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INDUSTRIAL PROCUREMENT MANAGEMENT EFFICIENCY GUIDELINES: PERFORM EXCELLENCE THROUGH ORGANISATIONAL CHANGE STRATEGIES

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ABSTRACT

Purpose: The objective of this research was to use structural equation modelling to illustrate guidelines for enhancing procurement management efficiency in the industrial business sectors.

Theoretical framework: The conceptual framework was developed based on relevant studies and incorporated elements from procurement excellence models established by renowned organisations, including McKinsey's successful procurement operating model (2018), BCG's five pillars of procurement excellence (2019), and PwC's operating procurement model (2019).

Design/methodology/approach: This study utilised a mixed-methods approach, combining qualitative (in-depth interviews and focus group discussions) and quantitative (survey) research methods. The quantitative data was collected through a questionnaire consisting of four parts, which was administered to 500 executives from industrial businesses. The data was analysed using descriptive, inferential, and multivariate statistical techniques.

Findings: The guidelines thoroughly examined four key elements: organisational change, technology management, internal control process, and business alliance networks - influencing procurement management efficiency in Thailand. This analysis used confirmatory factor analysis, second-order confirmatory factor analysis, and structural equation modelling. After modification, the final model included 23 observed variables under six hypotheses and was evaluated using congruence evaluation criteria to ensure its effectiveness.

Research, Practical & Social implications: The researchers suggested that future studies focus on the specific characteristics of each industrial type, such as the automobile sector, food and beverage industry, or emerging S-curve and new S-curve segments. The future research results would allow for a more in-depth analysis of the unique factors that impact procurement management efficiency within each industry.

Originality/value: The findings suggest that the developed models can serve as valuable guidelines for industrial businesses looking to improve their procurement management systems and implement effective strategies. By adopting these models, businesses may enhance their profitability and optimise their use of resources, thereby improving overall efficiency.

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DIRETRIZES DE EFICIÊNCIA DE GESTÃO DE COMPRAS INDUSTRIAIS: DESEMPENHAR EXCELÊNCIA ATRAVÉS DE ESTRATÉGIAS DE MUDANÇA ORGANIZACIONAL

RESUMO

Objetivo: O objetivo desta pesquisa foi usar a modelagem de equações estruturais para ilustrar diretrizes para melhorar a eficiência da gestão de compras nos setores de negócios industriais.

Estrutura teórica: A estrutura conceitual foi desenvolvida com base em estudos relevantes e incorporou elementos de modelos de excelência em compras estabelecidos por organizações renomadas, incluindo o modelo operacional de compras bem-sucedidas da McKinsey (2018), os cinco pilares de excelência em compras do BCG (2019) e o modelo operacional de compras da PwC (2019).

Desenho/metodologia/abordagem: Este estudo utilizou uma abordagem de métodos mistos, combinando métodos de pesquisa qualitativos (entrevistas em profundidade e discussões de grupos focais) e quantitativos (pesquisas). Os dados quantitativos foram coletados por meio de um questionário composto por quatro partes, aplicado a 500 executivos de empresas industriais. Os dados foram analisados por meio de técnicas estatísticas descritivas, inferenciais e multivariadas.

Resultados: As diretrizes examinaram minuciosamente quatro elementos-chave: mudança organizacional, gerenciamento de tecnologia, processo de controle interno e redes de alianças comerciais - influenciando a eficiência do gerenciamento de aquisições na Tailândia. Essa análise usou análise fatorial confirmatória, análise fatorial confirmatória de segunda ordem e modelagem de equação estrutural. Após modificação, o modelo final incluiu 23 variáveis observadas sob seis hipóteses e foi avaliado por meio de critérios de avaliação de congruência para garantir sua eficácia.

Implicações de pesquisa, práticas e sociais: Os pesquisadores sugeriram que estudos futuros se concentrem nas características específicas de cada tipo industrial, como o setor automobilístico, a indústria de alimentos e bebidas ou a curva S emergente e novos segmentos da curva S. Os resultados da pesquisa futura permitiriam uma análise mais aprofundada dos fatores exclusivos que afetam a eficiência do gerenciamento de aquisições em cada setor.

Originalidade/valor: Os resultados sugerem que os modelos desenvolvidos podem servir como diretrizes valiosas para empresas industriais que buscam melhorar seus sistemas de gestão de compras e implementar estratégias eficazes. Ao adotar esses modelos, as empresas podem aumentar sua lucratividade e otimizar o uso de recursos, melhorando assim a eficiência geral.

Palavras-chave: Gestão de Compras, Eficiência nas Compras, Mudança Organizacional, Gerenciamento de Tecnologia, Processo de Controle Interno, Redes de Alianças Empresariais, Modelo de Equação Estrutural.

DIRECTRICES DE EFICIENCIA EN LA GESTIÓN DE LAS COMPRAS INDUSTRIALES: DESEMPEÑO DE LA EXCELENCIA A TRAVÉS DE ESTRATEGIAS DE CAMBIO ORGANIZACIONAL

RESUMEN

Propósito: El objetivo de esta investigación fue utilizar el modelo de ecuaciones estructurales para ilustrar las pautas para mejorar la eficiencia de la gestión de adquisiciones en los sectores comerciales industriales.

Marco teórico: El marco conceptual se desarrolló en base a estudios relevantes e incorporó elementos de modelos de excelencia en adquisiciones establecidos por organizaciones reconocidas, incluido el exitoso modelo operativo de adquisiciones de McKinsey (2018), los cinco pilares de excelencia en adquisiciones de BCG (2019) y el modelo operativo de adquisiciones de PwC (2019).

Diseño/metodología/enfoque: Este estudio utilizó un enfoque de métodos mixtos, combinando métodos de investigación cualitativos (entrevistas en profundidad y discusiones de grupos focales) y cuantitativos (encuestas). Los datos cuantitativos fueron recolectados a través de un cuestionario que consta de cuatro partes, el cual fue administrado a 500 ejecutivos de empresas industriales. Los datos se analizaron mediante técnicas estadísticas descriptivas, inferenciales y multivariadas.

Hallazgos: Las pautas examinaron a fondo cuatro elementos clave: cambio organizacional, gestión de tecnología, proceso de control interno y redes de alianzas comerciales, que influyen en la eficiencia de la gestión de adquisiciones en Tailandia. Este análisis utilizó el análisis factorial confirmatorio, el análisis factorial confirmatorio de segundo orden y el modelado de ecuaciones estructurales. Después de la modificación, el modelo final incluyó 23 variables observadas bajo seis hipótesis y se evaluó utilizando criterios de evaluación de congruencia para asegurar su efectividad.

