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DIGITAL TRANSFORMATION IN THAI PUBLIC HEALTH: A TAM ANALYSIS OF TECHNOLOGY ADOPTION

Thittarat PIMPAPORN[1], Nuanluk SANGPERM[1*], Werayut PIMPAPORN[2], Daranee JUNJAROENWONGSA[3] and Nantawan HENGTRAKULVENICH[3]

1 Faculty of Management Sciences, Kasetsart University, Thailand; thittarat.p@ku.th (T. P.); nuanluk.s@ku.th (N. S.) (Corresponding Author)
2 Faculty of Science at Sriracha, Kasetsart University, Thailand; werayut.p@ku.th
3 The Office of Disease Prevention and Control, Region 6 Chonburi, Department of Disease Control, Thailand

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Abstract

This study explores factors influencing digital technology adoption in the Thai public health sector, using an extended Technology Acceptance Model (TAM 3). Data from 238 personnel at the Office of Disease Prevention and Control Region 6 were analyzed through multiple linear regression. The findings indicate that perceived usefulness is significantly influenced by image, output quality, and job relevance, while perceived ease of use is shaped by objective ability, computer self-efficacy, enjoyment, playfulness, and perception of external control. Furthermore, subjective norm impacts image, and both perceived usefulness and ease of use are critical for intention to use digital technology. The findings offer actionable insights for government agencies to enhance digital technology adoption. Understanding these factors enables the design of effective strategies to promote digital transformation in Thailand's public health sector, supporting the goals of modernization, efficiency, and citizen-centric service delivery.

Keywords: Technology Acceptance Model, Digital Transformation, Public Health, Government Agencies, Thailand

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Introduction

The Digital Government Development Plan of Thailand (2023-2030) aims to transform the public sector into a modern, efficient, and citizen-centric system. Its key objectives include delivering responsive public services, reducing inequality, and enhancing business competitiveness. The plan emphasizes transparency/full disclosure by promoting open access to information, fostering public participation, and building an agile government capable of adapting to rapid changes. These initiatives serve as a foundation for driving Thailand's economic and social progress. A major strategy outlined in the plan focuses on enhancing digital transformation in the public sector to enable flexible, agile management while extending these capabilities to local government agencies. Among the critical sectors, health and medical services play a pivotal role in advancing the Digital Government initiative (Digital Government Development Agency, 2023).

The digital transformation of Thai government agencies is essential for aligning organizations with the country's national strategic plan. A core component of this transformation is the development of human resources to adapt to advances in digitization, a factor that is vital for sustainable progress. Transforming government agencies into digital workplaces involves establishing a clear and tangible operational framework. This makes it possible to integrate digital technology across all dimensions, including work processes, product development, organizational culture, and future growth strategies.

In the contemporary operational landscape, digital transformation is paramount. Consequently, adapting operational models to prioritize digital technologies is a critical administrative function for modern organizations (Jamjang & Kraiwanit, 2019). The adoption of digital technology enhances operational efficiency, equips organizations to respond to technological advancements, and supports the development of innovative business models and services. Effective management of digital technology projects and operations must prioritize quality and the ability to achieve the ongoing and sustainable objectives of government agencies (Digital Government Development Agency, 2023; Office of the National Economic and Social Development Council, 2022).

Recognizing the importance of digital transformation in Thailand's public sector, government personnel are clearly the key resource driving its success. Consequently, understanding technology acceptance and behavioral intention to use technology is essential for developing strategies to effectively prepare personnel for the transition to digital organizations. A key activity in this effort is the "analysis of factors to develop recommendations for fostering behavioral intention to use technology." This initiative enables organizations to design effective and targeted strategies for technology adoption, ensuring readiness for digital transformation.

In the context of public workforce development, the importance of enhancing skill sets, mindsets, and attitudes must not be underestimated. Preparing personnel with modern and relevant skills for the digital age, such as proficiency in information technology, data analysis, and digital system management, will enable them to perform efficiently and meet organizational demands. Additionally, cultivating an open mindset towards change and innovation will help employees remain adaptable and continuously learn new technologies.

Developing positive attitudes towards technology usage and fostering teamwork will create an environment conducive to creativity and growth within the organization. Investing in the development of human resources in these areas is essential for advancing Thai state enterprises towards a stable and sustainable digital future.

In alignment with the digital government development Plan, the successful implementation of digital transformation in the public health sector depends largely on the willingness of personnel to adopt new technologies. This is particularly important in achieving public health-specific goals such as improving service delivery, enhancing disease surveillance, and

ensuring timely access to health information. However, the adoption of digital tools in the Thai public health system continues to face challenges, including resistance to change, lack of digital skills, and concerns about usability and relevance to existing workflows. Understanding the factors that influence technology acceptance is therefore essential for realizing the full potential of digital transformation in this sector.

Therefore, the process of analyzing factors to develop recommendations for fostering behavioral intention to use technology is a vital step in strengthening the confidence and capabilities of personnel. This ensures that organizations can achieve their goals efficiently and sustainably.

Research Objective

This study extends the Technology Acceptance Model 3 (TAM 3) to investigate digital technology adoption within a Thai Government Agency. It seeks to adapt TAM 3 by incorporating key organizational and cultural factors from the Thai public sector influencing digital tool adoption. Subsequently, the research will empirically validate this contextualized model to identify significant predictors of employee technology usage. The ultimate aim is to provide managers with an evidence-based framework and actionable insights for fostering more effective digital technology implementation and integration.

Literature Review

The Technology Acceptance Model 3 (TAM 3) is an extension of the original Technology Acceptance Model (TAM) and its subsequent version, TAM2. Developed by Venkatesh & Bala (2008), TAM 3 aims to provide a more comprehensive framework for understanding the factors that influence the acceptance and adoption of technology in organizational settings. TAM 3 integrates elements from TAM2, the Theory of Planned Behavior (TPB), and the Model of Personal Computer Utilization (MPCU), while also adding new constructs related to individual differences, organizational factors, and technology experience.

1) Evolution of TAM to TAM 3

The original TAM, proposed by Davis (1989), was designed to explain how users come to accept and use technology. It focuses on two key variables: perceived usefulness (PU) and perceived ease of use (PEOU). According to TAM, these factors determine an individual's intention to use a system, which subsequently affects actual usage behavior.

TAM 2, developed by Venkatesh & Davis (2000), extended the original TAM by incorporating additional factors such as subjective norms, image, job relevance, output quality, and result demonstrability. These additional variables helped explain technology acceptance in contexts where social influence and cognitive instrumental processes are significant.

TAM 3 further extends this model by integrating two additional streams. The first comprises the determinants of perceived ease of use: TAM 3 incorporates new factors like computer self-efficacy, perceptions of external control, computer anxiety, and computer playfulness. These variables aim to explain what shapes an individual's perception of how easy or difficult it is to use a technology.

The second comprises experience and moderating effects: TAM 3 emphasizes the role of experience, which can moderate the relationships between the key determinants of perceived usefulness, ease of use, and behavioral intention.

2) Key Constructs in TAM 3

The variables based on the Technology Acceptance Model 3 (TAM 3) framework for studying digital organizational development are summarized below:

1) Subjective Norm in using digital technology in work performance. Refers to the social pressure or expectations from significant individuals (such as supervisors, colleagues, or the organization) that influence an individual's decision to use digital technology in their work.

