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ENHANCING OPERATIONAL EFFICIENCY: INVESTIGATING TECHNOLOGY READINESS, ACCEPTANCE, AND UTILIZATION OF THAILAND NATIONAL SINGLE WINDOW IN IMPORT, EXPORT, AND LOGISTICS BUSINESSES

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Abstract

The research aimed to identify factors encouraging direct use, which could improve industry efficiency in the digital era. The research methodology in this research was quantitative research with survey method by using questionnaires for data collection. The respondents were 400 import, export, and logistics entrepreneurs in the Bangkok Metropolitan Region who have previous experience in using Thailand National Single Window (NSW) system. The results of hypothesis testing revealed that technology readiness (optimism and innovativeness) and acceptance and use of technology (performance expectancy, effort expectancy, social influence, and facilitating conditions) affected intention to use the system. Acceptance and use of technology (performance expectancy, effort expectancy, social influence, and facilitating conditions) affected actual usage behavior whereas intention to use the system also affected actual usage behavior. Besides, technology readiness (optimism and innovativeness) affected actual usage behavior through intention to use the system at a statistical significance level of .001.

Keywords: Technology Readiness, Acceptance and Use of Technology, Thailand National Single Window, Intention, Logistics Businesses

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Introduction

The role of information technology is crucial in enhancing efficiency and competitiveness, especially in rapidly changing markets. Using information technology helps organizations better respond to demands and competition, particularly in small and medium-sized businesses (SMEs). Technology readiness and the appropriate use of information technology are key factors in an organization's success, boosting confidence and operational efficiency (Nugroho, 2015). The advancement of technology is very important for national development and stability. Thailand has embraced digital economy policies to enhance competitiveness and sustainability (Mohanarajan, 2016). Information technology plays a vital role, especially in key industries like imports, exports, and logistics, facilitating electronic customs and trade processes. The National Single Window (NSW) system integrates government and business data, improving efficiency, reducing paperwork, and enabling electronic transactions securely. This initiative aligns with regional frameworks like the ASEAN Single Window and APEC Paperless Trading, enhancing trade facilitation and customs operations. The NSW system has witnessed continuous growth, which supports over 100 million electronic transactions annually and expands its capabilities to include B2G and international data exchanges. This technological readiness and adoption are crucial for businesses to thrive in the digital era and drive industry efficiency (Thailand National Single Window, n.d.a). Numerous businesses within Thailand's import, export, and logistics sectors have primarily utilized freight forwarders instead of directly engaging with the NSW system. Small and medium-sized enterprises (SMEs) often encounter significant barriers in adopting information technology due to limited resources, inadequate digital literacy, and financial and knowledge constraints. Additionally, the lack of a company-specific digital transformation strategy represents a major challenge for SMEs (Brozzi et al., 2021). These challenges hinder their ability to fully exploit technological advancements for enhanced competitiveness and operational efficiency. Researchers are keen on investigating the technological readiness, acceptance, and utilization of the NSW system among importers, exporters, and logistics service providers. This research was intended to steer industry practices toward enhanced efficiency in the digital era.

Literature Reviews

Technology Readiness or Technology Readiness Index (TRI)

Technology Readiness Index (TRI) was first introduced by Parasuraman (2000) to measure individual readiness for adopting new technologies, focusing on two positive aspects—Optimism and Innovativeness—and two negative aspects—Discomfort and Insecurity. The index was later updated to TRI 2.0 by Parasuraman & Colby (2015), refining the measurement to 16 items to better align with modern trends. TRI and its components have been applied in various research fields, such as financial technology (Phurkwattanakul & Methavasaraphak, 2021; Chin & Ahmad, 2015), and have been integrated with models such as the UTAUT (Reyes-Mercado et al., 2023; Rinjany, 2020) and TAM (Wook et al., 2014; Lai & Lee, 2020) to predict technology acceptance and usage. Studies indicate that optimism and innovativeness positively impact technology adoption intentions, while discomfort and insecurity have a lesser impact (Rahim et al., 2022; Kampa, 2023; Nugroho & Fajar, 2017; Erdoğmuş & Esen, 2011). In this research, TRI 2.0 was used to examine technology usage within Thailand's National Single Window (NSW) system, focusing on the roles of optimism and innovativeness in technology acceptance.