Implicaciones de investigación, prácticas y sociales: los investigadores sugirieron que los estudios futuros se centren en las características específicas de cada tipo industrial, como el sector del automóvil, la industria de alimentos y bebidas, o la curva S emergente y los nuevos segmentos de curva S. Los resultados de la investigación

futura permitirían un análisis más profundo de los factores únicos que afectan la eficiencia de la gestión de adquisiciones dentro de cada industria.
Originalidad/valor: los hallazgos sugieren que los modelos desarrollados pueden servir como pautas valiosas para las empresas industriales que buscan mejorar sus sistemas de gestión de adquisiciones e implementar estrategias efectivas. Al adoptar estos modelos, las empresas pueden mejorar su rentabilidad y optimizar el uso de los recursos, mejorando así la eficiencia general.

Palabras clave: Gestión de Compras, Eficiencia de las Adquisiciones, Cambio Organizacional, Gestión de la Tecnología, Proceso de Control Interno, Redes de Alianzas Empresariales, Modelo de Ecuaciones Estructurales.

INTRODUCTION

The industrial business has a significant share of the economy in Thailand; in 2020, the number of industrial businesses in Thailand was 92,422, divided into six categories: agriculture and food, consumer products, industrial products, real estate and construction, technology, and resources thereby, the government continuously issues support policies for both national and international companies' plant-based in Thailand (Office of SMEs Promotion, 2020). Notwithstanding, the Office of Industrial Economics (2021) reported that in 2019, various economic sectors slow-down. In the overall financial direction, the industry contracted by 0.36% in the Year 2019—because the manufacturing sector contracted by 0.98% due to increased production costs and selling and administrative expenses. In addition, from the survey of Thailand's industrial problems, the top three most frequently encountered were raw material costs, labour costs, and workforce performance. Consistent with Utit, Abdul & Saari (2022) summarised that SMEs are the backbone of many developing economies but face many challenges because of structural differences. Efficiency and productivity issues, such as financial, technological, market access, production capacity, and a lack of entrepreneurship skills, frequently plague SMEs.

Furthermore, the Office of the National Economic and Social Development Council (2021) concluded in September 2021 that in 2020, Thailand's logistics costs totalled 2,215.80-billion-baht, accounting for 14.10% of GDP, a higher proportion than the previous year. In addition, there were freight costs of 1,021.80-billion-baht, inventory storage costs of 1,029.10 billion baht, and management costs of 164.90 billion baht. As a result, the logistics cost was slightly lower than the previous year or decreased by 0.70%, downwardly adjusted according to the contraction of economic activities in the country and the world economy affected by the epidemic situation of the new coronavirus disease (COVID-19). However, risk factors still need to be assessed, especially the prolongation of the COVID-19 pandemic and the situation of rising oil prices and freight rates. As a result, the economic added value of the logistics business

in 2020 was 477.40 billion baht, a decrease from 487.00 billion baht in 2019. Besides that, the total operating costs per sales value increased from 91.49% in 2018 to 92.25% in 2019 (Office of Industrial Economics, 2021).

The cost of production is considered a primary factor that affects the business's profit, reflecting the efficiency in the use of industrial business resources, causing operators to be disadvantaged by higher production costs and reducing the ability to compete in price. Therefore, many entrepreneurs have considered the procurement function to drive their business. For example, the operators in the Thais construction industry seek cost control performance in the pre-construction, construction, and after-construction phases (Chinda, 2020). Procurement is the management of resources for products and services from outside the organisation both the main activities and supporting activities must be managed for maximum benefit (Johnson & Flynn, 2015; Weele, 2018). The procurement system in private organisations will differ according to the production, service, or buying and selling type of business, including organisations such as limited partnerships, limited companies, and public limited companies (Purchasing and Supply Chain Management Association of Thailand, 2017).

Nowadays, procurement experts work under business competition with limited time to support continued operations; therefore, procurement excellence models are employed to develop procurement, especially in the industrial business. Thus, this research aimed to demonstrate the structural equation modelling of procurement management efficiency guidelines for the industrial business sectors; therefore, this study will benefit from revealing the factors that impact procurement efficiency.

LITERATURE REVIEW

Procurement is a crucial function in businesses, especially in industrial sectors that spend huge budgets on their operations (Deloitte, 2018; Munyimi, 2019). Moreover, all entrepreneurs pay attention to procurement tasks because procurement impacts operations, production, profits, and business reliability (Weele, 2018). Thus, in this section, the researchers intend to present reviews of the relevant literature to guide the hypothesis development framework.

Relation Between Organisational Change and Technology Management

Concepts and theories related to organisational change with technology management believe that organisational administration covers policymaking, strategy, organisational

structure, and personnel management, including determining how to work in procurement, which was considered the starting element in this research. Weele (2018) explained that procurement based on excellence must be carried out by strategic process management and operational processes related to procurement strategies. Therefore, organisation and personnel development affect the development and operation of information technology systems in procurement management.

According to McKinsey (2018), to increase the impact and potential of the procurement workload. Organisations must develop a competence set that spans cutting-edge technological, analytical, and management advancements. These requirements form a new era of procurement operations. Geissbauer et al. (2016) propose that organisations create a new job profile, whether for new buyers, contract specialists about intellectual property, or new sources of sales with the support of procurement partners. Organisations can fully benefit from digital transformation only with digitally competent procurement personnel. In line with Biazzin & Carvalho (2019), a successful organisation requires a consistent organisational and procurement strategy.

The relevant factors correlate with technical ability, business capability, personnel cooperation, organisation preparation, and big data implementation support. These are the main drivers of big data technology's success due to the possibility of simplifying complexity, reducing costs, supporting accurate decision-making processes, and avoiding fraud. In addition, the strategic plan of the organisation's business environment, mission, vision, and strategic plan will help improve quality compliance and respond to the successful adoption of big data in procurement. Thence, research hypothesis 1 was developed as below presenting.

H1: Elements of organisational change directly influence technology management.

Relation Between Organisational Change and Internal Control Process

The causal influence between the elements of the organisational change and the internal control process can be summarised. As Johnsons (2020) explained, organisations face the challenge of success in a highly competitive global market, concepts, and theories related to organisational change internal control process. The firm's risk includes risk types, risk management, ethical culture, human resource policies, responsibility assignment, and the organisational structure to manage risks (Tri, Tran, & Huu, 2020). An organisation's ability effectively connects with external social, economic, political, legal, and technological environments for adaptation to change. Therefore, defining and implementing a strategic plan is essential to revenue generation and survival (Munyimi, 2019). McKinsey (2015) consistently

explained that strategic management could be considered in two dimensions: whether the product is a global or local market. Furthermore, the goods are easy to buy or complicated by the nature of supply and demand for each commodity and its influence on procurement and bargaining strategies.

