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RESEARCH BRIEF

Antecedents of Thai Logistics Business Performance: A SEM Analysis

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Studies have determined that a well-operated logistics system can enhance the competitiveness of both government and commercial enterprises (Mangan, Lalwani, & Butcher, 2008; Tseng, Yue, & Taylor, 2005). Additionally, logistics and the associated management techniques can assist in the optimization of current manufacturing and distribution processes, which increases the efficiency and competitiveness of the enterprise. Drašković (2009) also reported that logistics has a proven and significant role in integrating the marketing and management systems of a business.

Li (2014) defined logistics as the management of the flow of goods between the point of origin and the point of consumption. Additionally, Gencer and Akkucuk (2016, p. 126) have defined logistics as involving the integration of information flow, material handling, production, packaging, inventory, transportation, warehousing, and often security. Logistics has also been stated to be a branch of engineering which involves creating "people systems" as opposed to "machine systems" (Gencer & Akkucuk, 2016). According to Moshref-Javadi (2018), logistics complexity can also be modeled by the use of simulation software, which helps minimize the use of resources for import and export. The Council of Logistics Management also has a definition for logistics, which includes the planning process, implementation, and the efficient and effective flow and storage of goods, services, and related information origin to the consumer for the purpose of conforming to customer requirements (Association of Southeast Asian Nations, 2014, p. 2). This also includes the inbound, outbound, internal, and external movements and the return of materials for environmental purposes.

As can be seen, the concept of logistics focuses on a product's flow, with the English word "flow" being the word translated into Chinese as the meaning of logistics (Li, 2014). In Thailand, logistics is a crucial segment of the economy which, in 2016, represented 14% in costs of the country's gross domestic product (GDP; World Bank Group, 2018). Thailand has also become a "logistics hub" in Southeast Asia, with logistics revenues forecasted to reach $96.5 billion by 2019 (Spire Research, 2016). Additionally, according to the World Bank Group's (2018) report, Thailand rose 13 positions in 2018 (32nd of 160 countries ranked) in the global logistics rankings from 2014. The biennial index measures customs procedures, infrastructure development, international shipments, logistics competence, tracking and tracing, and timeliness.

The Thai government officials have stated that the significant improvement in global rankings is due to massive investment in transport infrastructure and appropriate legal reforms (Theparat, 2018). However, according to Sivalai and Rojniruttikul (2018), logistics costs in Thailand are high when compared to other regional countries such as Malaysia and Singapore, both of which have cost below 10% of GDP. Also, according to the National Economic and

Social Development Board (NESDB, 2017), this is because Thailand's transportation and logistics infrastructures have remained inefficient and lack systematic connectivity, leading to higher costs than in other countries. Reduction of costs is, therefore, a primary motivation in rail investment, with railway transport benefitting from high carrying capacity, lower weather influences, and lower energy consumption (Tseng et al., 2005).

Road transport has become a significant sector of the economy, despite its inefficiency in terms of energy consumption (Pomlaktong, Jongwilaiwan, Theerawattanakul, & Pholpanich, 2011). Therefore, Thailand has made substantial investments in the country's transportation infrastructure under the 12th National Economic and Social Development Plan, which has set a goal to cut the Kingdom's logistics costs to 12% of GDP by 2021. Thailand's 12th plan (2017–2021) details the transport infrastructure development for major cities and border towns, as well as the methods for improved connectivity with neighboring countries. The new Thai plan's objectives include raising rail transport load factors to 4% of total transport from the present 1.4%, increasing waterway transport from 12% to 15%, and reducing road transport by 2021 from 88% to 80% (NESDB, 2017). In 2015, the total domestic volume of transported goods was 494 million tons, of which 97.68% was road transport, 2.30% rail, and 0.02% air.

Rail development has been stated to be instrumental in reducing logistics costs, with the present double-track rail network currently accounting for approximately 9% of total rail transport. Therefore, Thailand's 12th plan now calls for a US$ 81.57 billion expenditure as part of the installation of 14 double-track rail projects, which increases Thailand's double-track rail coverage to 2,500 km by 2021, up from only 359 km in 2018 (Sivalai & Rojniruttikul, 2018). The plan is set to be divided into three periods from 2017 to 2036. Within each time segment, there are plans for 2,777 km of double-track work, the construction of 2,457 km of standard-gauge lines for high-speed trains, network electrification, and the development of intermodal rail freight terminals (Sivalai & Rojniruttikul, 2018).