Unified Theory of Acceptance and Use of Technology (UTAUT)

This research applies the Unified Theory of Acceptance and Use of Technology (UTAUT) framework developed by Venkatesh et al. (2003). The UTAUT model synthesizes elements from various theories into four key factors that influence technology acceptance: performance expectancy, effort expectancy, social influence, and facilitating conditions. These factors

significantly impact both the intention to use and actual usage behaviors of information technology systems. Additional variables such as gender, age, experience, and voluntariness of use enhance the model's accuracy in predicting technology acceptance. Performance expectancy, derived from concepts like perceived usefulness and extrinsic motivation, reflects beliefs about the efficiency benefits of using technology. Effort expectancy, which includes perceived ease of use and system complexity, addresses the user's perceived ease of adopting technology. Social influence considers how social norms influence technology adoption, drawing on theories of subjective norms and social impact. Facilitating conditions, which include technical readiness and organizational support, focus on the environmental factors that facilitate technology use. Together, these elements form a robust framework for understanding and predicting technology acceptance and usage, as outlined by Venkatesh et al. (2003).

Intention to Use (INT)

Behavioral intention or intention to use refers to an individual's readiness to demonstrate behavior and acts as a forecaster of behavior (Ajzen, 2002), and it explains the occurrence of behavior (Gaitán et al., 2015). According to the UTAUT theory, Venkatesh et al. (2003) discovered that factors influencing behavioral intention and behavior encompass performance expectation, effort expectancy, social influence, and facilitating conditions. Hence, the following hypotheses were formulated for this research:

H1: Technological readiness (optimism and innovativeness) affects intention to use the system.

H2: Acceptance and use of technology (performance expectancy, effort expectancy, social influence, and facilitating conditions) affects intention to use the system.

Use Behavior of the NSW System (USE)

Use behavior reflects the actual utilization of technology, with Venkatesh et al. (2003) highlighting that intention consistently influences technology usage across various theories. Empirical evidence supports this, showing intention's direct impact on behavior. Gaitán et al. (2015) confirmed this in their study on elderly users' internet banking habits, where intention was a precursor to behavior. Additionally, Luomala (2016) demonstrated how habitual tendencies directly affect usage behavior, using contactless payment systems as an example. Moreover, Manutworakit & Choocharukul (2022) stated that use behavior is positively influenced by intention in battery electric vehicle adoption in Thailand. These findings illustrate the critical link between intention and actual technology use. Therefore, the following hypotheses were proposed for this research:

H3: Technological readiness (optimism and innovativeness) affects actual usage behavior.

H4: Acceptance and use of technology (performance expectancy, effort expectancy, social influence, and facilitating conditions) affects actual usage behavior.

H5: Intention to use the system affects actual usage behavior.

The Mediating Role of Intention to Use (INT)

The Unified Theory of Acceptance and Use of Technology (UTAUT), developed by Venkatesh et al. (2003), explores system adoption at the individual level. It considers personal factors like gender, age, experience, and willingness to use as moderators that influence the relationships among key variables: performance expectations, effort expectations, social influences, and facilitating conditions. These factors affect both the intention to use and actual usage behavior. In the UTAUT, intention consistently serves as a mediating factor in translating these influences into observable usage behaviors. Consequently, the following hypotheses were formulated for this research:

H6: Technological readiness (optimism and innovativeness) affects actual usage behavior through intention to use the system.

H7: Acceptance and use of technology (performance expectancy, effort expectancy, social influence, and facilitating conditions) affects actual usage behavior through intention to use the system.

National Single Window (NSW)

The National Single Window (NSW), managed by Thai Customs, streamlines import, export, and logistics through electronic data interchange (EDI) across government and business sectors, reducing paperwork and enhancing operational efficiency in ASEAN. It supports secure transactions, real-time tracking via an e-Tracking system, and standardizes data exchange for about 125,000 Thai companies. By centralizing data submissions, the NSW boosts data sharing, cuts operational costs by 82,000-100,000 million baht annually, and improves supply chain management and international competitiveness (Thailand National Single Window, n.d.b).