Moreover, changing organisational culture and capabilities is the most powerful way to improve efficiency. BCG (2019) presents the five key dimensions that drive excellence in procurement: strategy and role, structural design, people, tools, measures, and systems, and delivered value. Pazirandeh (2016) described organisational strategies and structures influencing procurement processes and decisions. The procurement context of different organisations will also affect the organisation's procurement strategy and processes. At the same time, Bag et al. (2020) pointed out that the Procurement 4.0 strategy will depend on the nature of operations and business factors. The new system involves long-term, medium-term, and short-term strategic decision-making. Any organisation that can process data using Procurement 4.0 technology will take advantage of the audit process and optimise the procurement process. Thus, research hypothesis 2 was the following.

H2: Elements of organisational change directly influence the internal control process.

Relation Between Organisational Change and Business Alliance Networks

Organisations can play different roles in the partner network depending on the organisation's objectives—organisational resources and the relationship or affiliation between alliance members. However, managers must understand the roles of the organisation and the limitations of each role to achieve the desired results from alliances (Peterman, Kourula & Levitt, 2020). Due to intense competition, business managers must develop new models for managing products, and information flows are critical for all parties (Watts, 2020), including suppliers, manufacturers, distributors, retailers, and customers. Production of low-cost, high-quality products has given rise to a concept of supply chain management (Mulyaningsiha et al., 2021).

In addition, supply chain management leaders should consider the impact of transformational leadership characteristics and make decisions on long-term relationships sustainably with suppliers in international organisations that should have a standard and suitable system (Fariz, 2022). Furthermore, the function and existence of the long-term collaboration strategy's antecedents are crucial factors in determining supply chain performance (Watts, 2020). Interestingly, the influence analysis showed that communication significantly influences

dolphin choir performance more than commitment (Mulyaningsiha et al., 2021). Moreover, Sukhawatthanakun (2022a) stated that entrepreneurs should implement ethical norms to reduce problems with the products they offer customers to sustain trust in the marketing process. Finally, research hypothesis 3 was designed as follows.

H3: Elements of organisational change directly influence business alliance networks.

Relation Between Technology Management and Internal Control Process

Concepts and theories about technology management and internal control process have the idea of the rapid development of information technology in this era and the high competition of organisations to improve business processes as a normal phenomenon. Chakraborti (2019) stated that procurement executives should use digital technology to transform their procurement operations, such as electronic procurement technology, contract lifecycle management software, automatic invoicing, and applying the latest technology to manage vendor relationships. The findings also indicate that procurement organisations with advanced automation technology can operate by reducing labour costs to be more efficient and develop the organisation to have the potential to compete.

Furthermore, Saputra & Putra (2020) have introduced improvements to efficient and effective business processes with the business planning process architecture based on the TOGAF ADM model, considering the out-of-the-box approach. For example, they are reducing the use of paper documents, simplifying work-integrated and automation in the procurement process with the electronic procurement system. Implementing e-procurement has helped improve procurement operations efficiency and good corporate governance. Consistent with COSO (2020), Masudin et al. (2021) described that many changes are taking place today with the adoption of blockchain with other technology, e.g., big data, artificial intelligence, internet of things; these technologies make business operations more streamlined. Therefore, research hypothesis 4 is below.

H4: Elements of technology management directly influence the internal control process.

Relation Between Technology Management and Business Alliance Networks

Concepts and theories on technology management and business alliance networks; Quang et al. (2016) stated that supply chain quality management is not just about operations within the organisation but also external operations that cross the organisation's boundaries to integrate the organisation with customers and vendors. Mokhtar et al. (2019(explained that

many technological tools improve process efficiency and productivity where procurement managers can focus on higher value-added jobs from supplier selection. Categories spending and internal relationships (other functions or senior management) and external relations (vendors) with the following technologies: enterprise resource planning, cloud computing, supply chain electronic procurement system, catalogue system, electronic information exchange (EDI), central market system, reverse online auction system (Johnson & Flynn, 2015).

According to a Deloitte (2018) research report, it is estimated that within the next five years, the work involved in finding sales sources, placing orders, managing vendors, business planning, and strategy development will be the most significant impact due to digital technology changing. As Lintukangas, Kähkönen & Hallikas (2019) found, innovation in supply management significantly influences an organisation's overall sustainability performance. The orientation focuses on the vendors' strategic direction, positively impacting sustainability performance. The findings of Hofbauer (2019) consistently revealed that adopting blockchain technology in procurement would play a role in vendor qualification, requesting a quote, ordering, evaluation, and vendor development. Blockchain technology makes buyers and sellers work faster, reduces working time, and is accurate and reliable. The procurement is transparent; payments allow sellers to use cryptocurrency, where technology is crucial in seller management. Support with Wambua & Kagiri (2019) found that information technology cooperation with sellers, outsourcing strategies, and procurement risk management positively influence corporate performance. These strategies allow organisations to streamline their procurement processes and help build confidence in their technology-enabled personnel. Thus, research hypothesis 5 was:

H5: Elements of technology management directly influence business alliance networks.

Relation Between Internal Control Process and Business Alliance Networks

Influencing of internal control process and business alliance networks as previously studied follows. Hopkin (2017) mentioned that it is beneficial to build strategic partnerships through two types of strategic cooperation: outsourcing and joint ventures. Consistent with Parniangtong (2016), the nature of alliances can take two forms: contractual and ownership. In addition, a higher level of relationship can be achieved through the attention of senior management.

Murphy & Knemeyer (2018) explained that the main objective of modern procurement management is to optimise resource utilisation and achieve the set goals. Secondary important work is that controlling the source of sales will involve selecting, developing, and maintaining sales resources. The organisation's policy is a factor that affects the approach to management and evaluation of vendors. In addition, Rezaei & Lajimi (2019) conclude that a significant change in the current procurement operations requires categorising goods procured by organisations based on their importance or impact on profit and risk in the absence of the product itself. Then it comes to vendor management by grouping them by established criteria and using vendor relationships to help mitigate procurement risks. At the same time, Vlahakis, Kopanaki & Apostolou (2019) have confirmed that proactive decision-making methods by procurement suppliers can lead to improvements in order efficiency, increased flexibility, and cost management.