2) Image of using digital technology in work performance. Describes the perception that using digital technology enhances the user's professional image within the organization or society. For example, being seen as technologically competent may lead to greater recognition and credibility.
3) Job Relevance in using digital technology in work performance. Reflects the degree to which individuals perceive that digital technology is essential and applicable to their specific job roles and responsibilities.
4) Output Quality in using digital technology in work performance. Refers to the belief that the outcomes derived from using digital technology are of high quality and meet work-related expectations.
5) Result Demonstrability in using digital technology in work performance. Indicates the extent to which individuals can visibly observe or effectively explain the benefits and results gained from using digital technology in their work.
6) Computer Self-Efficacy in using digital technology in work performance. Represents the confidence individuals have in their ability to successfully use digital technology in their work, even without external assistance.
7) Perception of External Control in using digital technology in work performance. Refers to the belief that organizational support and available resources (such as IT support, stable network infrastructure, or training programs) facilitate smooth adoption and use of digital technology.
8) Computer Anxiety and Work Performance. Describes the feelings of nervousness or apprehension associated with using digital technology, often stemming from a lack of familiarity or fear of making mistakes.
9) Computer Playfulness in Work Performance. Captures the extent to which individuals find joy and curiosity in exploring and experimenting with digital technology voluntarily.
10) Objective Usability in using digital technology in work performance. Involves the actual assessment of digital technology's effectiveness, including its speed, accuracy, and ease of use, based on real-world applications.
11) Voluntariness in using digital technology in work performance. Represents the degree to which individuals choose to use digital technology willingly, without being forced or pressured by their organization or superiors.
12) Experience in using digital technology in work performance. Relates to an individual's previous exposure to digital technology, which influences their confidence and capability in using it effectively.
13) Perceived Usefulness in using digital technology in work performance. Refers to the belief that digital technology enhances work efficiency by improving speed, reducing errors, and increasing productivity.
14) Perceived Ease of Use in using digital technology in work performance. Reflects the perception that digital technology is intuitive, easy to navigate, and does not require excessive effort to learn.
15) Intention to use digital technology in work performance represents an individual's willingness and commitment to adopt and integrate digital technology into their work in the future.
These variables reflect key aspects of how individuals interact with and adopt digital technologies in the context of work.

Factors Influencing Perceived Usefulness of Technology

Empirical Support for TAM 3. Several studies have provided empirical validation for TAM 3 across various contexts. For example, Venkatesh & Bala (2008) conducted field studies in organizational settings to validate the model, showing that TAM 3 successfully predicts technology adoption and use over time.

In the healthcare sector, TAM 3 has been used to explore the adoption of health information systems. Researchers found that perceived ease of use and perceived usefulness, along with computer self-efficacy and external control, significantly influenced health professionals' willingness to use new technology (Holden & Karsh, 2010).

In educational settings, TAM 3 has been applied to understand the adoption of e-learning platforms, with results suggesting that enjoyment, playfulness, and self-efficacy are key factors influencing student acceptance of these systems (Padilla-Meléndez et al., 2013).

TAM 3 in the Context of Digital Technology in Thai Government Agencies.

Perceived Usefulness is a core component of the Technology Acceptance Model (TAM) and is further expanded in TAM 3, stating that users will accept technology if they believe that it can improve their ability to do their job (Venkatesh & Davis, 2000). Several studies have found that subjective norms or social pressures influence the perceived usefulness of technology (Schepers & Wetzels, 2007), particularly in work environments where employees are required to use technology in accordance with organizational policies.

On the other hand, subjective norms wield no influence on perceived usefulness, according to research by Khamlamai & Simakhajornboon (2022), who investigated the factors affecting the perceived usefulness of food delivery applications.

H1: Subjective norms exert an influence on the perceived usefulness of digital technologies.

The relationship between technology use image and perceived usefulness was confirmed by Venkatesh & Davis (2000), who indicated that if individuals perceive that using technology enhances their career status, they will believe that the technology is useful.

H2: Image of technology use has an influence on the perceived usefulness of digital technology.

Davis et al. (1989) stated that users will perceive technology as useful if they perceive it to be directly relevant to their job. Venkatesh & Bala's (2008) research also supports the contention that job relevance is an important variable in determining the value of technology.

H3: Job Relevance influences the perceived usefulness of digital technology.

Research by Wixom & Todd (2005) showed that if the outcomes of using technology do not match the user's expectations, it may result in reduced perceived benefits. Including the study carried out by Chen & Lin (2019), research on digital financial services discovered that output quality affects perceived usefulness, which in turn influences usage intention.

H4: Output Quality has an influence on the perceived usefulness of digital technology.

Result demonstrability is an important factor that allows users to gauge the effectiveness of a technology. Karahanna & Straub's (1999) research indicates that if users can clearly observe the results of using technology, they will perceive the technology as useful. However, some research found that result demonstrability had no positive influence on perceived usefulness (Khamlamai & Simakhajornboon, 2022).

H5: Result Demonstrability has an influence on the perceived usefulness of digital technology.

Barki & Hartwick (1994) in their research suggest that if individuals are forced to use technology, they may perceive its usefulness to be lower than those who use the technology voluntarily. Davis (1989) stated that perceived ease of use influences digital technology use intention. Alalwan et al. (2018) examined the usage of digital banking services and found that perceived ease of use has a significant influence on the intention to use.

H6: Perceived Ease of Use has an influence on digital technology use intention.

Factors Affecting Perceived Ease of Use

Perceived ease of use is another key TAM factor affecting technology adoption. Compeau & Higgins (1995) pointed out that people who have confidence in their ability to use technology (Computer Self-Efficacy) will perceive the technology as easy to use. Subanjui (2017) conducted an analysis of the components of computer self-efficacy perception among

operational employees in industrial businesses. The research results indicated that computer self-efficacy perception consists of key components that significantly affect the use of digital technology.

H7: Computer Self-Efficacy has an influence on the perception of ease of using digital technology.

Venkatesh & Bala (2008) stated that organizational support, such as training and technical assistance, influences users' perception of the technology as easier to use.

H8: Perception of external control has a positive influence on perceived ease of use of digital technology.

Igbaria & Iivari (1995) argued that people with technological anxiety tend to perceive it as difficult to use. Venkatesh (2000) found that computer anxiety had a negative influence on perceived ease of use of technology. Additionally, research by Marakas et al. (1998) noted that computer anxiety was negatively related to perceived ease of use, meaning that people with high computer anxiety tended to find technologies more difficult to use and were less confident in using them.

H9: Computer Anxiety has an influence on the perceived ease of use of digital technology.

Webster & Martocchio's (1992) research reported that people who enjoy using computers perceive the technology as easy to use. Microcomputer playfulness refers to the extent of spontaneous cognitive engagement during interactions with microcomputers. Studies on the broader concept of playfulness have shown connections with traits such as creativity and exploration. Given the increasing use of computers in organizations, exploring microcomputer playfulness could offer valuable insights with practical implications for organizations.

H10: Computer Playfulness has an influence on the perceived ease of use of digital technology.

Agarwal & Karahanna (2000) showed that if individuals enjoy using technology, they perceive the technology as less complicated.