Conceptual Framework

The conceptual framework presented integrated the Technology Readiness Index 2.0 (TRI 2.0) by Parasuraman & Colby (2015) and the Unified Theory of Acceptance and Use of Technology (UTAUT) by Venkatesh et al. (2003). It aimed to explore the factors influencing the intention and actual use of the NSW system in the import, export, and logistics sectors. The conceptual framework had been drawn as shown in figure 1 below:

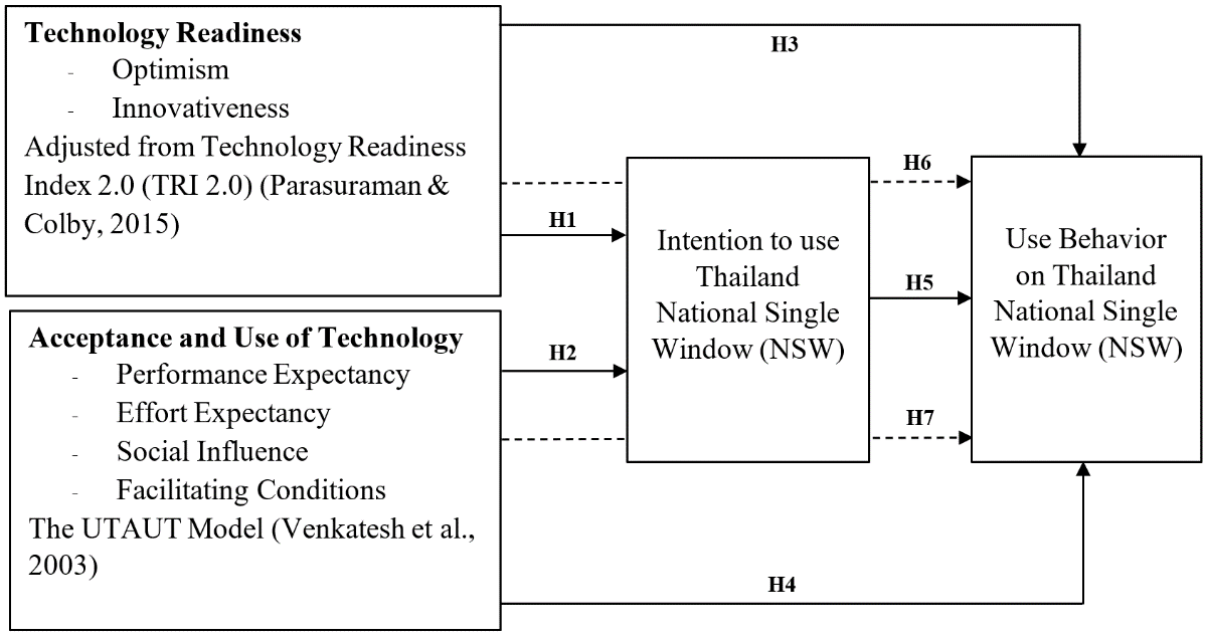


Figure 1 Conceptual Model

Research Methodology

Population and Samples

The research population comprised importers, exporters, and logistics service providers experienced with the NSW system in the Bangkok Metropolitan Region. The sample size, determined using Cochran's formula (1953), was initially set at 385. However, to meet the requirements for structural equation modeling as recommended by Yuan & Bentler (2000) and Savalei & Bentler (2005), the sample was increased to 400. A non-probability purposive sampling technique was used to select the samples.

Data Collection

This research used a quantitative survey methodology to gather data. Questionnaires, the primary instrument, were distributed to importers, exporters, and logistics service providers in the Bangkok Metropolitan Region. The questionnaires featured six sections: Sections 1 to 5 used five-point Likert scale questions to assess technological readiness, acceptance, intention to use, and usage behavior of the NSW system. Section 6 contained closed-ended questions about company specifics such as enterprise type, employee count, and industry experience.

The researchers had experts in related fields inspected the accurateness and consistency of contents and questions and recommended the improvement and revision. Cronbach's alpha and composite reliability were investigated to measure construct reliability. The results of this investigation indicated an IOC value of 0.88 and a Cronbach's alpha of 0.973, demonstrating the satisfactory quality of the research tool (Polit & Beck, 2006; Hair et al., 2012; Hair Jr et al., 2016).