Moreover, in line with Manucharyan (2021), a vendor-relationship management system design selects vendors with potential for development and interoperability in product development innovation. In addition, Thomas (2019) confirmed that the relationship between universities and industry in innovation systems correlates through formal and informal cooperation. Thus, research hypothesis 6 was developed as follows.

H6: Elements of the internal control process directly influence the business alliance networks.

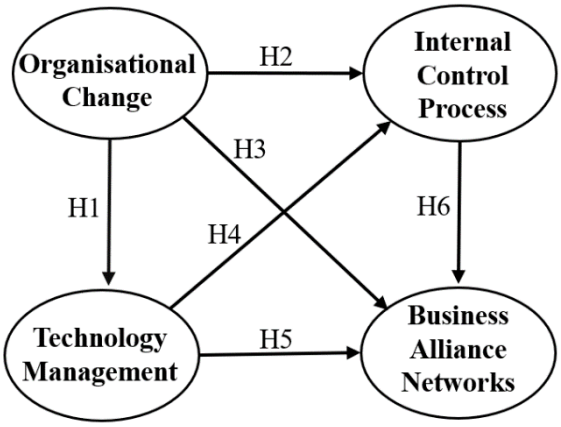
Conceptual Framework Model

The researchers reviewed literature and relevant studies, but we found a research gap that limited the number of studies to prove the procurement excellence strategies, not even the scope in the focus of industrial sectors. Therefore, the conceptual framework constructed under relevant studies and adapted from the procurement excellence models presented by well-known organisations, such as the successful procurement operating model of McKinsey (2018), the five pillars of procurement excellence of BCG (2019), and the operating procurement model of PwC (2019). Therefore, the research framework and guidelines for developing industrial procurement management efficiency are presented in this article.

The conceptual research model consisted of one exogenous latent variable, the Organisational Change element, combined with the three endogenous latent variables, Internal Control Process, Technology Management and Business Alliance Network. First, the

researchers aimed to study the relationship between four elements, and then the six hypotheses were set (see Figure 1) to prove by developing the structural equation modelling.

Figure 1. Conceptual framework model



Source: Prepared by authors (2023).

METHODOLOGY

This research used a mixed research methodology (Silpcharu, 2020) by combining qualitative research (in-depth interview technique), quantitative research (survey questionnaire technique) and the last stage with qualitative research (focus group technique), as below description.

Qualitative Research: In-depth Interview Technique

The first step of this research used the in-depth interview technique using the structured interview form as opened-end questions, reviewed from literature focusing on four elements. The nine qualified procurement management experts include three experts in the industrial business sector, three keymen in association or industrial ministry, and three scholars in university by purposive selection. The researchers spent 60-90 minutes interviewing each expert with constructed interview questions and using video and short note recordings.

Data Analysis: The qualitative data from the in-depth interview technique were recorded; thus, after the in-depth interview, the researchers replayed the video recorder using the contents analysis method (Silpcharu, 2020). Afterwards, the interview content from nine experts was synthesised and transformed into the questionnaire as a quantitative research tool.

Quantitative Research: Survey Questionnaire Technique

Questionnaire Design: A research questionnaire consisted of four parts; Part I: industrial business organisation factors with five items of a multiple-choice question; Part II: general procurement management factors with 20 items of a multiple-choice question; Part III: importance level of the procurement management efficiency guidelines with a rating scale set weight criteria to five levels of Likert's scale question total 100 items; Part IV: additional suggestion on procurement management with five items of an open-ended question.

Validity and Reliability: The five experts first validated and evaluated the drafted questionnaire for construct validity. First, these variables were analysed using the Item Objective Congruence method and showed a 0.60-1.00 value (accepted at > 0.50). Then, 30 try-out sets of questionnaires (Stockemer, 2019) were evaluated by Cronbach's alpha reliability (Engel & Schutt, 2017), with statistics showing 0.984 (accepted at > 0.80). Moreover, in the discrimination of both checklist and rating-scale question items test (Silpcharu, 2020), the standard deviation analysis obtained 0.50-2.53, and the corrected item-total correlation analysis got 0.32-0.87 (accepted at > 0.30).

Population and Sample: The population selected for the quantitative study was industrial businesses in Thailand; the number of large (L) and small and medium-sized (SME) industrial businesses in Thailand were 92,422 businesses (Office of SMEs Promotion, 2020). Then the sample size was calculated at 500 samples (Comrey & Lee, 2013) as a good number for quantitative data analysis. Therefore, the sample of 250 large and 250 small and medium-sized industrial businesses. This study used non-probability sampling by employing the purposive sampling method from enterprise owner /procurement executives of industrial businesses in Thailand.

Data Analysis: The quantitative data from the completed 500 questionnaires were analysed using the SPSS version 22.0. This research employed descriptive statistics: Frequency and Percentage for analysing collected data in Part I – II of the questionnaire using mean and standard deviation (S.D.) for analysing collected data in Part III of the questionnaire, and content analyses were used for part 4 of the questionnaire (Engel & Schutt, 2017). The interpreting data analysis of the mean level was as follows: mean score of 1.00-1.49 mean very low importance, 1.50-2.49 mean low importance, 2.50-3.49 mean average importance, 3.50-4.49 mean high importance and 4.50-5.00 mean very high importance (Silpcharu, 2020). In addition, the multivariate statistical analysis employed structural equation modelling (SEM) by the SPSS AMOS programme to evaluate the data-model fit in four standard criteria. Including

the chi-square probability level or CMIN – ρ value is higher than 0.05; the relative chi-square value or CMIN/DF value is less than 2.00; the goodness-of-fit-index or GFI value is higher than 0.90; the root means the square error of approximation or RMSEA value is lower than 0.08 (Arbuckle, 2016).

Qualitative Research: Focus Group Technique

In the final step of this mixed methodology research, the researchers invited 11 business executives and two academic professors to join the focus group discussion meeting with the professional moderator. The moderator was responsible for influencing the group to come up with ideas and express their opinions on research results and developed CFA, S-CFA, and SEM models for the discussion broadly and deeply. Focus group discussion data were video recordings of the conversation, covering three rounds under 120 minutes.

Data Analysis and Result: After the focus group discussion, the researchers replayed the video recorder file to summarise discussion data by content analysis method (Silpcharu, 2020). All participants unanimously approved the research findings and final models with some recommendations for complete report adjustment. Therefore, the researchers could present the research results in the following sections.

RESULTS AND DISCUSSION

Industrial Business Organisation Factors

The respondents were 250 large-sized and 250 small and medium-sized industrial businesses, totalling 500. Most of them were in the industrial products industry (27.60%), operating in business for over 30 years of establishment (30.80%), procurement budget value not over 100 million baht (52.40%), procurement department workforce not over ten persons (73.80%), and most of them did not implement ISO 20400 (54.20%) (see Table 1).