H11: Computer Enjoyment has an influence on the perceived ease of use of digital technology.

Venkatesh et al. (2012) in their research showed that users' actual technical abilities shape the perceived ease of use of technology.

H12: Objective Ability has an influence on the perceived ease of use of digital technology.

Factors Affecting Intention to Use

A study conducted in Vietnam by Tran et al. (2023) explored the factors influencing teachers' intention to use the social media platform Zalo. The findings revealed that subjective norms—shaped by peers, administrators, students, and parents—played a significant role in shaping teachers' attitudes and their decision to adopt the application. Similarly, Sullivan et al. (2022) found that subjective norms and attitudes influenced the intention to use technological innovations within organizations, with procedural justice acting as a moderating factor.

H13: Subjective norm has an influence on the intention to use digital technology.

Davis et al.'s (1989) research confirmed that perceived usefulness of technology is the most important variable influencing use intention. Furthermore, more recent research supports the results of this research, and this is in reference to Legramante et al. (2023), whose study confirmed that perceived ease of use positively influences perceived usefulness. This means that when users find a system easy to navigate and interact with, they are more likely to perceive it as useful for their tasks and activities. In turn, perceived usefulness was found to have a significant positive effect on both user satisfaction and behavioral intention.

H14: Perceived usefulness of technology has an influence on intention to use digital technology.

Salar & Hamutoglu (2022) believe that behavioral intention is strongly influenced by both perceived usefulness and perceived ease of use, with perceived ease of use playing a crucial role in predicting both perceived usefulness and behavioral intention in the individual adoption of CCSs.

H15: Perceived ease of use has an influence on intention to use digital technology.

Suwanchawalit (2022) found that the influence of people and the wider society has a significant positive relationship with image, and this also applies to autonomous vehicles in Bangkok. Khamlamai & Simakhajornboon (2022) studied factors affecting the perceived usefulness of food delivery applications, and they found that subjective norm has a positive influence on image.

H16: Subjective norm has an influence on image.

Experience is a Moderating Variable in the TAM 3 Model

Venkatesh & Davis (2000) found that the influence of subjective norm on usage intention or perceived system usefulness decreased over time as users tend to rely more on direct experience of system use, instead of relying on others' opinions to determine intention and perceived usefulness of the technology. The role of experience as a moderator reduces the influence of social influence (which is like subjective norm) on intention to use technology, which means that more experienced users will have a reduced influence of subjective norm on intention because they have more experience and their conformity to others will decrease (Venkatesh et al., 2003).

H17: Experience moderates the relationship between subjective norm and intention to use digital technology.

H18: Experience moderates the relationship between subjective norms and perceived usefulness of digital technology.

The study by Wild et al. (2012) examined computer-related self-efficacy and anxiety in older adults with and without mild cognitive impairment. The main finding was that computer proficiency, rather than intellectual status, significantly impacted confidence and anxiety regarding specific computer use. Over the course of a one-year follow-up, participants showed reduced anxiety and increased confidence in their ability to use computers.

H19: Experience moderates the relationship between computer anxiety and perceived ease of use of digital technology.

Hackbarth et al. (2003) explored the role of computer experience as a mediating variable between computer playfulness and perceived ease of use. Their research found that both computer playfulness and computer anxiety function as significant mediators, highlighting how experience with technology influences users' perceptions of its ease of use.

However, according to the TAM 3 Model, the focus is on technology experience as a moderator in the relationship between computer enjoyment, objective ability, and perceived ease of use. The literature review revealed a lack of sufficient research exploring the relationship between these variables. Consequently, the researcher aims to study technology experience as a moderating variable in this relationship.

H20: Experience moderates the relationship between computer playfulness and perceived ease of use of digital technology.

H21: Experience moderates the relationship between computer enjoyment and perceived ease of use of digital technology.

H22: Experience moderates the relationship between objective ability and perceived ease of use of digital technology.

Venkatesh & Davis (2000) described the Technology Acceptance Model 2 (TAM2) as follows: experience significantly weakens the relationship between ease of use, perceived usefulness, and adoption of technology. It also highlights that the strength of relationships

between key technology acceptance variables oscillates depending on the level of user experience.

H23: Experience moderates the relationship between perceived ease of use and perceived usefulness of digital technology.

H24: Experience moderates the relationship between perceived ease of use and intention to use digital technology.

Voluntariness is a Moderate Variable in the TAM 3 Model

According to TAM 3, when the use of technology is voluntary, subjective norm wields a stronger influence on the intention to use the technology because users have the freedom to make their own decisions. As a result, they may place greater importance on the opinions of others. However, when technology use is mandatory, subjective norm may have a smaller impact on the intention to use, since users may feel compelled to use the technology rather than being influenced by others' opinions.

H25: Voluntariness moderates the relationship between subjective norm and intention to use digital technology.

In the context of a Thai Government Agency, TAM 3 can provide a comprehensive framework for understanding how employees perceive and adopt digital technologies. Given the public sector's focus on modernization and digital transformation, TAM 3's focus on factors like self-efficacy, subjective norms, and perceived enjoyment could be particularly relevant. For instance, initiatives to improve employee confidence in using digital tools (enhancing self-efficacy) and reducing technology-related anxiety could significantly impact the successful adoption of new systems. Additionally, cultural factors in Thailand, such as the acceptance of hierarchical organizational structures and respect for authority, may influence the role of subjective norms in technology adoption.

Research Methodology

This research is a quantitative study that utilizes a closed-ended questionnaire as the research tool. The research process involves certain steps, which are explained more fully below.

Population and Sample

The population for this study comprised 279 personnel from the Office of Disease Prevention and Control 6, Chonburi, under the Department of Disease Control, Ministry of Public Health, Thailand. A total of 238 participants were selected using a convenience sampling method, with selection based on the departmental distribution outlined in the organization's structure. This study used an online questionnaire, which was distributed via Google Forms. Participant protection measures included obtaining informed consent, maintaining data confidentiality/anonymity, ensuring voluntary involvement, and securing all collected information.

Research Instrumental

Based on the adapted Technology Acceptance Model (TAM 3), the questionnaire was divided into four sections: 1) General information about the respondents, 2) Factors derived from the adapted TAM 3 framework, 3) Perceptions and behavioral intention related to digital technology use in work practices, and 4) Suggestions.

Data Analysis

This quantitative study utilized descriptive statistics and inferential statistics for hypothesis testing. Multiple linear regression assessed direct effects. For moderating effects, we employed PROCESS Macro (Model 1) in SPSS, which precisely identifies how moderator levels influence the independent-dependent variable relationship. This allows us to pinpoint specific organizational factors that enhance digital technology effectiveness.

Research Finding

Most respondents were female (60.9%), from Generation Y, born between 1980 and 1997 (48.7%), with a Bachelor's degree (57.1%), and had worked for 25 years or more (29.8%). Most were government employees (53.4%), with 83.6% working in operational roles, while the majority worked in the communicable disease group (9.2%).

The average and standard deviation of the acceptance of technology were analyzed. The top three highest mean scores were: perceived ease of use, enjoyment in using computers, and previous experience with technology, as shown in Table 1.