Although Thailand has most recently risen 13 positions in the World Bank Group's global logistics rankings, it still falls significantly below its regional peers of Singapore and Malaysia. With logistics cost still high at 14% of GDP, the Thai government has, therefore, made significant moves to improve the Kingdom's infrastructure. However, the variables affecting a logistics company's business performance are far more complex, and thus the reason for the seven hypothesized relationships amongst the study's six constructs. This study, therefore, set out to explore how the companies identified from the sample were affected by process capability (PC), technology capability (TC), product innovation (PI), knowledge absorption capability (KAC), and service innovation (SI).

The Research Framework

Model and hypotheses development for the Thai logistics industry business performance (BP) are shown in Figure 1. The conceptual model shows the relationships between KAC, PC, TC, SI, PI, and BP. Table 1 also shows the latent variables, observed variables, and related literature and theory.

From this, the following hypotheses were conceptualized:

H1: Knowledge absorption capability (KAC) directly influences process capability (PC).

H2: Technology capability (TC) directly influences process capability (PC).

H3: Process capability (PC) directly influences service innovation (SI).

H4: Process capability (PC) directly influences product innovation (PI).

H5: Process capability (PC) directly influences business performance (BP).

H6: Service innovation (SI) directly influences business performance (BP).

H7: Product innovation (PI) has a direct positive influence on business performance (BP).

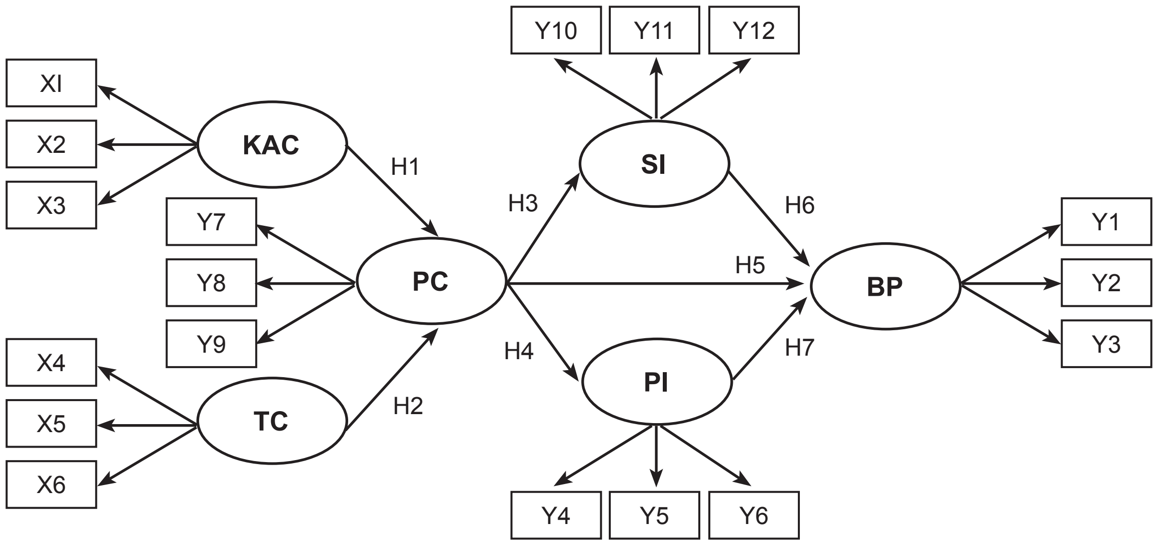

Figure 1. Conceptual model.