Table 1. Industrial business organisation factors

Industrial business organisation factors	Frequency	Percent (%)
Industry category		
Agriculture and food	123	24.60
Consumer products	132	26.40
Industrial products	138	27.60
Real estate and construction	42	8.40
Technology	60	12.00
Resources	5	1.00
Operating duration		
Not over 10 years	142	28.40
11-20 years	111	22.20
21-30 years	93	18.60
Over 30 years	154	30.80
Procurement budget value		
Not over 100 million baht	262	52.40
101-500 million baht	83	16.60
Over 500 million baht	155	31.00
Procurement department workforce		
Not over 10 persons	369	73.80
11-20 persons	59	11.80
21-30 persons	29	5.80
Over 30 persons	43	8.60
ISO 20400 Implementation		
Unimplemented	271	54.20
Implemented	229	45.80

Source: Prepared by authors (2023).

Importance Level of the Procurement Management Efficiency Guidelines

The results of analysing the procurement management efficiency in industrial business sectors guidelines from 25 observed variables in each element total of 100 observed variables were as follows.

The overall importance level of procurement management efficiency in industrial business sector guidelines was high, with a mean of 4.01. In addition, for each latent variable, it was found that the importance level of the internal control process latent variable was high, with a mean of 4.12. The organisational change latent variable was high with a mean of 4.06, the business alliance networks latent variable was high with a mean of 3.93, and the technology management latent variable was high with a mean of 3.92 (see Table 2).

Table 2. Importance level of the procurement management efficiency guidelines

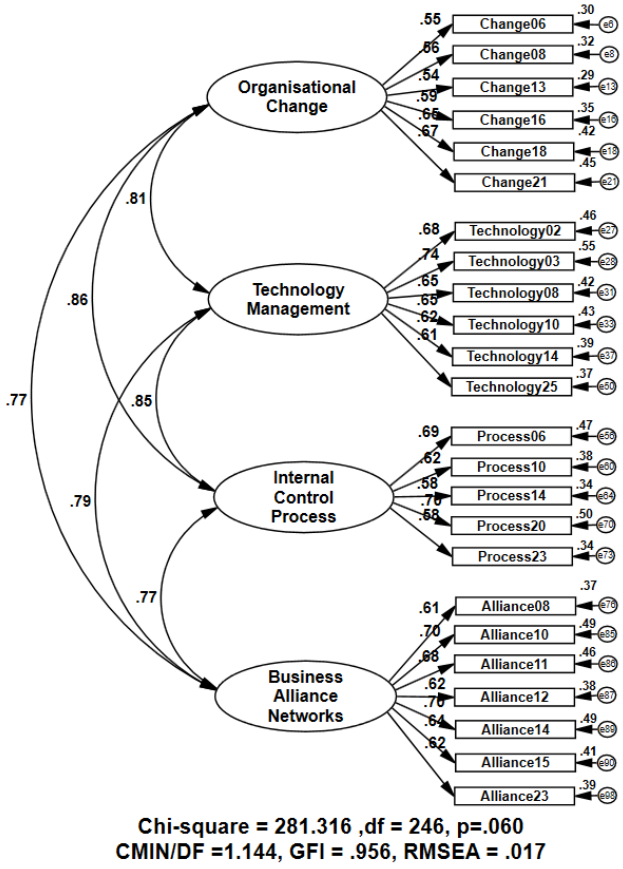
Factors of procurement management efficiency guidelines	$\bar{X}$	S.D.	Cronbach's alpha
Overall	**4.01**	**0.48**	**0.977**
1. Internal Control Process	4.12	0.50	0.929
2. Organisational Change	4.06	0.49	0.924
3. Business Alliance Networks	3.93	0.58	0.936
4. Technology Management	3.92	0.59	0.939

Source: Prepared by authors (2023).

Confirmatory Factor Analysis

The CFA model was developed from 100 observed variable factors of the procurement management efficiency guidelines and consisted of four latent variables (elements); the researcher employed a cutting-off technique for model modification (see figure 2).

Figure 2. Confirmation model after modification in standardised mode



Source: Prepared by authors (2023).

Table 3. Mean and standard deviation of variable factors of the procurement management efficiency guidelines.

Variable factors of the procurement management efficiency guidelines		$\bar{X}$	S.D.
1. Organisational Change			
Change01	Analyse the business environment to direct the business operation of the organisation.	4.25	0.78
Change06	Make procurement work more efficient by concentrating on operational procedures.	4.20	0.76
Change08	Change the procurement department structure in the present business circumstances.	3.97	0.87
Change13	Segregate procurement department independently under the control of top management.	4.01	0.81
Change16	Develop job descriptions for procurement works to cover the new job scopes.	4.10	0.74
Change18	Declare procurement working standards in the right direction and controllable.	4.11	0.74
Change21	Skill up workforce capability by focusing on procurement systems with digital technology.	4.08	0.83
2. Technology Management			
Technology01	Create the information technology systems for procurement works under the strategic plan.	4.05	0.88
Technology02	Allocate procurement technology hardware budget.	3.90	0.94
Technology03	Enable new technologies of procurement system for the supply chain works.	3.96	0.90
Technology08	Share procurement information for efficient work by information technology systems platform.	3.94	0.89
Technology14	Link internal departments with a procurement software package.	4.03	0.87
Technology17	Integrate the Big Data system into procurement management functions.	3.83	0.96
3. Internal Control Process			
Process06	Identify the supplier qualifications to cover the standard of the organisation.	4.14	0.81
Process10	Audit the procurement process by internal and external committees.	4.08	0.86
Process14	Develop the new suppliers as supply sources reducing the sole source risk.	4.14	0.84
Process20	Arrange regular procurement performance meetings review among internal departments.	4.07	0.87
Process23	Set up the monitoring system and issue the quarterly procurement analysis report.	4.10	0.77
4. Business Alliance Networks			
Alliance03	Select outsourced expertise providers to reduce the organisational operating risks.	3.95	0.94
Alliance10	Improve procurement operations by leveraging alliance resources and capabilities.	4.06	0.83
Alliance11	Reduce logistics costs by utilising business partner synergies.	4.17	0.80
Alliance12	Form a committee team to improve procurement relationships with strategic suppliers.	3.92	0.89
Alliance14	Participate in developing the supplier's production process under the organisational objectives.	3.97	0.84
Alliance15	Request the alliance networks for machine or equipment-sharing support.	3.93	0.88
Alliance23	Achieve better procurement work by organising a knowledge-sharing meeting with business alliances.	3.93	0.93

Source: Prepared by authors (2023).

