codes in situations that may lead to the theft of personal assets, such as banking, in open areas.

4.2. Inferential Statistics

Table 4a: Analysis of PU and PEN of Using QR Codes in the Context of Socio-Demographic Characteristics of Consumers

			Group Statistics			Test Statistics		
			n	x̄	s.	t	df	p
PU	Gender	Female	324	2.97	1.20	1.009	449.8	.314
		Male	232	2.85	1.39			
	Marital status	Single	232	3.31	1.05	-6.654	550.625	**.000**
		Married	324	2.63	1.35			
	Used a QR code	No	213	1.98	1.13	-16.527	554	**.000**
		Yes	343	3.49	.99			
	Purchase by Scanning a QR Code	No	369	2.46	1.20	-14.608	472.081	**.000**
		Yes	187	3.80	.91			
	Risk Perception	Risk-free	256	3.51	1.12	11.340	548.054	**.000**
		Risky	300	2.40	1.18			
PEN	Gender	Female	324	2.78	1.24	1.516	468.965	.130
		Male	232	2.61	1.36			
	Marital status	Single	232	3.12	1.07	-6.880	548.956	**.000**
		Married	324	2.41	1.36			
	Used a QR code	No	213	1.69	.96	-18.667	554	**.000**
		Yes	343	3.34	1.04			
	Purchase by Scanning a QR Code	No	369	2.18	1.14	-17.611	458.304	**.000**
		Yes	187	3.75	.90			
	Risk Perception	Risk-free	256	3.22	1.24	9.306	554	**.000**
		Risky	300	2.27	1.17			

According to the results in Table 4a, marital status, prior use of QR codes, prior purchase using QR codes, and perceived risk factor of using QR codes show statistically significant differences in terms of both PU and PEN (p<.05). Consumers who are single, those who have used QR codes before, those who have shopped with QR codes, and those who perceive QR codes as risk-free find them both useful and enjoyable (p<.05). It is possible to say that the main reason for this situation is that people with prior experience can use technology more confidently and consciously. This is due to their increased ability to use technology, which in turn reduces their anxiety. Therefore, individuals who have used QR codes before or have shopped through this technology are more likely to have a more enjoyable experience when using QR codes. Türker's (2019) study found that single individuals have a higher perceived usefulness tendency. Reasons for this difference may be that single individuals are typically younger, have more free time, engage in more social interaction, are more susceptible to technology, and have more personal freedom than married individuals. Yıldırım and Kaplan (2019) found that technology users tend to select applications that are easy to

comprehend and provide benefits, and they continue to use the application if they trust it. The gender variable did not have a significant impact on PU or PEN (p=.314, .130). However, the gender variable does not significantly affect the PU or PEN (p=.314, .130). Similar to this study, Türker (2019) found that gender is not a predictive factor. Uyar (2019) on the other hand, reported that men find mobile applications more enjoyable than women do, while Fettahlıoğlu et al. (2018) found them to be more useful for men than women.

According to Table 4b, generation, education, work status, e-commerce usage and social media usage variables (p<.05) create a significant difference in terms of PU and PEN variables. The Tukey test was used to determine which groups were causing the differences. The analysis revealed that Gen X and Gen Y perceive QR codes as more useful than previous generations. Gen Z, on the other hand, perceives QR codes as more useful than Gen X, baby boomers and silent generation, while it does not differ from Gen Y. When examining the PEN dimension, it is evident that different generations have varying perceptions of QR codes. Specifically, Gen X finds QR codes more entertaining than the silent generation, while Gen Y perceives QR codes as more entertaining than both the silent generation and baby boomers. Finally, Gen Z finds QR codes more entertaining than both Gen X, baby boomers, and the silent generation. Consumers with primary education or no education have a lower perception of the usefulness of QR codes compared to those who have completed higher levels of education. On the other hand, consumers who have completed postgraduate education perceive QR codes as more useful than those with other levels of education. Similarly, Uyar's (2019) study found that the perceived usefulness and enjoyment dimensions decreased with increasing age, while the perceived enjoyment dimension increased with increasing education level. However, in contrast to this study, Fettahlıoğlu et al. (2018) concluded that there was no significant difference in the perceived usefulness dimension across generations. An analysis of employment status shows that unemployed and retired consumers differ from all other groups in both PU and PEN, with lower perceptions. However, PU and PEN are higher for unemployed consumers than for retired consumers. At this point, life expectancy and anxiety are considered as important predictors. When examining income, it is observed that it is not a predictor variable for PU and PEN. However, Türker (2019) argues that the perception of usefulness decreases as income status improves, which contrasts with the findings of the present study.