Data Analysis

Descriptive statistics used in quantitative data analysis included frequency, percentage, mean, and standard deviation. Due to hypothesis testing, inferential statistics used were Pearson's Product Moment Correlation Coefficient, and Structural Equation Modeling with Confirmatory Factor Analysis (CFA) were performed, considering good-fit indices, as well as assessing convergent and discriminant validity through factor loading (FL), composite reliability (CR), average variance extracted (AVE), correlation matrix, and the square root of AVE. The model under this research was expected to yield satisfactory good-fit indices (Tabachnick et al., 2007). However, adjustments to the model were allowed based on modification indices if it was deemed unfit (Knekta et al., 2019).

Research Results

The research findings indicate that most respondents were affiliated with export enterprises (38.0%), with a workforce size ranging between 50 and 100 employees (58.8%). Moreover, a significant portion had tenure of 6-10 years with their current enterprises (51.0%) and held managerial positions (40.5%), with industry experience also falling within the 6-10 years (51.0%). The research results further revealed that most of the respondents had agreements toward overall technology readiness at the strongly agree level with the mean of 4.227, comprising average means of 4.186 on optimism, and 4.268 on innovativeness. Besides, most of the respondents had agreements toward overall acceptance and use of technology at the agree level with the mean of 3.833, comprising average means of 3.666 on performance expectancy, 3.838 on effort expectancy, 3.818 on social influence, and 4.021 on facilitating conditions. Finally, most of the respondents had agreements toward intention to use the NSW system and actual usage behavior at the agree level with the mean of 4.089 and 4.107, respectively.

Model Development, Convergent Validity, and Discriminant Validity

The crucial point for evaluating the model, Confirmatory Factor Analysis (CFA) with good-fit indices was first performed and analyzed. The results revealed that good-fit indices (CMIN/Df of 1.256, p-value of 0.081, GFI of 0.975, AGFI of 0.948, RMR of 0.013, RMRSEA of 0.025, TLI of 0.995, CFI of 0.997, and NFI of 0.987) were acceptable. After that, factor loadings, composite reliability, average variance extracted, correlation matrix, and square root of AVE were depicted in Table 1 and Table 2.

In Table 1, in terms of composite reliability, all factor loading values ranged from 0.779 to 0.947, which were more than the recommended value of 0.50; hence, the constructs in the research model are acceptable (Bagozzi & Yi, 2012). The Cronbach's alpha coefficient of each construct ranged from 0.906 to 0.952, meaning that all constructs are acceptable according to the recommended threshold value of 0.70 (Fornell & Larcker, 1981). The value of AVE was in the range of 0.648 to 0.838, which exceeded the minimum threshold value of 0.50, confirming convergent validity.

Table 1 Factor Loading, Cronbach's Alpha Coefficient (CA), Composite Reliability (CR) and Average variance extracted (AVE) for Measurement Model

Latent Variable	Indicators	Loads	CA	CR	AVE
Technology Readiness (TRI)	OPT	0.919	0.941	0.912	0.838
	INN	0.911			
Acceptance and Use of Technology (UTAUT)	PE	0.850	0.952	0.921	0.744
	EE	0.947			
	SI	0.795			
	FC	0.852			
Intention to Use NSW System (INT)	INT1	0.795	0.904	0.902	0.648
	INT2	0.705			
	INT3	0.815			
	INT4	0.849			
	INT5	0.851			
Actual Usage Behavior (USE)	USE1	0.840	.906	.914	.679
	USE2	0.783			
	USE3	0.779			
	USE4	0.849			
	USE5	0.866			