Figure 2 shows the result after model modification; the simulation model passed the standard fitting criteria with the empirical data giving CMIN–ρ was 0.060, CMIN/DF was 1.144, GFI was 0.956, and RMSEA was 0.017 (Arbuckle, 2016). As a result, the organisational change element consisted of six variable factors; the technology management element consisted of six variable factors; the internal control process element consisted of five variable factors; and the business alliance networks element consisted of seven variable factors, giving a total of 24 variable factors.

Table 3 shows the confirmation model of the procurement management efficiency guidelines in standardised mode with 24 observed variables described below.

The organisational change element consisted of seven observed variables as follows, prioritising mean; (1) Change01: analyse the business environment to direct the business operation of the organisation at a mean of 4.25; (2) Change06: make procurement work more efficient by concentrating on operational procedures at a mean of 4.20; (3) Change18: declare procurement working standards in the right direction and controllable at a mean of 4.11; (4) Change16: develop job descriptions for procurement works to cover the new job scopes at a mean of 4.10; (5) Change21: skill up workforce capability by focusing on procurement systems with digital technology at a mean of 4.08; (6) Change13: segregate procurement department independently under the control of top management at a mean of 4.01; and (7) Change08: change the procurement department structure in the present business circumstances at a mean of 3.97, respectively.

The technology management element consisted of six observed variables as follows prioritising; (1) Technology01: create the information technology systems for procurement works under the strategic plan at a mean of 4.05; (2) Technology14: link the internal departments with a procurement software package at a mean of 4.03; (3) Technology03: enable new technologies of procurement system for the supply chain works at a mean of 3.96; (4) Technology08: share procurement information for efficient work by information technology systems platform at a mean of 3.94; (5) Technology02: allocate procurement technology hardware budget at a mean of 3.90; and (6) Technology17: integrate the big-data system into procurement management functions at a mean of 3.83, respectively.

The internal control process element consisted of five observed variables as follows prioritising mean; (1) Process06: identify the supplier qualifications to cover the standard of the organisation at a mean of 4.14 (S.D. 0.81); (2) Process14: develop the new suppliers as supply sources reducing the sole source risk at a mean of 4.14 (S.D. 0.84); (3) Process23: set

up the monitoring system and issue the quarterly procurement analysis report at a mean of 4.10; (4) Process10: audit the procurement process by internal and external committees at a mean of 4.08; and (5) Process20: arrange regular procurement performance meetings review among internal departments at a mean of 4.07, respectively.

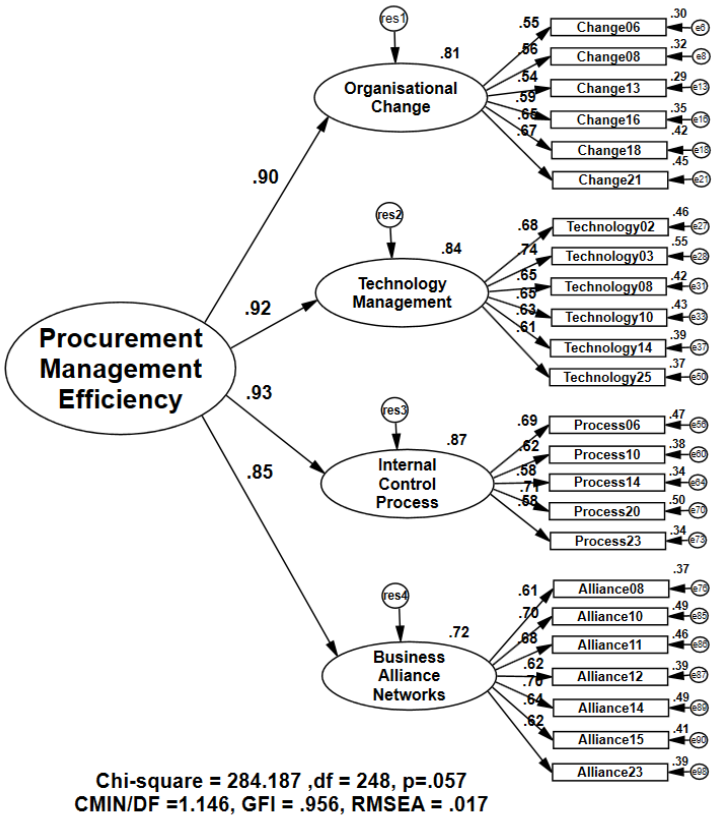
The business alliance networks element consisted of seven observed variables as follows prioritising mean; (1) Alliance11: reduce logistics costs by utilising business partner synergies at a mean of 4.17; (2) Alliance10: improve procurement operations by leveraging alliance resources and capabilities at a mean of 4.06; (3) Alliance14: participate in developing the supplier's production process under the organisational objectives at a mean of 3.97; (4) Alliance03: select outsourced expertise providers to reduce the organisational operating risks at a mean of 3.95; (5) Alliance15: request the alliance networks for machine or equipment-sharing support at a mean of 3.93 (S.D. 0.88); (6) Alliance23: achieve better procurement work by organising a knowledge-sharing meeting with business alliances at a mean of 3.93 (S.D. 0.93); and (7) Alliance12: form a committee team to improve procurement relationships with strategic suppliers at a mean of 3.92, respectively.

Second-Order Confirmatory Factor Analysis

According to the final fit model of CFA analysis, the researcher developed the second-order confirmation model**,** as shown in Figure 3. As a result, the value of evaluating metrics of data-model fit of the S-CFA by congruence evaluation criteria was improved at CMIN – $\boldsymbol{\rho}$ was 0.057, CMIN/DF was 1.146, GFI was 0.956, and RMSEA was 0.017. In summary, the retained 24 observed variables factors under four elements sorted by weighted scoring prioritisation from highest to lowest, which were (1) internal control process with the regression weight at 0.93 and R-squared at 0.87, consisting of five observed variables, which were Process06, Process10, Process14, Process20, and Process23, (2) technology management with the regression weight of 0.92 and R-squared at 0.84, consisted of six observed variables which were Technology02, Technology03, Technology08, Technology10, Technology14, and Technology25, (3) organisational change with the regression weight at 0.90, and R-squared at 0.81, consisted of six observed variables which were Change06, Change08, Change13, Change16, Change18, and Change21 and (4) business alliance networks with the regression weight of 0.85 and R-squared at 0.72, consisted of seven observed variables which were

Alliance08, Alliance10, Alliance11, Alliance12, Alliance14, Alliance15, and Alliance23 (see figure 3).