Examining the perception of QR code usage in relation to e-commerce habits, consumers who make online purchases at intervals of more than one month are more likely to engage in e-commerce than those who never make online purchases, and those who purchase online frequently are more likely to be e-commerce shoppers compared to those who rarely purchase online. When analyzing the perception of QR code usage in terms of social media usage time, it can be concluded that individuals who spend less than one hour on social media have lower PU and PEN perceptions compared to those who spend regular time on social media. Consumers who frequently use e-commerce applications and spend a significant amount of time on social media are more likely to come across QR codes, which may result in positive associations. Hypotheses "**H₁:** PU of QR code use differs in terms of consumers' demographic characteristics" and "**H₄**: PEN of QR code use differs in terms of consumers' demographic characteristics" are supported.

Table 4b: Analysis of PU and PEN of Using QR Codes in the Context of Socio-Demographic Characteristics of Consumers

			PU					PEN				
			Group Statistics		Test Statistics			Group Statistics		Test Statistics		
		n	x̄	s.	F	df	p	x̄	s.	F	df	p
Generation	Silent Generation	53	1.60	1.00				1.42	.81			
	Baby Boomers	78	2.11	1.21				1.91	1.08			
	Gen X	69	2.55	1.32	45.110	4	.000	2.13	1.25	49.912	4	.000
	Gen Y	172	3.24	1.13				3.05	1.22			
	Gen Z	184	3.46	.99				3.31	1.03			
Education	Primary Education / Uneducated	169	1.92	1.10				1.67	0.97			
	High School	122	3.22	1.23				3.01	1.25			
	Associate Degree	106	3.47	0.99	55.782	4	.000	3.33	0.91	58.784	4	.000
	Undergraduate	96	3.13	1.05				3.01	1.24			
	Postgraduate	63	3.77	0.96				3.46	1.10			
Work	Private Sector Employee	113	3.08	1.27				2.94	1.37			
	Public Sector Employee	111	3.39	1.14				3.10	1.20			
	Retired	86	1.86	1.15	31.924	4	.000	1.76	1.09	39.230	4	.000
	Unemployed	126	2.58	1.27				2.30	1.24			
	Student	120	3.45	0.92				3.25	0.97			
Income	Income Less Expenses	190	2.989	1.293				2.76	1.28			
	Income Equals Expenses	266	2.797	1.264	2.577	2	.077	2.61	1.29	2.097	2	.124
	Income Exceeds Expenses	100	3.107	1.289				2.90	1.33			
E Commerce Usage	Never	170	1,99	1,18				1,71	1,04			
	Rarely	136	3,07	1,20	89.357	2	.000	2,84	1,18	111.666	2	.000
	Often	250	3,46	1,02				3,33	1,09			
Social Media Usage	Less than 1 hour	205	2,29	1,30				2,06	1,25			
	2-3 hours	176	3,23	1,16	32.596	3	.000	3,04	1,21	34.002	3	.000
	4-5 hours	114	3,20	1,11				3,01	1,18			
	6+	61	3,62	0,94				3,42	0,97			

These findings highlight the importance of considering the target audience when developing QR code strategies. Specifically, marketers should focus on prior experience and perceived risks to increase QR code usage. To enhance the usefulness and enjoyment of QR codes, marketers can target consumers with previous QR code experience and shopping history. To reduce the perceived risk of QR codes, it is suggested to emphasize security measures and ease of use. Marketing strategies can be developed for younger generations, who are more likely to use QR codes. Additionally, campaigns and communication strategies can be tailored based on factors such as education level and employment status.

4.2.1. Measurement Model

Table 5: Values for The Assumptions

Variable	Skewness	Kurtosis	Tolerance	VIF
PU	-.104	-1.134	.264	3.790
PEN	.143	-1.163	.211	4.749
ATT	-.076	-1.228	.199	5.026
ITU	.111	-1.128	.223	4.475

The first step in the path analysis study was to verify if the data met the assumptions for the analysis. No outliers were detected. As normality assumption is hard to meet in social science research, some researchers, such as George and Mallary (2010) and Tabachnick and Fidell (2013), suggest that normality distribution should be determined by examining the skewness and kurtosis values. Tabachnick and Fidell (2013) state that skewness and kurtosis values between -1.5 and +1.5 indicate normal distribution. The skewness and kurtosis values in this study fall within this range. A linear relationship between the variables is expected. The correlation analysis revealed moderate positive relationships between the variables, indicating a significant linear relationship. In path analysis, it is important to avoid multicollinearity among exogenous variables. The study checked for multicollinearity among sub-dimensions using VIF and Tolerance values. A VIF value less than 10 and a tolerance value greater than .01 indicate no multicollinearity. Based on the VIF and tolerance values of the four variables at Table 5, there is no multicollinearity among them.