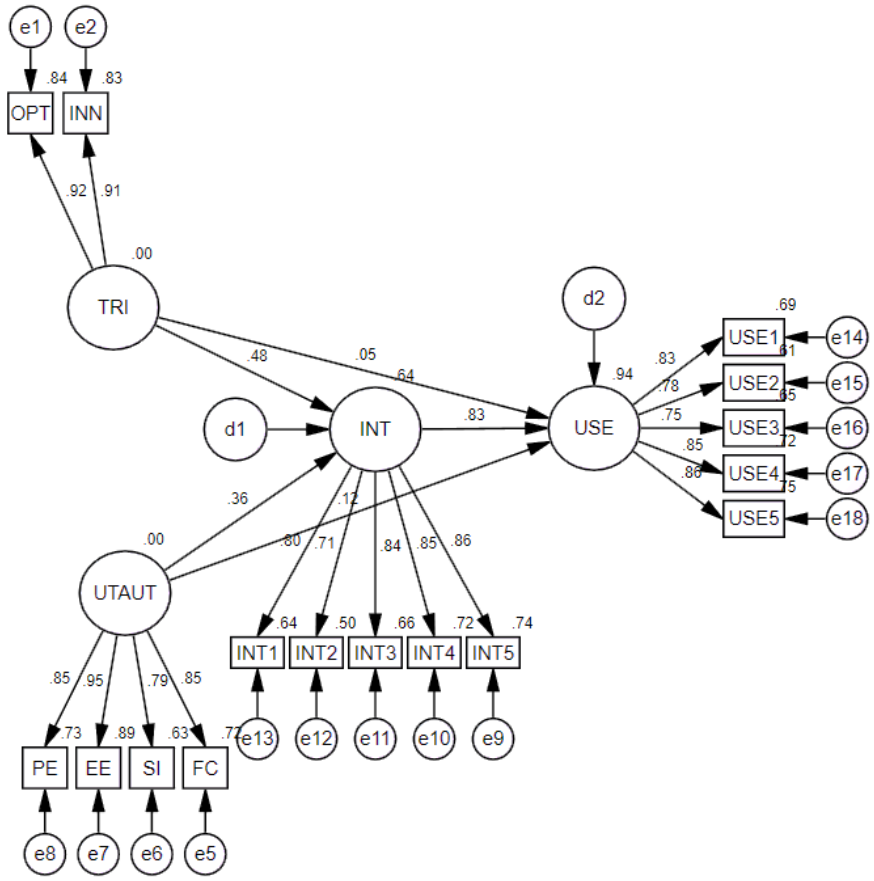
In Table 2, discriminant validity was assessed, and the square roots of Average Variance Extracted (AVEs) exceeded the minimum threshold of 0.7. In addition, all values were higher than the correlations among the latent constructs (ranging from 0.681 to 0.915), indicating the validity of the discriminant validity test.

Table 2 Discriminant Validity

Variables	TRI	UTAUT	INT	USE
TRI	**0.915**			
UTAUT	0.724**	**0.863**		
INT	0.701 **	0.681**	**0.805**	
USE	0.729**	0.698**	0.882**	**0.824**

Final Model and Hypothesis Analysis

After conducting the model investigation using confirmatory factor analysis (CFA), the finalized model was derived using structural equation modeling (SEM), as depicted in Figure 1. The decisive indicators, such as t-values, z-values, and p-values, were assessed for hypothesis analysis. Furthermore, essential indices such as standardized estimates, were examined to describe the predictive influence on variables, as presented in Table 3.



CMIN/Df =1.254, p-value = 0.075, GFI = 0.974, AGFI = 0.948, RMR = 0.011, RMRSEA = 0.025, TLI = 0.995, CFI = 0.997, and NFI = 0.986

Figure 1 The results of testing the structural model of the theoretical framework

Table 3 Standardized Estimate, Unstandardized Estimate, Standard Error, t-value, z-value, and p-value

Hypothesis	**Standardized Estimate (β)**	**T Statistics**	**P-Values**	**Results**
H1: TRI → INT	0.478	6.937	0.000***	Supported
H2: UTAUT → INT	0.365	5.404	0.000***	Supported
H3: TRI → USE	0.052	.875	0.382	Rejected
H4: UTAUT → USE	0.122	2.395	0.017*	Supported
H5: INT → USE	0.832	13.100	0.000***	Supported
	Standardized Indirect Effect	**Sobel Test**	**Z-value**	
H6: TRI → INT → USE	0.397	6.119	0.000***	Supported
H7: UTAUT → INT → USE	0.304	4.971	0.630	Rejected

Note: *p < .05; **p < .01; ***p < .001 (two-tailed test)

The results of structural model showed that TRI and UTAUT had the positive effects on INT (β = .478, p < 0.001 and β = .365, p < 0.001), so H1 and H2 were supported. The results also revealed that UTAUT and INT had positive and significant effects on USE (β = 0.122, p < 0.05 and β = 0.832, p < 0.001), so H4 and H5 were supported. Finally, the results also revealed that TRI had positive and significant effect on USE through INT, so H6 was supported. In contrast, TRI did not have direct effect on USE, and UTAUT did not have effect on USE through INT (β = 0.052, p > 0.05 and β = 0.304, p > 0.05), so H3 and H7 were not supported.