Figure 3. Second-order confirmation model after modification in a standardised model



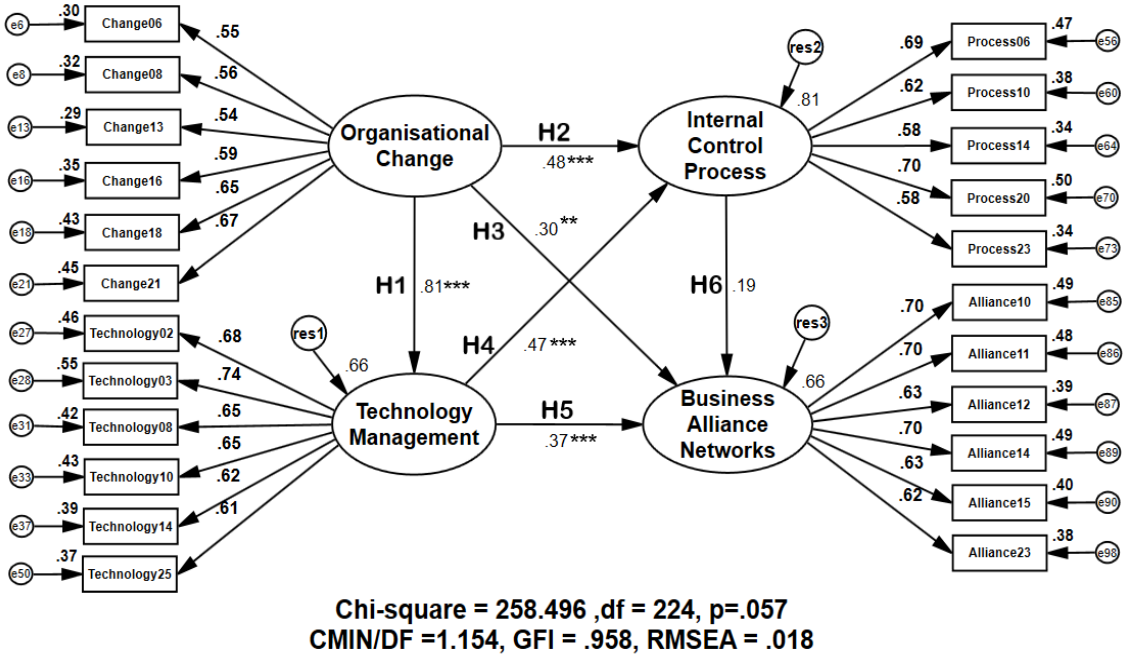
Source: Prepared by authors (2023).

Therefore, these results could be concluded that the four statistical results passed the standard criteria. Thus, the adjusted second-order confirmatory factor analysis model matched the empirical data from industrial business sectors in Thailand and was suitable for the structural equation modelling analysis in the next step.

Structural Equation Modelling Analysis

The researchers carefully revised the S-CFA simulation model of procurement management efficiency guidelines by considering modification indices (Arbuckle, 2016). As a result, the value of evaluating metrics of data-model fit of the SEM by congruence evaluation criteria was improved at CMIN – ρ was 0.057, CMIN/DF was 1.154, GFI was 0.958, and RMSEA was 0.018 (see Figure 4).

Figure 4. Structural equation model after modification in standardised mode



Source: Prepared by authors (2023).

After modifying the procurement management efficiency guidelines, the researchers cut off the Alliance08 variable factor. Finally, after modification, the structural equation model comprises 23 observed variables by six hypotheses as to the following description.

The organisational change element directly influenced the technology management element; the standardised regression weight was 0.81, the unstandardised regression weight was 1.25, the R-squared value was 0.66, the variance value was 0.14, and the critical ratio value was 9.79, at the significant level of 0.001.

The organisational change element directly influenced the internal control process element; the standardised regression weight was 0.48, the unstandardised regression weight was 0.64, R-squared was 0.81, the variance was 0.06, and the critical ratio was 4.82, at the significant level of 0.001.

The organisational change element directly influenced the business alliance networks element; the standardised regression weight was 0.30, the unstandardised regression weight was 0.42, the R-squared value was 0.66, the variance value was 0.11, and the critical ratio value was 2.46, at the significant level of 0.01.

The technology management element directly influenced the internal control process element; the standardised regression weight was 0.47, the unstandardised regression weight was 0.41, the R-squared value was 0.81, the variance value was 0.06, and the critical ratio value was 4.99, at the significant level of 0.001.

The technology management element directly influenced the business alliance networks element; the standardised regression weight was 0.37, the unstandardised regression weight was 0.34, the R-squared value was 0.66, the variance value was 0.11, and the critical ratio value was 3.32, at the significant level of 0.001.

The internal control process element directly influenced the business alliance networks element; the standardised regression weight was 0.19, the unstandardised regression weight was 0.20, the R-squared value of 0.66, the variance value was 0.11, and the critical ratio value was 1.35, no significant level of 0.05.

Hypotheses Testing and Results

In the following detail, hypotheses testing the relationship between variables in the research model are demonstrated by assessing regression weights, R-squared, and variance values, as illustrated in Figure 3. The structural equation model and model fit indices are a good fit with the value of CMIN – ρ was 0.057, CMIN/DF was 1.154, GFI was 0.958, and RMSEA was 0.018; thus, the developed SEM model was acceptable as below summarised results of the hypothesised model (see Table 3).

Table 3. Hypotheses testing and structural equation modelling results

	Hypothesis path	Proposed effect	Regression weight	*p*-Value	Result
H1	Organisational Change → Technology Management	Positive	0.81	0.000	Supported
H2	Organisational Change → Internal Control Process	Positive	0.48	0.000	Supported
H3	Organisational Change → Business Alliance Networks	Positive	0.30	0.014	Supported
H4	Technology Management → Internal Control Process	Positive	0.47	0.000	Supported
H5	Technology Management → Business Alliance Networks	Positive	0.37	0.000	Supported
H6	Internal Control Process → Business Alliance Networks	Negative	0.19	0.176	Not Supported

Source: Prepared by authors (2023).

H1: The result of regression weight was 0.81, and the *p*-value was 0.000 showing that organisational change directly influences technology management; thus, H1 was supported.

H2: The result of regression weight was 0.48, and the *p*-value was 0.000 showing that organisational change directly influences the internal control process; thus, H2 was supported.

H3: The result of regression weight was 0.30, and the *p*-value was 0.014, showing that organisational change directly influences technology management; thus, H3 was supported.