Table 6: Values for the Measurement Model

Variables	Expressions	Factor Loadings	AVE	CR	p
PU	PU1	0.895	.89	.92	***
	PU2	0.917			
	PU3	0.848			
PEN	PEN1	0.819	.85	.88	***
	PEN2	0.871			
	PEN3	0.845			
ATT	ATT1	0.931	.93	.93	***
	ATT2	0.934			
ITU	ITU1	0.861	.86	.85	***
	ITU2	0.864			
Model Fit Values	X^2/DF=2.810; GFI= .970; AGFI= .942; CFI= .991; RMSEA= .057				

*** Significantly different from zero at the 0,001 level (two-tailed).

Table 6 displays the model fit indices resulting from the CFA. Upon examination of the acceptable values of the fit indices, it can be concluded that the factor structure of the scale exhibits a good or acceptable level of fit in terms of the Chi-Square Fit Test (CMIN/DF<3), Goodness of Fit Index (GFI>.95), Adjusted Goodness of Fit Index (AGFI>.90), Comparative Fit Index (CFI>.95), and Root Mean Square Error of Approximation (RMSEA<.08) values. Construct validity consists of two parts: convergent validity and discriminant validity. To ensure convergent validity, all standardized loadings should be higher than 0.50, the Average Variance Extracted (AVE) should be higher than 0.50, and Composite Reliability (CR) should be higher than 0.60 (Hair et al., 2010: 708-709). It was found that all items in the measurement model had standardized loadings greater than 0.50, indicating statistical significance (p < .05). Additionally, the AVE values for the four sub-dimensions were calculated, all of which were greater than 0.50, confirming convergent validity. Furthermore, CR values were above 0.60 for all variables, indicating acceptable reliability. The factor loading values for the items of each variable were all above the recommended lower limit of 0.70, thus supporting the model's composite reliability.

Table 7: Values for Discriminant Validity

| Constructs	PU AVE Square Root (0.943)	PEN AVE Square Root (0.922)	ATT AVE Square Root (0.964)	ITU AVE Square Root (0.927)
PU	1.00	0.91	0.34	0.33
PEN	0.91	1.00	0.60	0.80
ATT	0.34	0.60	1.00	0.51
ITU	0.33	0.80	0.51	1.00

For discriminant validity, the Fornell & Larcker criterion states that the square root of the AVE for each construct should be greater than the correlation with any other construct in the framework (Fornell & Larcker, 1981). Table 7 displays these discriminant validity results. The results indicate that for PU, the AVE square root (0.943) is greater than its correlations with PEN (0.91), ATT (0.34), and ITU (0.33). For PEN, the AVE square root (0.922) exceeds its correlations with PU (0.91), ATT (0.60), and ITU (0.80). For ATT, the AVE square root (0.964) is greater than its correlations with PU (0.34), PEN (0.60), and ITU (0.51). Lastly, for ITU, the AVE square root (0.927) is greater than its correlations with PU (0.33), PEN (0.80), and ATT (0.51). These findings confirm that the measurement model is consistent with the Technology Acceptance Model (TAM).

4.2.2. Structural Equation Model (SEM) Results

Figure 8 displays the total effects and path coefficients of endogenous and exogenous variables on mediating and endogenous variables of the tested model. The study examines the variables that predict consumers' QR code usage. The findings in the figure indicate that the PU and PEN variables together predict 86% of the variance in the ATT variable (R^2=86). The PU, PEN, and ATT variables directly and indirectly predict 98% (R^2=98) of the variance in the ITU variable. In path analysis, the t-value indicates whether each variable is a significant predictor or not, and the path coefficient (β) indicates the degree of effect. Table 8 shows that PU (t=4.199, β=.342), and PEN (t=7.143, β=603) are significant predictors for ATT. Regarding the effects of the exogenous variables for ATT, the order from highest to lowest is first PEN and then PU. PEN (t=6.642, β=.798), and ATT (t=5.664, β=-.514) are significant predictors of ITU. The study found that PU (t=-3.634, β=-.332) is not a significant predictor of ITU.