Conclusion and Discussion

The research findings demonstrate that technology readiness, acceptance, and use significantly enhance the intention to use the NSW system among importers, exporters, and logistics companies. Technology readiness accelerates data processing and communication, boosting efficiency, adaptability to change, and confidence in using the NSW system. These results corroborate Rahim et al. (2022), who found that a positive attitude toward technology fosters acceptance. Furthermore, according to Kampa (2023), a favorable view of technology improves its perceived ease and usefulness. Overall, embracing technology leads to a stronger intention to use the NSW system, thereby enhancing operational efficiency and data management in these sectors.

Despite the importance of technology readiness (optimism and innovativeness), it did not directly impact the actual use of the NSW system among importers, exporters, and logistics firms. The complexity of implementing the system is a likely reason, as integration into existing operations can be intricate and time-consuming, requiring substantial investments in resources, training, and infrastructure. Additionally, Blut & Wang (2020) found no direct effect of motivators as optimism and innovativeness on usage behavior, but instead exert an influence through the TAM mediators ease of use and usefulness perception. Venkatesh et al. (2003) underscore the role of technology acceptance in IT usage, while Hooda et al. (2022) point out the importance of trust in technology adoption. These findings suggest that while businesses may recognize the benefits of technology, practical challenges often influence its practical application.

The intention to use the NSW system significantly influences its usage among importers, exporters, and logistics companies. This intention shapes user expectations, understanding, and confidence, leading to more effective system utilization. Alhalafi & Veeraraghavan (2023) support this, noting that intention predicts behavioral adoption of cybersecurity. Similarly, Gaitán et al. (2015) and Luomala (2016) observed that intention affects technology-related behavior. Ultimately, a strong intention helps businesses align their strategies and goals for effective system implementation, as noted by Nugroho (2015).

Technology readiness, encompassing optimism and innovativeness, enhances the use of the NSW system by influencing the intention to use it. This readiness enables business owners to recognize the system's benefits, fostering confidence and a belief in its value for improving efficiency. Furthermore, it encourages innovation in system usage to optimize processes and services (Nugroho, 2015). However, discomfort with the technology or security concerns may restrict effective system use. Enhancing system confidence is vital and can be addressed through risk assessments, prevention strategies, security training, and the use of certified technology, as demonstrated by Hung et al. (2013) in their study on mobile users' acceptance of electronic government services. Overall, robust technological readiness empowers business owners to utilize electronic data interchange systems effectively, facilitating smoother and more efficient business operations.

Although acceptance and usage of technology factors—performance expectancy, effort expectancy, social influence, and facilitating conditions—did not directly drive the decision to use the NSW system through intention, the complexity and demands of the logistics industry make the system essential. Due to the increasing volume of international trade, using the NSW system for electronic data linkage has become a standard and unavoidable requirement for efficient operations and adaptability. The Customs Department's adoption of the NSW system in 2020, which facilitates data linkage among government agencies, private sectors, and manages over 100 million electronic transactions annually, underscores this necessity. This adoption spans various sectors including Government-to-Government (G2G), Business-to-Government (B2G), and Business-to-Business (B2B), integrating with other systems like e-

Trade, e-Freight, and e-Payment, essential for effective communication with entities like the Customs Department.

Limitation

This research examined the impact of technology readiness, acceptance, and use on the intent to use the NSW system among specific industries in the Bangkok Metropolitan Region, showing a significant positive effect. However, its focus on particular sectors and regions may limit the generalizability of the findings. The research did not consider other factors such as training, digital strategies, or data analytics, which could influence technology utilization. Data were collected at a single time point using a quantitative method, excluding qualitative insights from methods like interviews or focus groups.