Table 1 Mean and standard deviation of the variable

Variable	Mean	Std. Deviation
Subjective Norm	4.209	.832
Image	4.407	.724
Job Relevance	4.410	.721
Output Quality	4.277	.736
Result Demonstrability	4.052	.784
Computer Self-Efficacy	4.077	.738
Perception of External Control	2.584	1.224
Computer Anxiety	3.424	1.208
Computer Playfulness	4.416	.751
Computer Enjoyment	4.181	.800
Objective Ability	3.845	.841
Voluntariness	3.231	.724
Experience	4.370	.778
Perceived Usefulness	4.448	.704
Perceived Ease of Use	3.949	.700
Intention	4.291	.720

A multicollinearity test was undertaken. It emerged that the independent variables were not related to each other, as evidenced by the Tolerance and VIF values passing the specified criteria (VIF < 5; Tolerance > 0.1, it means no significant multicollinearity problems were found (Hair et al., 2010)) Therefore, multiple regression analysis was conducted to find the influence of the dependent variables according to the hypotheses. As shown in Table 2.

Table 2 Multiple linear regression

Dependent Variable: Perceived Usefulness R = .823, R Square = .677, Adj R Square = .670						
Effect	**Estimate**	**S.E.**	**t**	**Sig**	**Tolerance**	**VIF**
(Constant)		.173	4.271	.000		
Subjective Norm	-.004	.043	-.075	.941	.542	1.846
Image	.391	.075	5.044	.000	.232	4.305
Job Relevance	.180	.079	2.240	.026	.215	4.654
Output Quality	.255	.073	3.346	.001	.240	4.170
Result Demonstrability	.062	.050	1.106	.270	.441	2.266
Perceived Ease of Use						
Dependent Variable: Perceived Ease of use R = .742, R Square = .550, Adj R Square = .538						
(Constant)		.245	2.692	.008		
Computer Self-Efficacy	.238	.065	3.672	.000	.417	2.399
Perception of External Control	.075	.038	1.985	.048	.692	1.445

Computer Anxiety	-.033	.031	-1.088	.278	.692	1.446
Computer Playfulness	.127	.063	2.005	.046	.419	2.386
Computer Enjoyment	.161	.068	2.369	.019	.324	3.087
Objective Ability	.239	.046	5.173	.000	.630	1.588
Dependent Variable: Image R = .660, R Square = .435, Adj R Square = .433						
(Constant)		.182	10.923	.000		
Subjective Norm	.660	.043	13.486	.000	1.000	1.000
Dependent Variable: Intention to Use R = .872, R Square = .760, Adj R Square = .758						
(Constant)		.153	.998	.320		
Perceived Usefulness	.645	.046	14.368	.000	.506	1.974
Perceived Ease of Use	.288	.047	6.426	.000	.506	1.974

Analysis of statistical values based on the hypothesis found that factors influencing perceived usefulness at the .01 significance level include: image (effect = .391) and output quality (effect = .255), at the .05 significance level; job relevance (effect = .180) is also significant. However, subjective norm and result demonstrability do not influence perceived usefulness, as has been shown in Table 2.

The factors influencing perceived ease of use at the .01 significance level include: objective ability (effect = 0.239) and computer self-efficacy (effect = .238), at the .05 significance level, computer enjoyment (effect = .161), computer playfulness (effect = .127); perception of external control (effect = .075) is also significant. However, computer anxiety does not influence perceived ease of use, as has been indicated in Table 2.

The subjective norm influences image at the .01 significance level with an effect of .660. Finally, the factors influencing intention to use at the .01 significance level are perceived usefulness (effect = .645) and perceived Ease of use (effect = .288). This is presented in Table 2.

Table 3 Moderated Effect

Variable	**coeff**	**se**	**t**	**p**	**LLCI**	**ULCI**
SN*EXP→ INT	-.0707	.1152	8.2039	.0203	-.1302	-.0111
SN*VOL→INT	-.1852	.0566	-3.2690	.0012	-.2968	-.0736
SN*EXP→ PerUse	-.1236	.0263	-4.5854	.0000	-.1766	-.0705
JR*OQ→ PerUse	-.1392	.0351	-3.9681	.0001	-.2083	-.0701
PerEase*EXP→ INT	-.0528	.0287	-1.8424	.0667	-.1093	.0037
PerEase*EXP→ PerUse	-.1137	.0269	-4.2349	.0000	-.1666	-.0608
CA*EXP→ PerEase	-.0514	.0380	-1.3513	.1779	-.1264	.0235
OA*EXP→ PerEase	-.0815	.0383	-2.1282	.0344	-.1569	-.0061
CP*EXP→ PerEase	-.1072	.0393	-2.7291	.0068	-.1846	-.0298
CE*EXP→PerEase	-.0394	.0264	-1.4937	.1366	-.0914	.0126

SN = Subjective Norm, EXP = Experience, INT = Intention to Use, VOL = Voluntariness, PerUse = Perceived usefulness, PerEase = Perceived Ease of use, JR = Job Relevance, OQ = Output Quality, CA = Computer Anxiety, OA = Objective Ability, CP = Computer Playfulness, CE = Computer Enjoyment

After analyzing the direct influence, the moderation variables were examined. The analysis followed the TAM 3 model, incorporating voluntariness and experience as a moderation variable in Process Macro model 1 using a significance level of .05. The results are as follows.

At the .05 significance level, the effect of subjective norm on intention to use depends on the level of experience, showing an inverse relationship (coeff = -.0707, p = .0203). When

dividing experience into three levels—low, medium, and high—it was found that when experience is low, the influence of subjective norm on intention is stronger. Conversely, when experience is high, the influence of subjective norm on intention is weaker. The influence values are shown in Table 3 and Figure 1.

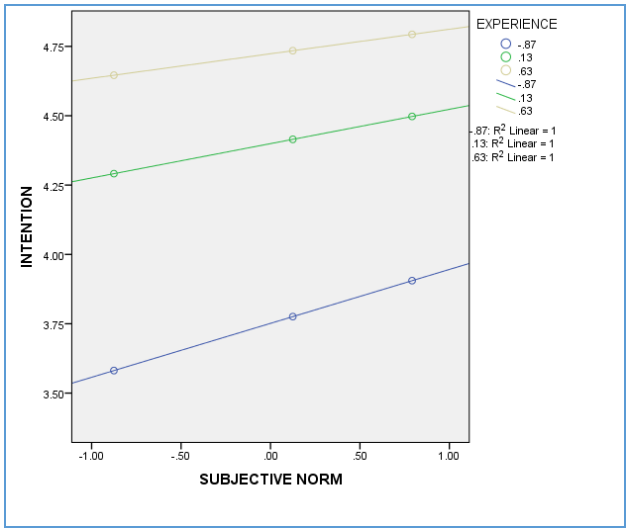

Figure 1 The level of experience in the subjective norm and intention to use

At the .05 significance level, the effect of subjective norm on intention to use depends on the level of voluntariness, showing an inverse relationship (coeff = -.1852, p = 0.0012). When dividing voluntariness into three levels—low, medium, and high—it was evident that when voluntariness is low, the influence of subjective norm on intention to use is stronger. Conversely, when voluntariness is high, the influence of subjective norm on intention to use is weaker. The influence values are shown in Table 3 and Figure 2.