These results support hypotheses "**H₂:** PU of QR code use has positive effect on consumers' attitude of using it", "**H₅:** PEN of QR code use has positive effect on consumers' attitude of using it", "**H₆:** PEN of QR code use has positive effect on consumers' ITU", and "**H₇:** Consumers' attitude of

Figure 7: *Proposed Research Model Path Analyze*
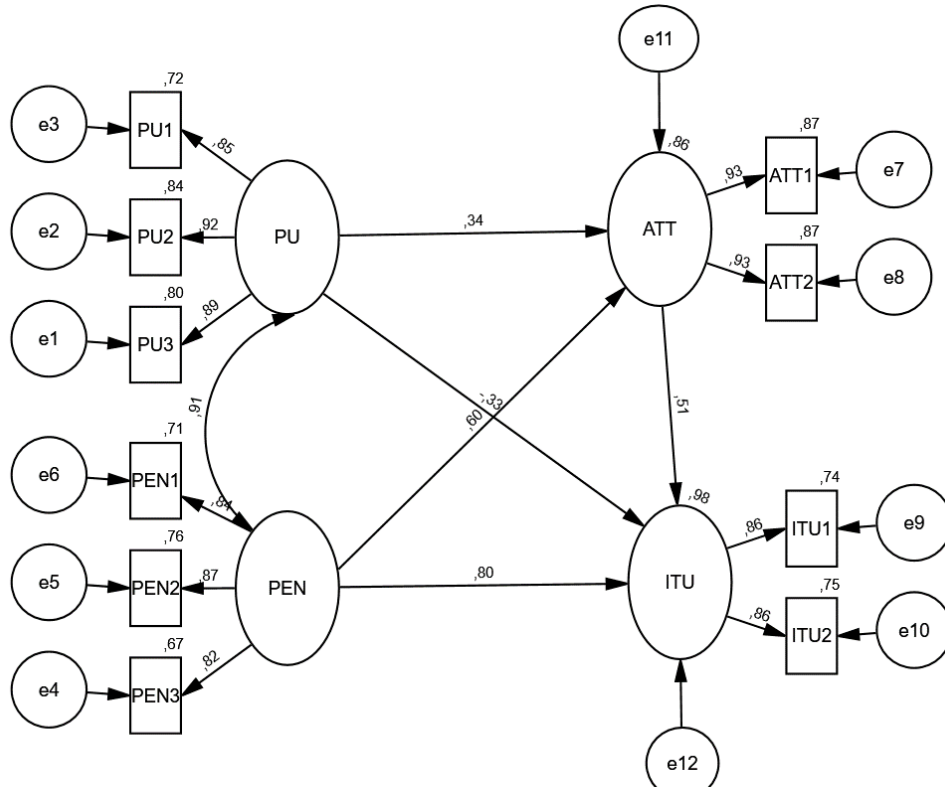
using QR codes has positive effect on their ITU", but do not support hypothesis "**H₃: PU of QR code use has positive effect on consumers' ITU**".

Table 8: Measurement Values of The Tested Structural Model

Structural Pathways	Estimate (β)	df	t	p
PU → Attitude	.342	.086	4.199	***
PU → ITU	-.332	.083	-3.634	***
PEN → Attitude	.603	.098	7.143	***
PEN → ITU	.798	.120	6.642	***
Attitude → ITU	.514	.078	5.664	***

The analysis focuses on two variables, PEN and ATT, and their direct and indirect effects on ITU. The total effect of the PEN variable on ITU is 1.108, with a direct effect of .798 and an indirect effect of .310. The direct effect of ATT on ITU is .514, and it also acts as a mediator in the effect of PEN on ITU. The hypothesis "H₈: Attitude has a mediating role in the effect of consumers' PEN of QR code use on their ITU" is supported. However, the hypothesis "**H₉:** Attitude has a mediating role in the effect of consumers' PU of QR code use on their ITU" could not be supported, as PU has no direct effect on ITU. In other words, when consumers perceive QR codes as enjoyable, it has a positive effect on their attitudes towards QR codes, which in turn, enhences their intention to use them.

Table 9: Standardized Total, Direct, and Indirect Effect Values for The Tested Structural Model

		PU	PEN	ATT
Total Effects	*ATT*	.342	.603	.000
	ITU	-.156	1.108	.514
Direct Effects	*ATT*	.342	.603	.000
	ITU	-.332	.798	.514
Indirect Effects	*ITU*	.176	.310	.000

5. Conclusion

This study examined the usage tendencies of consumers from different generations with various demographic characteristics with regard to QR codes within the scope of the technology acceptance model (TAM). While half of the consumers perceived QR codes as risky, the remaining half did not perceive any risk. However, it was observed that the majority were familiar with using QR codes, but those who used them during purchase were in the minority. The findings revealed that user experience and security perception have an impact on QR code usage. Similarly, Zhong and Moon (2022: 7149) demonstrated that enhanced service security fosters user satisfaction, which, in turn, encourages regular use. Marketing communication is based on perception. Therefore, to increase the widespread acceptance of QR codes, it is necessary to develop security measures, implement awareness-raising efforts to ensure that users use this technology more safely, and increase consumers' perception of the safety of QR codes. Furthermore, it is recommended that more careful consideration be given to the design and use of QR codes to increase the safety of users.