Table 1

Latent, Observed Variables, and Related Literature

Latent Variables	Observed Variables (17 items)	Related Literature and Theory
Knowledge absorption capability (KAC)	knowledge creation (X1), knowledge application (X2), and knowledge transfer (X3)	Cohen & Levinthal, 1990; Dahlander & Gann, 2010; De Zubielqui, Lindsay, Lindsay, & Jones, 2018; *Fanbasten*, 2014; Hsieh, 2007; *Sulistyo & Ayuni,* 2018
Technology capability (TC)	Management Information Systems (X4), technology leadership (X5), and technology innovation (X6)	Brunswicker & Vanhaverbeke, 2015; Closs, Goldsby, & Clinton, 1997; Ji, Wang, & Zhou, 2009
Process capability (PC)	standardized management systems (Y7), service improvement evaluation (Y8), and listening to suggestions and comments (Y9)	Dierickx & Cool, 1989; Goldsby & Martichenko, 2005; Narvekar & Jain, 2006; Park, Vertinsky, & Lee, 2011; Peppard & Rylander, 2005; Williams & Ecker, 2011)
Service innovation (SI)	*new service development* (y10), the speed of service innovation development (y11), and *continuous service innovations* (y12)	Chen, Kirkman, Kanfer, & Allen, 2007; European Commission, 2012; Hauknes, 1997; Herrman, 2011, Hu, Horng, & Sun, 2008; Sundstrom, 1999
Product innovation (PI)	new and advanced products (Y4), fast product development (y5), and new product development (y6)	Llanto & del Prado, 2014; Organisation for Economic Co-Operation and Development, 2018; Tohidi & Jabbari, 2012; Vincent, Bharadwaj, & Challagalla, 2004
Business performance (BP)	sales and profit (y1), market share (y2), and customer satisfaction (y3)	Aaker & Jacobson, 1994; Atif, Nazir, & Abdullah, 2017; Buzzell, Gale, & Sultan, 1975; Capon, Farley, & Hoeni, 1990; Anderson, Fornell, & Lehmann, 1994; Huo, Han, & Prajogo, 2016; Jantarakolica, Jullobol, Worasesthaphong, & Aleenajitpong, 2017; Pooser & Browne, 2018

Methods

Population and Sample

From Thailand's Department of Commerce's Office of the National Economic and Social Development Board, a population size of 21,603 logistics operators were determined (NESDB, 2016). Pituch and Stevens (2016) have also suggested that to determine a study's sample size, 15 cases per predictor is sufficient. Additionally, Mertler (2016) has also suggested that in educational research, if population size is around 1,500, a sample size of 300 is adequate. From these and other scholars' input, and to assure study validity, an initial target of 500 sample size was targeted.

Research Instrument

By using a seven-level Likert type agreement scale, Thai land transport logistics companies' BP was evaluated, with "1" indicating "strongly disagree," "4" indicating a "no comment" agreement, and "7" representing a response of "strongly agree." The survey also consisted of seven sections. Section 1 consisted of nine items concerning the individual's personal and company data, such as their gender, age, education level, and company position. Section 2 had nine items and was concerned with the respondent's opinions concerning their company's KAC. Section 3 contained eight items concerning process capability (PC). Section 4 contained nine items concerned with process innovation (PI). Section 5 contained nine items concerned with TC, and finally, Section 6 contained nine items concerned with the firm's BP. Table 3 shows each variable's questionnaire results from the analysis.

Questionnaire Design Process

After a review of the literature and theory, a 61-item questionnaire was created which used a seven-level Likert type agreement scale to rate the respondent's opinions of each item. Questionnaire validity was determined by interviews with five experts in their related fields, and the use of the index of item objective congruence (IOC) to rate each expert's response (Hambleton, 1984). The five experts held positions as academics, logistics company executives, and field operations managers. Further verification came from a 30-individual test (try-out) not used in the subsequent study. The IOC used in conjunction with the expert group was tasked with evaluating the content of the survey's items. By definition, an IOC score greater or equal to 0.50 is considered acceptable (Tavakol & Dennick, 2011). From the five experts, questionnaire item scores ranged between 0.80 and 1.00, which was deemed reliable (Kline, 2011).

The validity of the questionnaire was also calculated by using Cronbach's alpha (Cronbach, 1990) to ensure whether there was internal consistency within the items. George and Mallery (2010) illustrated the value of Cronbach's alpha (α), and a score of 0.9 was considered "excellent." According to the pre-test, the Cronbach's alpha ranged from 0.85 to 0.98 (Table 5 and Table 6), so the questionnaire items were deemed to be good to excellent.

Data Collection

The data collection process began with a sample survey. Beginning in May 2017, using multi-stage random sampling, we, along with a student interview team, solicited logistic company owners, executives, and managers by post and e-mail. The results did not meet the study's sampling objectives; therefore, a second phase was implemented in July 2017 in which the post, e-mail, and personal interviews were conducted. From the 2-phase sampling process, 500 were eventually returned/collected. After the audit process, 483 questionnaires were deemed acceptable, with this phase of the collection process completed in late August 2017 (Table 1).

Data Analysis

From other Southeast Asian studies concerning logistics firms' business performances (Banomyong & Supatn, 2011; Banomyong, Huong, & Ha, 2014), the sample of 483 was judged to be very reliable. The structural equation model (SEM) path analysis was conducted using LISREL (LInear Structural RELations) 9.10 software. However, before the SEM analysis, a confirmatory factor analysis (CFA) was performed to validate the measurement model.