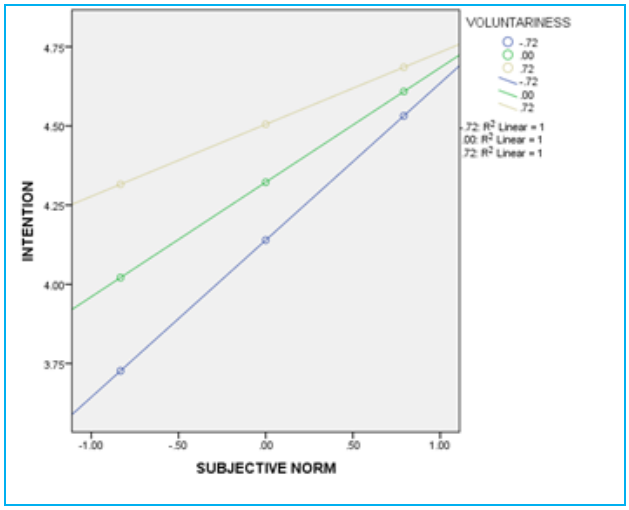

Figure 2 illustrates the level of voluntariness in the subjective norm and intention to use

At the .05 significance level, the effect of subjective norm on perceived usefulness depends on the level of experience, the direction of the relationship reverses depending on experience level (coeff = -.1236, p = .0000). When dividing experience into three levels—low, medium, and high—it was found that when experience is low, the influence of subjective norm on perceived usefulness is stronger. Conversely, when experience is high, the influence of

subjective norm on perceived usefulness is weaker. The influence values are shown in Table 3 and Figure 3.

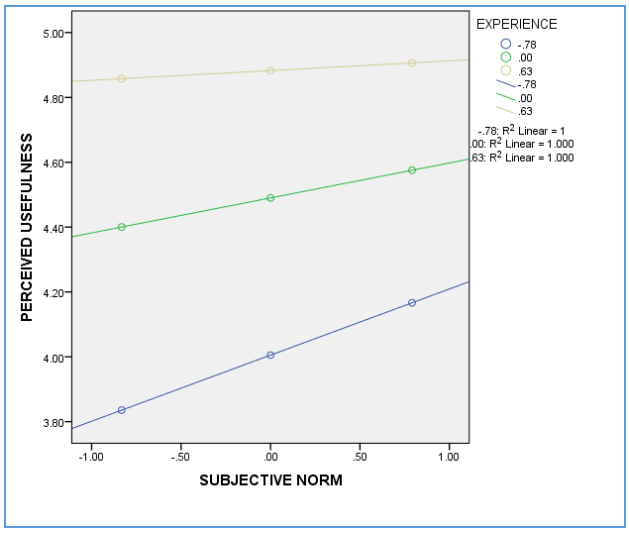

Figure 3 The level of experience in the subjective norm and perceived usefulness

At the .05 significance level, the effect of job relevance on perceived usefulness depends on the level of output quality; the direction of the relationship reverses depending on the output quality level (coeff = -.1392, p = .0001). When dividing output quality into three levels—low, medium, and high—what was evident is that when output quality is low, the influence of job relevance on perceived usefulness is stronger. Conversely, when output quality is high, the influence of job relevance on perceived usefulness is weaker. The influence values are shown in Table 3 and Figure 4.

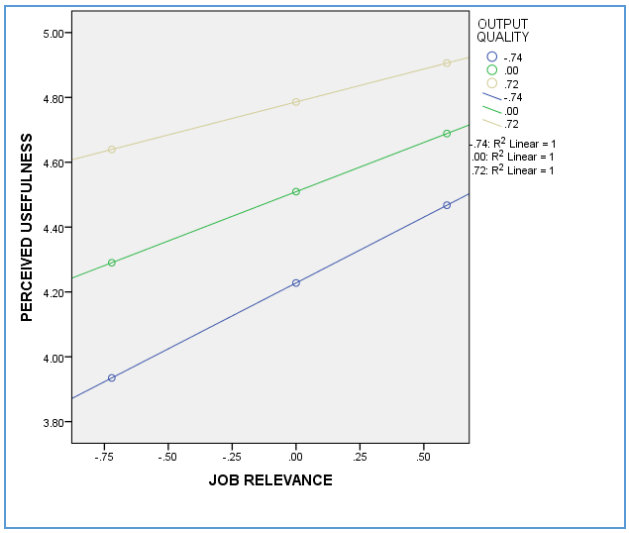

Figure 4 The level of output quality in the job relevance and perceived usefulness

At the .05 significance level, the effect of perceived ease of use on intention to use does not depend on the level of experience (coeff = -.0528, p = .0667). When dividing experience into three levels—low, medium, and high—it was found that when experience is low and high, the influence of perceived ease of use on intention to use is not different (the slopes of the three graph lines are parallel). The influence values are shown in Table 3 and Figure 5.

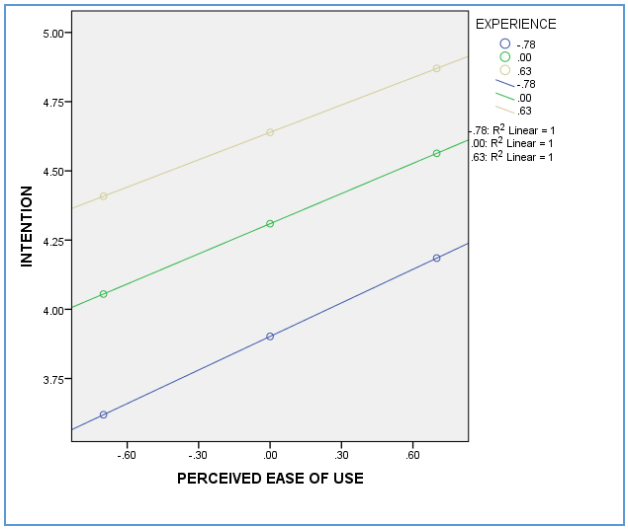

Figure 5 The level of experience in the perceived ease of use and intention to use

At the .05 significance level, the effect of perceived ease of use on perceived usefulness to use depends on the level of experience, the direction of the relationship reverses depending on experience level (coeff = -.1137, p = .0000). When dividing experience into three levels—low, medium, and high—it was found that when experience is low, the influence of perceived ease of use on perceived usefulness is stronger. Conversely, when experience is high, the influence of perceived ease of use on perceived usefulness is weaker. The influence values are illustrated in Table 3 and Figure 6.

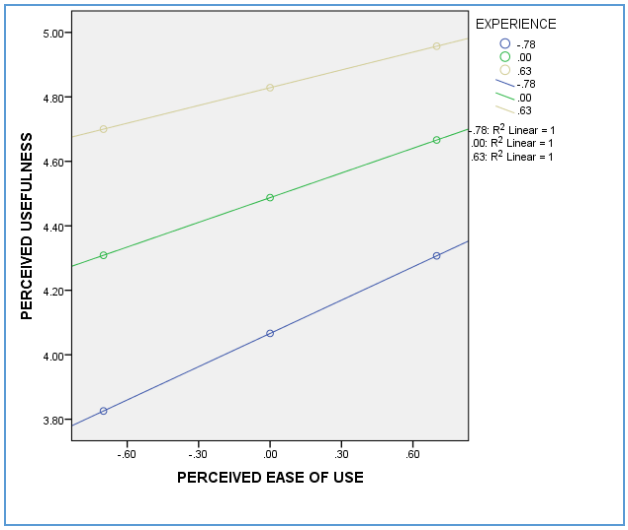

Figure 6 The level of experience in the perceived ease of use and perceived usefulness

At the .05 significance level, the effect of computer anxiety on perceived ease of use does not depend on the level of experience (coeff = -.0514, p = .1779). When dividing experience into three levels—low, medium, and high—it emerged that when experience is low and high, the influence of computer anxiety on perceived ease is not different (the slopes of the three graph lines are parallel). The influence values are shown in Table 3 and Figure 7.