H4: The result of regression weight was 0.47, and the *p*-value was 0.000 showing that technology management directly influences the internal control process; thus, H4 was supported.

H5: The result of regression weight was 0.37, and the *p*-value was 0.000, showing that technology management directly influences business alliance networks; thus, H5 was supported.

H6: the result of regression weight was 0.19, and the *p*-value was 0.176 showing that the internal control process negatively influences the business alliance networks; thus, H6 was not supported.

From the structural equation model of the procurement management efficiency guidelines, after modification. The most influential factor was the organisational change, which influenced the technology management element at the standardised regression weight of 0.81. Meanwhile, the overall influence analysis result was highest in that the organisational change element influenced the internal process control element at the standardised regression weight of 0.86. The total effect value was the sum of direct influence from elements of organisational change that directly influence the internal control process element and indirectly influence through the technology management element. Therefore, the beforementioned researchers could summarise that the statistical testing results passed the standard evaluation; with this, the model of the adjusted SEM analysis of procurement management efficiency guidelines matched the empirical data from industrial business sectors in Thailand.

DISCUSSION

The researchers had designed the organisational change element as an exogenous latent variable started in this research. The explanation above confirmed this idea because organisation management covers policymaking, organisational structure, workforce management, and defining how procurement works consistently with Alvesson & Sveningsson (2016). While Vlahakis, Kopanaki & Apostolou (2019) concluded that strategic process management needs to carry out procurement development based on excellence. Interestingly, the observed factor Change21 was a strong influence that is skill up workforce capability by focusing on procurement systems with digital technology; this finding was consistent with Stek

& Schiele (2021) found that operational processes related to planning the procurement strategy organisation and workforce development in digital era circumstances.

The organisational change element directly influences the technology management element with the highest standardised regression weight of 0.81; this research was supported by Bag et al. (2020) study, which pointed out that organisations develop and operate information technology systems in procurement management according to the procurement 4.0 model. In addition, Dankaew & Silpcharu (2020) revealed that working procedures interact with an information technology system for each department to function faster and more efficiently. Therefore, consistent with Bateman et al. (2017); Chakraborti (2019), modern business enterprises need a process change in vendor management, strategic procurement planning, and development to undergo the most extensive changes due to digital technology. On the other hand, Ahmad & Sulaiman (2023) argued that the old idea and dogma inherited from their predecessors by taking a close look at what has been done in the past had not been fundamentally altered by SME owners in the way they run their companies.

Notably, the observed factor Technology03: to enable new technologies of procurement system for the supply chain works, was outstanding with a regression weight of 0.74. This point could explain that successful organisations must develop and coordinate a competence set spanning technology, information analysis, and modern management, which will generate modern procurement operations that restructure functional relationships with internal and external organisations, as mentioned by Quang et al. (2016); Lintukangas, Kähkönen & Hallikas, (2019). Consistent with Masudin et al. (2021) stated that executive support positively influences electronic procurement and indirectly influences organisational performance. Furthermore, Alia & Ahmed's study (2022) identified that the big data technology adoption guidelines to increase the organisation's efficiency positively affect capability, supply chain performance, and productivity. Supporting the study of Srihabut, Jariyapoom & Roopsing (2021) found that management was essential to building an organisation into a high-tech and innovative enterprise. Consequently, Sutrisno, Fachrunnisa & Widodo (2022) prove that The research shows that a company's social responsibility, innovation, and training are essential and beneficial sustainability elements.

In comparison, Miethlich et al. (2022) revealed that numerous external challenges, especially during the COVID-19 pandemic, drive organisations to seek new approaches to organising digital. The research findings acknowledged that the current business era faces rapid technological disruption. Furthermore, several technology tools help improve procurement

process efficiency and productivity (Mokhtar et al., 2019), such as ERP, cloud computing, big data, A.I., blockchain, and e-procurement, facilitate quick work between buyers and sellers, reduce working time, transparent accuracy, and reliability (Biazzin & Carvalho, 2019; Hofbauer, 2019).

However, the relationship between the internal control process element and the business alliance networks was negatively influenced. At this point, the researchers could explain that high internal control levels negatively impact an alliance relationship level related to Peterman, Kourula & Levitt's study (2020) summarised that each alliance in modern business management might require building strategic partnerships. Therefore, for excellent management, it is crucial to comprehend the nature of relationships and how they change during and after the project is complete (Jelodar, van Heerden & Chawynski, 2020). Moreover, (Sukhawatthanakun, 2022b; Almeida et al., 2023) confirmed that corporate partnerships, alliances, networks, and collaborations must develop over time, as demonstrated by the fact that the industry's most important growth driver is the business alliances but should be flexible.

CONCLUSION

Changing policy, vision, mission, organisational structure, personnel management, and upskilling or reskill training strategies could help procurement management become more efficient in today's corporate environment. The procurement system's internal control process should be handled by qualified persons who monitor standard operations, mainly trade obligations. Furthermore, in this digitalised era, technology management impacts strategic business alliance networks; as a result, industrial organisations encourage business transformation by incorporating technology into the procurement process linked to the global supply chain. Finally, the given research model would benefit the industrial business as a reference for establishing the procurement management system in excellent practical strategies, increasing profitability, and resulting in industrial business resource use efficiency.

To organise the supply chain for global competition, the government should support a clustered entrepreneurial network that connects firms as buyers and sellers. Furthermore, the government should encourage the creation of procurement software in Thailand rather than relying on license purchases from other countries.

Alternatively, digital agencies should give entrepreneurs access to central intelligence platforms to help with procurement accuracy decision-making. In addition, professional associations and industrial firms should collaborate to provide training and certification of

qualifications. Finally, establish national and international networks to exchange helpful information, strategies, and methodologies for the efficient development of procurement activities.

The industrial business should follow international criteria or an efficient procurement structure. Entrepreneurs should use digital technology to drive their businesses, despite the hefty initial cost, as it will pay off in the long run. The company can manage real-time procurement and connect internal and external partners efficiently. As a result, it can save errors, expenses, and time while worsening the alliance's relationship and bringing them closer together.

The limitation of this research is that the scope of the research covered industrial businesses in Thailand only; the findings may not be suitable for excellent procurement management in services business sectors. Secondly, using a purposive sampling technique increased the possibility of selection bias. Thus, the researcher recommended that further study consider the depth of attention on each industrial type, such as the automobile sector, food and beverage business, or the principal S-curve and new S-curve segment industry. Moreover, comparing procurement management between industrial and service businesses to find each sector's strategic excellence will be a fascinating case for future research.

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