Results

Table 2 shows the regional results from the study's 2-phase sampling process, in which 500 surveys were collected. The total population of 21,603 registered logistics firms was obtained from the 2016 Thailand logistics report produced in the Thai language from the Ministry of Commerce's Office of the National Economic and Social Development Board (NESDB, 2016). In the first phase in May 2017, 232 audited surveys were collected. From Phase 2, 251 audited surveys were collected, for a total of 483.

Customer Descriptive Statistics (n = 483)

After an audit of the 500 questionnaires returned, 483 were usable for the study. From this, 63.15% were male, and 36.85% were female. The majority were between 41–50 years of age (44.31%) and had at least a four-year university degree (60.66%). More detail of the respondents' characteristics are shown in Table 3.

Table 4 shows the survey questionnaire's results for each of the six latent variables.

Confirmatory Factor Analysis Results

CFA was carried out using SEM with LISREL 9.10 to examine the general fit of the proposed model with data and to identify the overall relationships among these constructs (Byrne, 2010; Diamantopoulos & Siguaw, 2000; Jöreskog & Sörbon, 2015). A 2-step analysis was conducted in which analysis of the measurement model and both sets of dependent and independent variables were conducted separately (see Table 5 and Table 6; Anderson & Gerbing, 1998). In the second step, the analysis of the structural equation model (SEM) of the two competing models of Thai logistics BP was measured.

In SEM, CFA is usually used to access construct validity (Jöreskog & Sörbom, 2015), with factor loadings or regression weight estimates of latent to observed variables having values higher than 0.50 indicating that all of the constructs conform to the construct validity test (Byrne, 2010; Hair, Hult, Ringle, & Sarstedt, 2016). The criteria for determining the variables each have validity convergence to have the AVE higher than 0.50 as well (Hair et al., 2016), which was confirmed in Table 7.

The Direct Effect (DE), Indirect Effect (IE), and Total Effect (TE)

Table 8 shows the DE, IE, and TE of each construct (Bollen, 1987), with the independent variable having the greater coefficient (TE) accounting for more variance in the dependent variable.

Table 2

Regional Data Collection Results

Region	Population	Sample	May 2017			July 2017				Audited Total
			Post	e-mail	Total	Post	e-mail	Interview	Total	
Northern	1,263	29	10	3	13	12	2	2	16	29
Central	6,028	140	48	11	59	64	9	7	80	139
Northeast	1,307	30	9	5	14	11	2	3	16	30
Eastern Seaboard	3,152	73	28	7	35	25	5	4	34	69
Southern	1,543	36	12	8	20	11	2	3	16	36
Bangkok	8,310	192	74	17	91	69	12	8	89	180
Total	21,603	500	181	51	232	192	32	27	251	483

Table 3

Respondents' Characteristics

Characteristic		Frequency	Percent
1. Respondent's Gender			
Male		305	63.15
Female		178	36.85
	Total	483	100.00
2. Respondent's Age			
21–30 years of age		36	7.45
31–40 years of age		191	39.54
41–50 years of age		214	44.31
Over 50 years of age		42	8.70
	Total	483	100.00
3. Education Level			
Vocational certificate/ High vocational certificate/ Diploma.		18	3.73
- Bachelor Degree		293	60.66
- Postgraduate		172	35.61
	Total	483	100.00
4. Company revenue per year			
Less than 1 million Baht		54	11.18
1–10 million Baht		285	59.01
11–30 million Baht		114	23.60
Over 30 million Baht		30	6.21
	Total	483	100.00
5. Respondent's position in the company			
Owner		204	42.24
Executive		106	21.95
Manager		173	35.82
	Total	483	100.00
6. Number of employees			
Less than 50 staff members		370	76.60
51–200 staff members		95	19.67
Over 200 staff members		18	3.73
	Total	483	100.00
7. Total number of years the company has been in business.			
Less than five years		174	36.02
6–10 years		180	37.27
Over ten years		129	26.71
	Total	483	100.00
8. Is the company ISO quality management system certified?			
Certified		132	27.33
Not certified		351	72.67
	Total	483	100.00
9. Registered Capital			
Less than 5 million Baht		226	46.79
5–50 million Baht		185	38.30
Over 50 million Baht		72	14.91
	Total	483	100.00

Table 4

Questionnaire Statistical Results for the Latent Variables

Latent Variable	Items	Mean	S.D.	Level	Skewness	Kurtosis
Knowledge Absorption Capability (KAC)	9	5.19	.77	slightly agree	-.73	.63
Product Innovation (PI)	8	4.96	.84	slightly agree	-.63	.38
Service Innovation (SI)	8	5.01	.83	slightly agree	-.68	1.20
Process Capability (PC)	9	5.11	.76	slightly agree	-.13	-.24
Technology Capability (TC)	9	5.12	.80	slightly agree	-.47	-.10
Business Performance (BP)	9	5.37	.76	agree	-.55	.64
Total and Averages	52	5.13	.79	-	-	-