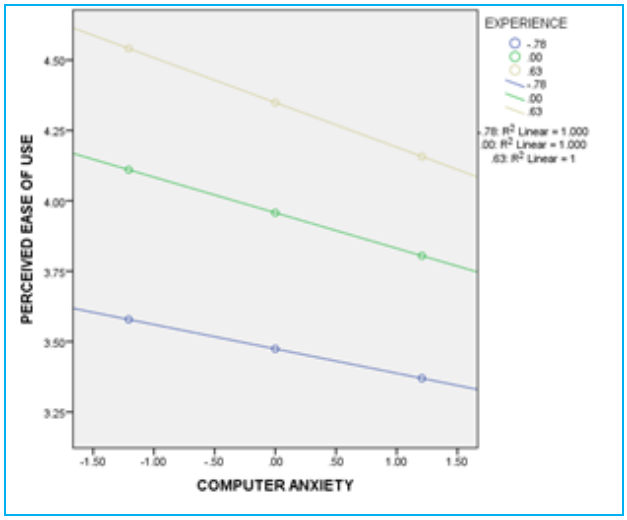

Figure 7 The level of experience in computer anxiety and perceived ease of use

At the .05 significance level, the effect of objective ability on perceived ease of use depends on the level of experience; the direction of the relationship reverses depending on experience level (coeff = -.0815, p = .0344). When dividing experience into three levels—low, medium, and high—it was found that when experience is low, the influence of objective ability on perceived ease of use is stronger. Conversely, when experience is high, the influence of objective ability on perceived ease of use is weaker. The influence values are depicted in Table 3 and Figure 8.

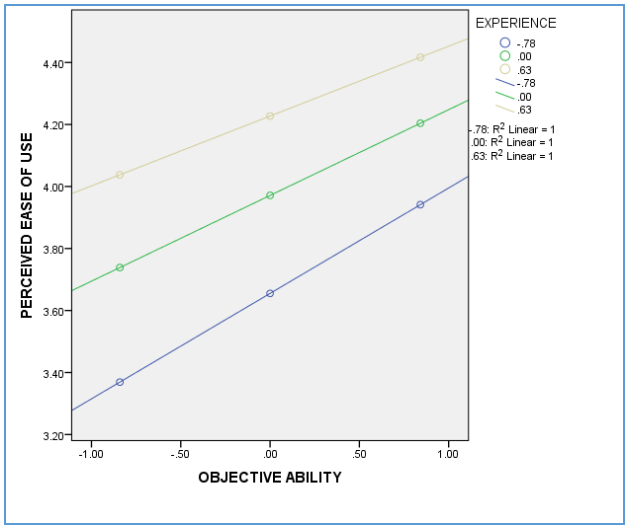

Figure 8 The level of experience in objective ability and perceived ease of use

At the .05 significance level, the effect of computer playfulness on perceived ease of use depends on the level of experience, exhibits an inverse relationship (coeff = -.1072, p = .0068). When dividing experience into three levels—low, medium, and high—it was found that when experience is low, the influence of computer playfulness on perceived ease of use is stronger. Conversely, when experience is high, the influence of computer playfulness on perceived ease of use is weaker. The influence values are shown in Table 3 and Figure 9.

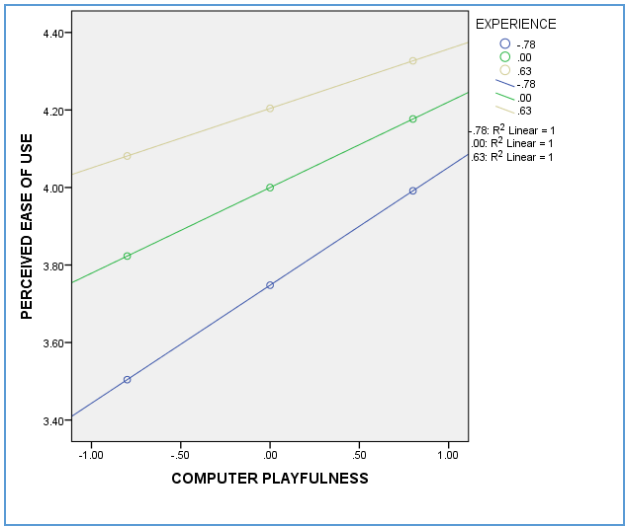

Figure 9 The level of experience in computer anxiety and perceived ease of use

At the .05 significance level, the effect of computer enjoyment on perceived ease of use does not depend on the level of experience (coeff = -.0394, p = .1366). When dividing experience into three levels - low, medium, and high—it was found that when experience is low and high, the influence of computer enjoyment on perceived ease is not different (the slopes of the three graph lines are parallel). The influence values are shown in Table 3 and Figure 10.

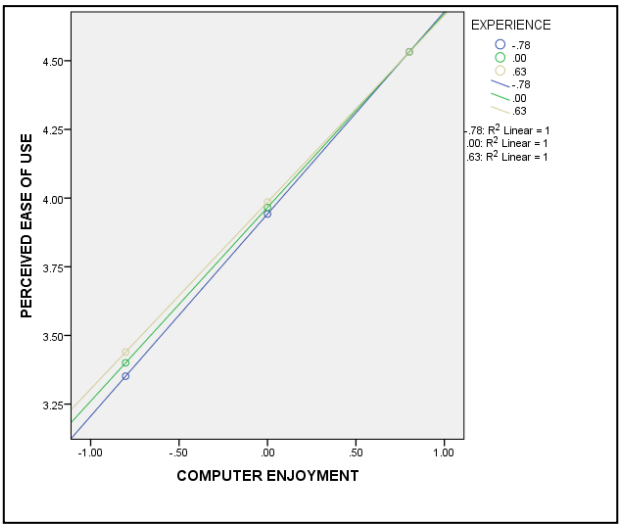

Figure 10 Illustrates the level of experience in computer enjoyment and perceived ease of use.