Recommendations

The following recommendations are based on technology readiness, acceptance, and use of Thailand National Single Window (NSW) system in import, export, and logistics enterprises: 1) Conduct Technology Readiness Surveys: Businesses should conduct surveys to assess their technology readiness levels, including aspects like infrastructure, employee skills, and overall technological readiness, 2) Promote Innovation Activities: Businesses should encourage and support innovation activities within the organization, such as creating platforms or centralized hubs for data linkage and logistics that are modern and constantly evolving as well develop applications or tools that can enhance operational efficiency and learning for entrepreneurs, employees, and stakeholders involved in technology usage, 3) Training and Skill Development: Businesses should invest in training programs and skill development initiatives for entrepreneurs, employees, and relevant individuals to build confidence and competence in using electronic data interchange systems and other related technologies effectively, 4) Clear Management Processes: Businesses should establish clear and well-defined management processes for technology management and system usage, and they should also define roles, responsibilities, and accountability for different parts of the organization, including collaboration between technology management departments and system users, and 5) Foster Collaboration: Businesses should foster collaboration between technology management departments and system users through activities like regular meetings to exchange ideas, support, and understand user needs as well as create interdisciplinary teams with members from both sides to work together towards common goals and efficient operations.

The findings present several implications for both academia and management practitioners, providing insights into crafting effective strategies to enhance users' or employees' technology adoption and enhancing readiness to improve efficiency and competitiveness in the digital economy.

Future Research

To address the limitations of this current research study on the NSW system, future research should broaden its geographic and sectoral scope to enhance generalizability. It should incorporate additional variables such as training levels, digital strategies, and data analytics, which could influence technology utilization. Moreover, adopting longitudinal and qualitative methods will gain deeper insights into user experiences and perceptions. Comparative case studies could identify key factors influencing successful implementation, while an investigation into the impact of specific training and support mechanisms could provide actionable insights to improve system adoption and effectiveness.

References

Ajzen, I. (2002). Perceived behavioral control, self-efficacy, locus of control, and the theory of planned behavior. *Journal of Applied Social Psychology, 32*(4), 665-683.

Alhalafi, N., & Veeraraghavan, P. (2023). Exploring the challenges and issues in adopting cybersecurity in Saudi smart cities: Conceptualization of the cybersecurity-based UTAUT model. *Smart Cities, 6*(3), 1523-1544.

Bagozzi, R., & Yi, Y. (2012). Specification, evaluation, and interpretation of structural equation models. *Journal of the Academy of Marketing Science, 40*, 8-34.

Blut, M., & Wang, C. (2020). Technology readiness: a meta-analysis of conceptualizations of the construct and its impact on technology usage. *Journal of the Academy of Marketing Science, 48*, 649-669.

Brozzi, R., Riedl, M., & Matta, D. (2021). Key readiness indicators to assess the digital level of manufacturing SMEs. *Procedia CIRP, 96*, 201-206.

Chin, L., & Ahmad, Z. (2015). Consumers' intention to use a single platform e-payment system: A study among Malaysian internet and mobile banking users. *Journal of Internet Banking and Commerce, 20*(1), 1-13.

Cochran, W. (1953). *Sampling Techniques*. New York: John Wiley & Sons, Inc.

Erdoğmuş, N., & Esen, M. (2011). An investigation of the effects of technology readiness on technology acceptance in e-HRM. *Procedia-Social and Behavioral Sciences*, *24*, 487-495.

Fornell, C., & Larcker, D. (1981). Structural equation models with unobservable variables and measurement error: Algebra and statistics. *Journal of Marketing Research, 18*(3), 382-388.

Gaitán, J., Peral, B., & Jerónimo, M. (2015). Elderly and internet banking: An application of UTAUT2. *Journal of Internet Banking and Commerce, 20*(1), 1-23.

Hair Jr, J., Hult, G., Ringle, C., & Sarstedt, M. (2016). *A primer on partial least squares structural equation modeling (PLS-SEM)*. California: Sage Publications.

Hair, J., Sarstedt, M., Ringle, C., & Mena, J. (2012). An assessment of the use of partial least squares structural equation modeling in marketing research. *Journal of the Academy of Marketing Science, 40*(3), 414-433.

Hooda, A., Gupta, P., Jeyaraj, A., Giannakis, M., & Dwivedi, Y. (2022). The effects of trust on behavioral intention and use behavior within e-government contexts. *International Journal of Information Management, 67*, 102553.

Hung, S., Chang, C., & Kuo, S. (2013). User acceptance of mobile e-government services: An empirical study. *Government Information Quarterly, 30*(1), 33-44.