Individuals tend to gravitate towards phenomena they are familiar with or perceive as reliable. Research conducted by Suo et al. (2022) indicates that habits positively influence behavioral intention in the context of QR code use. Similarly, the study by Zhang and Xu (2019) demonstrated that QR codes are perceived as more useful as consumers' knowledge or frequency of use increases. In other words, individuals' approach to events and phenomena, their perceived sense of trust, their level of knowledge and frequency of exposure to the phenomenon, their life expectations, and anxiety levels affect their preferences. This finding is important for understanding and improving the user experience of technology use. In order for users to accept technology more easily and use it in a more enjoyable way, the importance of prior experience should be emphasized. At this juncture, those who have previously utilized the product offer their insights and counsel to those who have not (Zhang & Xu, 2019: 761). Consequently, technological adaptation period can be optimized to enhance its effectiveness and efficiency.

The PU of a phenomenon generally has a positive impact on ITU, according to many studies. Although Lin et al. (2017) demonstrated that PU positively affects ITU in their study on QR codes, other studies in the literature (Avcı, 2017) indicate that ITU QR codes is not influenced by PU. This study found that, in line with the broader literature, PU was not a predictor of ITU. Several reasons were identified for this, including lack of experience or familiarity with QR codes, limited trust, availability of alternative options, privacy and security. However, findings revealed that attitude significantly influenced ITU, with intention to use increasing as a result of PEN. Eyüboğlu and Sevim

(2016) concluded that PEN reduces perceived risk. It can be understood that while PEN positively and highly affects the ITU QR codes, it can also trivialize the perceived risk factor. Therefore, it is understood that further studies should be carried out in areas such as entertainment, usability, security, and marketing to increase the use of QR codes. At this juncture, the strategies that brands should pursue to enhance consumers' QR code utilization can be delineated as follows:

- **Enhance Security Measures:** Develop improved security measures to increase the widespread acceptance of QR codes, addressing concerns regarding their safety and reliability.

- **Increase Awareness and Trust:** Implement awareness campaigns and educational materials to enhance consumers' trust and understanding of QR code technology, thus boosting their confidence in using it securely.

- **Improve User Experience:** Focus on usability and user experience enhancements to streamline QR code usage, making it more intuitive and enjoyable for consumers.

- **Standardization and Transparency:** Establish clear standards, content guidelines, and safety notifications to alleviate privacy and security concerns associated with QR code usage.

- **Collaborative Promotions:** Engage in partnerships and promotional activities to incentivize QR code usage among consumers, potentially through exclusive offers or rewards.

- **Personalization and Entertainment:** Explore avenues for personalizing QR code experiences, such as through interactive and entertaining content, to make them more appealing and engaging for users.

- **Tailored Marketing Strategies:** Tailor marketing strategies to target audiences' specific needs and preferences, highlighting the benefits of QR code usage and providing guidance on its effective utilization through engaging multimedia content.

As a result, it is necessary to define the right target audience in the marketing strategies to be implemented, to clearly emphasize the benefit message that they will obtain if they use QR codes, and if necessary, to provide support with entertaining video content on how to use them. Given that QR codes represent a dynamic form of communication, it is crucial to integrate them into all advertising elements and ensure their visibility.

This study has several limitations. Firstly, since the data were collected within a single point in time, it was not possible to examine changes in consumer attitudes over time. Future studies consider collecting longitudinal data to analyze how attitudes evolve. Additionally, focusing solely on consumers in Türkiye restricts limits the generalizability of the findings to different cultural and geographical contexts. Future studies should aim to include broader demographic segments to obtain more comprehensive results. The use of self-report method in this study introduces the risk of social desirability bias in participants' responses. In future studies, it is recommended to combine application-based measurement methods with surveys for a more accurate assessment of attitudes. Lastly, the sample size determined using Yamane's formula may not be sufficient for certain demographic groups. Therefore, increasing the sample size in future studies would help achieve more representative population.

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