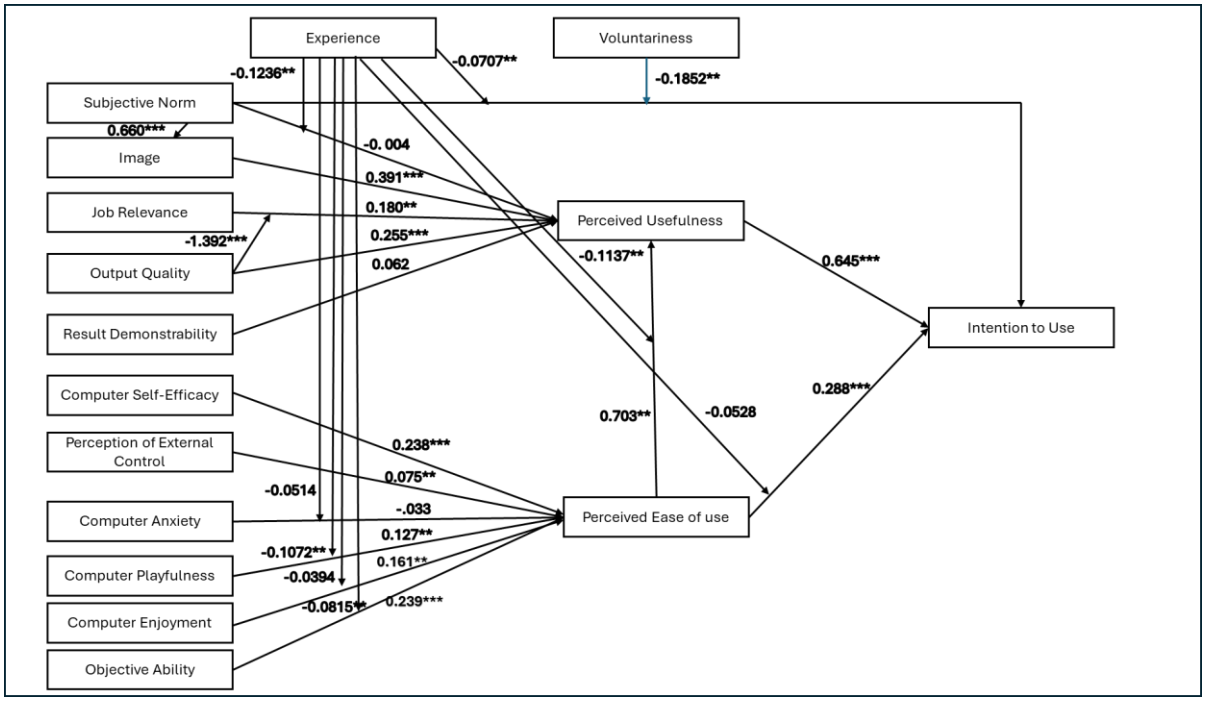

Figure 11 Model evaluation and hypothesis testing

Conclusion

From the results of the statistical analysis, it was discovered that the factors that influence the perception of usefulness include image, output quality, and job relevance, which is consistent with the research conducted by Venkatesh & Davis (2000), who explained that image has a positive influence on perceived usefulness. Yuan et al. (2021) showed that output quality has a significantly positive effect on perceived usefulness. If technology outcomes do not meet expectations, perceived benefits may decrease (Wixom & Todd, 2005). Chen & Lin (2019) asserted that output quality affects perceived usefulness, which in turn influences the intention to use digital financial services. Meanwhile, Dhiman et al. (2023) contended that job relevance can affect perceived usefulness. However, subjective norm and result demonstrability do not influence perceived usefulness. According to Khamlamai & Simakhajornboon (2022), who studied the factors affecting the perceived usefulness of food delivery applications, they found that subjective norms and result demonstrability have no influence on perceived usefulness.

The factors influencing perceived ease of use include objective ability, computer self-efficacy, computer enjoyment, computer playfulness, and perception of external control. These research findings are further supported by the work of Venkatesh et al. (2012), who demonstrated that users' actual technical abilities significantly influence their perceived ease of use of technology. In a similar vein, Subanjui (2017) highlighted that computer self-efficacy, which comprises key psychological and behavioral components, plays a crucial role in determining an individual's ability and willingness to engage with digital technologies. Furthermore, Agarwal & Karahanna (2000) detected that when individuals derive enjoyment from using technology, they tend to perceive it as less complex, reinforcing the relationship between intrinsic motivation and ease of use. This aligns with the earlier research of Webster & Martocchio (1992), which revealed that people who enjoy working with computers are more likely to perceive the technology as user-friendly. Additionally, Venkatesh & Bala (2008) emphasized the importance of organizational support, including training and technical assistance, in shaping users' perceptions of technology. Their findings suggest that when organizations provide adequate resources and guidance, users are more likely to view digital

tools as accessible and easy to use, ultimately fostering greater adoption and efficiency. However, computer anxiety does not influence perceived ease of use.

While several studies have established a negative relationship between computer anxiety and perceived ease of use (Igbaria & Iivari, 1995; Venkatesh, 2000; Marakas et al., 1998), the present study finds no significant impact. This discrepancy may be attributed to several key factors. First, modern technology is now much simpler to use and navigate, and has evolved to prioritize user-friendly interfaces, reducing the cognitive load required for interaction. As a result, even users with higher levels of computer anxiety may not perceive technology as inherently difficult to use. Second, the growing prevalence of digital literacy programs and exposure to technology in everyday life may help individuals develop coping mechanisms, mitigating the adverse effects of anxiety. Third, external support, such as training programs and customer assistance, may play a crucial role in alleviating concerns, allowing users to engage with digital systems more comfortably.

Research has consistently shown that subjective norms play a significant role in shaping individuals' perceptions of technology and its image. Suwanchawalit (2022) demonstrated that the influence of those around us, whether family, friends, or society, has a strong positive relationship with the image of autonomous vehicles in Bangkok. This suggests that social acceptance and external pressures contribute significantly to how people perceive the technological innovation of autonomous vehicles. Similarly, Khamlamai & Simakhajornboon (2022) found that subjective norms positively impact the image of food delivery applications, further emphasizing the power of social influence in shaping perceptions of new technologies. Together, these studies highlight the important role of social factors in shaping the image of emerging technologies, with the influence of the wider society playing a critical role in driving user acceptance and adoption.

Finally, the factors influencing intention to use are perceived usefulness and perceived ease of use. Research by Davis et al. (1989) highlighted that perceived usefulness is the most significant factor influencing technology adoption. This is further supported by Legramante et al. (2023), who noted that perceived ease of use positively impacts perceived usefulness, suggesting that easier-to-use systems are seen as more valuable. Moreover, perceived usefulness was shown to enhance both user satisfaction and behavioral intention. In their work, Salar & Hamutoglu (2022) emphasized that behavioral intention is strongly influenced by both perceived usefulness and ease of use, with the latter playing a key role in shaping users' intentions to adopt new technologies, particularly in complex systems like CCSs.

For analyzing the level of experience as moderating the relationship between variables and perceived ease of use, perceived usefulness and intention to use. Suggested by the research is that the effect of subjective norms on adoption of technology is influenced by the level of user experience, with its impact shifting in the opposite direction over time. Specifically, as users gain more experience with a system, they become less reliant on social influences and more on their own direct interactions with technology. This finding aligns with Venkatesh & Davis (2000), who demonstrated that the influence of subjective norms on usage intention and perceived usefulness diminishes as users grow more familiar with the system. Over time, personal experience becomes a stronger determinant in shaping perceptions and usage intentions, rather than external opinions or societal pressures.

Effect of subjective norm on intention to use: The impact of subjective norms on usage intention varies based on the user's level of experience. Early in the adoption process, social influences may play a stronger role in shaping usage intentions. However, as users gain experience, they tend to rely more on their personal experiences rather than external opinions. This finding is consistent with Venkatesh & Davis (2000), who argued that over time, the reliance on subjective norms diminishes as users become more familiar with the technology.