Kampa, R. (2023). Combining technology readiness and acceptance model for investigating the acceptance of m-learning in higher education in India. *Asian Association of Open Universities Journal, 18*(2), 105-120.

Knekta, E., Runyon, C., & Eddy, S. (2019). One size doesn't fit all: Using factor analysis to gather validity evidence when using surveys in your research. *CBE—Life Sciences Education, 18*(1), rm1.

Lai, Y., & Lee, J. (2020). Integration of technology readiness index (TRI) into the technology acceptance model (TAM) for explaining behavior in adoption of BIM. *Asian Education Studies, 5*(2), 10-17.

Luomala, R. (2016). *The factors affecting the use of contactless payments.* Master's Thesis, Jyväskylä University School of Business and Economics.

Manutworakit, P., & Choocharukul, K. (2022). Factors influencing battery electric vehicle adoption in Thailand—Expanding the unified theory of acceptance and use of technology's variables. *Sustainability, 14*(14), 8482.

Mohanarajan, A. (2016). *Business as an art form*. Master's Thesis, Ontario College of Art and Design University.

Nugroho, M. (2015). Impact of government support and competitor pressure on the readiness of SMEs in Indonesia in adopting the information technology. *Procedia Computer Science, 72*, 102-111.

Nugroho, M., & Fajar, M. (2017). Effects of technology readiness towards acceptance of mandatory web-based attendance system. *Procedia Computer Science, 124*, 319-328.

Parasuraman, A. (2000). Technology Readiness Index (TRI): A multiple-item scale to measure readiness to embrace new technologies. *Journal of Service Research, 2*(4), 307-320.

Parasuraman, A., & Colby, C. (2015). An updated and streamlined technology readiness index: TRI 2.0. *Journal of Service Research, 18*(1), 59-74.

Phurkwattanakul, N., & Methavasaraphak, P. (2021). Factors Affecting the E-payment Adoption on E-commerce Platform System in Thailand. *APHEIT International Journal, 10*(2), 22-34.

Polit, D., & Beck, C. (2006). The content validity index: Are you sure you know what's being reported? Critique and recommendations. *Research in Nursing & Health, 29*(5), 489-497.

Rahim, N., Humaidi, N., Aziz, S., & Zain, N. (2022). Moderating effect of technology readiness towards open and distance learning (ODL) technology acceptance during COVID-19 pandemic. *Asian Journal of University Education, 18*(2), 406-421.

Reyes-Mercado, P., Barajas-Portas, K., Kasuma, J., Almonacid-Duran, M., & Zamacona-Aboumrad, G. (2023). Adoption of digital learning environments during the COVID-19 pandemic: Merging technology readiness index and UTAUT model. *Journal of International Education in Business, 16*(1), 91-114.

Rinjany, D. (2020). Does technology readiness and acceptance induce more adoption of e-government? Applying the UTAUT and TRI on an Indonesian complaint-based application. *Policy & Governance Review, 4*(1), 68-86.

Savalei, V., & Bentler, P. (2005). A statistically justified pairwise ML method for incomplete nonnormal data: A comparison with direct ML and pairwise ADF. *Structural Equation Modeling, 12*(2), 183-214.

Tabachnick, B., Fidell, L., & Ullman, J. (2007). *Using multivariate statistics*. Massachusetts: Pearson.

Thailand National Single Window. (n.d.a). *Policy.* Retrieved from www.thainsw.net/INSW/Ent/DisplayPageServlet.

Thailand National Single Window. (n.d.b). *NSW Operator*. Retrieved from www.thainsw.net.

Venkatesh, V., Morris, M., Davis, G., & Davis, F. (2003). User acceptance of information technology: Toward a unified view. *MIS Quarterly, 27*(3), 425-478.

Wook, M., Yusof, Z., & Nazri, M. (2014). Data mining technology adoption in institutions of higher learning: A conceptual framework incorporating technology readiness index model and technology acceptance model 3. *Journal of Applied Sciences, 14*(18), 2129-2138.

Yuan, K., & Bentler, P. (2000). Three likelihood-based methods for mean and covariance structure analysis with nonnormal missing data. *Sociological Methodology, 30*(1), 165-200.

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