Effect of subjective norms on intention to use depending on voluntariness: Similarly, the influence of subjective norms is also contingent on the level of voluntariness. In voluntary contexts, social influences are less likely to drive adoption, as users feel more in control of their decisions. It indicates that in mandatory contexts, subjective norms might have a stronger effect on adoption intentions, as users are more likely to conform to external expectations.

Effect of job relevance on perceived usefulness: The relationship between job relevance and perceived usefulness is also moderated by the quality of output. When output quality is high, users are more likely to perceive the technology as useful for their tasks, reinforcing the idea that the usefulness of a technology is closely tied to its performance and ability to meet user needs. This aligns with the TAM theory, which highlights perceived usefulness as a primary determinant of user acceptance.

Effect of perceived ease of use on intention to use: Interestingly, the study found that the effect of perceived ease of use on intention to use does not depend on the level of experience. Suggested here is that ease of use remains an important factor in the decision to adopt technology, regardless of how familiar users are with the system. This may reflect the fact that even experienced users value systems that are easy to navigate and efficient.

Effect of perceived ease of use on perceived usefulness depending on experience: In contrast, the relationship between perceived ease of use and perceived usefulness is moderated by the level of experience, with more experienced users finding greater utility in systems that they find easy to use. This aligns with the idea that as users become more familiar with a system, they are better able to recognize the practical benefits it offers. Furthermore, the study documented that computer anxiety does not depend on the level of experience in influencing perceived ease of use. This indicates that while anxiety may affect initial user perceptions of ease of use, it does not change significantly with experience, suggesting that other factors, such as system design and external support, may mitigate the effects of anxiety over time.

Effect of objective ability on perceived ease of use depending on experience: The relationship between objective ability and perceived ease of use is moderated by experience, with more experienced users perceiving the system as easier to use due to their familiarity with its features. This highlights the role of individual skills and prior knowledge in shaping perceptions of usability, a concept emphasized in TAM as "user control" over the system.

Effect of computer playfulness on perceived ease of use depending on experience: Similar to objective ability, the effect of computer playfulness on perceived ease of use is influenced by the user's level of experience. Playful interactions with technology are likely to become more intuitive and enjoyable as users become more experienced, thereby enhancing their perceptions of ease of use.

Effect of computer enjoyment on perceived ease of use: Lastly, the effect of computer enjoyment on perceived ease of use does not depend on the level of experience. The findings show that enjoyment remains a consistent factor in shaping perceptions of ease of use, regardless of how familiar users are with technology. It supports the idea that a user’s positive experience can foster greater engagement and ease of use, as highlighted by TAM.

In summary, it can be concluded that factors such as image, output quality, and job relevance significantly influence perceived usefulness. Additionally, perceived ease of use is shaped by factors like objective ability, computer self-efficacy, and playfulness. Importantly, computer anxiety does not have a significant impact on perceived ease of use, likely due to user-friendly interfaces and increased digital literacy. The influence of subjective norms on technology perception remains strong, underlining the role of social factors. As well, perceived usefulness and ease of use are key drivers in determining users' intention to adopt or implement new technologies.

Lastly, the findings of this study emphasize the dynamic nature of technology adoption, where experience, social influences, and system characteristics interact to shape users' perceptions and intentions. By integrating these insights with TAM, it becomes clear that while ease of use and usefulness remain central to adoption decisions, the role of experience and external factors like subjective norms and job relevance should not be overlooked. These nuanced relationships offer valuable guidance for designing technologies that can effectively meet user needs and encourage widespread adoption.

In terms of subjective norm, its influence may not significantly impact the perception of usefulness because public organizations operate based on clearly defined duties and regulations. Technology adoption may therefore not be driven by social pressure or influence from colleagues or supervisors. Users may not clearly perceive the outcomes of technology use. Even though the system might provide benefits, if the results of system use (result demonstrability) are not clearly communicated or measured in a tangible way, users may not recognize its usefulness. They may use the system simply because they are required to, without perceiving any real improvement in performance. Moreover, high familiarity with basic technology among staff. In today's environment, personnel may already be familiar with basic technologies such as computers, online systems, and various applications.

It is evident both perceived usefulness and ease of use play a key role in shaping users' intention to adopt digital technologies. This implies organizations should clearly communicate how these tools improve work outcomes. Making systems user-friendly and offering supportive environments can increase user confidence. Practical steps include intuitive interface design and hands-on training. Together, these strategies can foster greater acceptance and sustained use of digital tools. Ensuring the long-term success and sustainability of these digital transformation efforts requires a holistic approach. As suggested by Siangchokyoo et al. (2025) in the context of e-commerce, fostering a supportive digital culture, encouraging innovation, and ensuring effective technology adoption are crucial components for achieving sustainable outcomes, principles that are equally applicable to the public health sector's digital journey. To promote effective digital technology adoption within public health organizations, several practical strategies are recommended. For enhancing perceived usefulness, organizations should clearly communicate how new digital technologies improve output quality and are directly relevant to job responsibilities. This includes organizing activities or campaigns that highlight and reward individuals or teams who effectively use digital tools, thereby enhancing the professional image of technology users, and developing communication materials such as posters, success stories, or internal newsletters that showcase practical benefits and real-life examples.

Regarding improving perceived ease of use, it is beneficial to provide hands-on training programs focused on building both confidence (self-efficacy) and technical skills (objective ability). Organizations should also select or design systems with user-friendly interfaces that are engaging and enjoyable, incorporating elements of playfulness where appropriate, and establish a tiered support system (external control) offering tailored assistance based on technology complexity and job functions, such as distinguishing between frontline health workers and administrative staff.

Furthermore, considering user experience levels is crucial; communication strategies and training formats should be customized based on users' prior technology experience, as this significantly moderates relationships between factors like PU, PEOU, and intention. For instance, beginner-friendly sessions can be offered for less experienced users, while advanced modules can cater to experienced personnel.

Finally, understanding the role of voluntariness is important. Assess whether technology use is mandatory or voluntary within each context, as this influences the impact of subjective norms on user behavior. For systems that are mandatory, ensure clear communication about

policy and rationale, while also offering motivational reinforcement. For voluntary systems, foster peer influence and positive user testimonials to encourage adoption.

Limitations and Future Research

This research is subject to limitations inherent in its cross-sectional design, which restricts the analysis of temporal dynamics in technology acceptance. Consequently, longitudinal changes in attitudes and intentions towards technology use, particularly as personnel gain greater familiarity with the technology, could not be systematically observed. Furthermore, the study's confinement to a single public sector organization may limit the generalizability of its findings concerning technology adoption. Perspectives gleaned from this specific context may not be readily transferable to other governmental entities possessing disparate functions or organizational cultures.

Future research endeavors would benefit from an expanded scope encompassing a more diverse array of public sector organizations to enhance the external validity of the findings. Longitudinal studies are also strongly recommended to meticulously track the evolution of attitudes and an user intentions as their experience and familiarity with the technology mature over time. Additionally, in-depth qualitative investigations, employing methodologies such as semi-structured interviews and focus group discussions, are advised to elicit more specific, contextualized, and nuanced insights into the multifaceted nature of technology acceptance within the public sector.

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Data Availability Statement: The raw data supporting the conclusions of this article will be made available by the authors, without undue reservation.

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