Table 5

CFA of the External Latent Variables

Latent variables	a	AVE	CR	Observed variables	loading	R^2
Knowledge Absorption Capability (KAC)	0.92	0.70	0.87	Knowledge creation (X1)	0.71	0.50
				Knowledge application (X2)	0.84	0.70
				Knowledge sharing (X3)	0.94	0.89
Technology Capability (TC)	0.92	0.75	0.90	Management Information Systems (X4)	0.89	0.79
				Technology leadership (X5)	0.87	0.76
				Technology innovation (X6)	0.83	0.69

Note. a = significance level, Chi-Square=0.00, df = 1, p-value = 0. 98122, RMSEA = 0.000.

Table 6

CFA of the Internal Latent Variables

Latent variables	a	AVE	CR	Observed variables	loading	R^2
Service Innovation (SI)	0.85	0.66	0.85	*New service development* (y10)	0.86	0.74
				The speed of service innovation development (y11)	0.84	0.68
				C*ontinuous service innovations* (y12)	0.74	0.55
Business Performance (BP)	0.89	0.60	0.81	Sales and profit (Y1)	0.95	0.90
				Market share (Y2)	0.63	0.39
				Customer Satisfaction (Y3)	0.71	0.51
Product Innovation (PI)	0.91	0.56	0.79	New and advanced products (Y4)	0.67	0.44
				Fast product development (Y5)	0.67	0.45
				New product development (Y6)	0.88	0.77
Process Capability (PC)	0.89	0.67	0.86	Standardized management systems (Y7)	0.79	0.62
				Service improvement evaluation (Y8)	0.80	0.64
				Listening, suggestions, and comments (Y9)	0.86	0.73

Note: a = significance level, Chi-Square=6.41, df = 15, *p*-value = 0. 97210, RMSEA = 0.000.

Table 7

Correlation Coefficients Between Latent Variables (beneath the ***bold*** *diagonal), Construct Reliability, and the Average Variance Extracted*

Latent variables	KAC	TC	PC	SI	PI	BP
Knowledge Absorption Capability (KAC)	1.00					
Technology Capability (TC)	.75**	**1.00**				
Process Capability (PC)	.70**	.83**	**1.00**			
Service Innovation (SI)	.81**	.71**	.77**	**1.00**		
Product Innovation (PI)	.81**	.72**	.65**	.87**	**1.00**	
Business Performance (BP)	.47**	.62**	.56**	.52**	.41**	**1.00**
ρv (AVE)	0.79	0.72	0.63	0.58	0.66	0.60
ρc (Construct Reliability)	0.92	0.89	0.83	0.81	0.85	0.81
$\sqrt{AVE}$	0.89	0.85	0.79	0.76	0.81	0.77

Note. **Sig. < .01.

Table 8

DE, IE, and TE From the SEM Path Analysis (n= 483)

Dependent variables	R^2	Effect	Independent variables				
			KAC	TC	PC	SI	PI
Process Capability (PC)	1.02	DE	0.28**	0.78**			
		IE	–	–			
		TE	0.28**	0.78**			
Service Innovation (SI)	.93	DE	–	–	0.95**		
		IE	0.27**	0.74**	–		
		TE	0.27**	0.74**	0.95**		
Product Innovation (PI)	.77	DE	–	–	0.87**		
		IE	0.25**	0.67**	–		
		TE	0.25**	0.67**	0.87**		
Business Performance (BP)	.65	DE	–	–	0.55*	0.02	0.26**
		IE	0.23**	0.62**	0.24	–	–
		TE	0.23**	0.62**	0.79**	0.02	0.26*

Note. *Sig. < 0.05, **Sig. < 0.01, KAC = knowledge absorption capability.

Structural Equation Modeling Results

The SEM results in Figure 2 are from the analysis of the variables' effects on Thai's land transport logistics business performance. The results showed that all models met the required criteria as the chi-square index was not statistically significant at 30.27, the *p*-value was = 0.142, the root mean square error of approximation (RMSEA) = 0.026, goodness of fit index (GFI) = 0.99, adjusted goodness of fit index (AGFI) = 0.95, and the standardized root mean square residual (SRMR) = 0.02 (Table 9). Therefore, all causal factors in the model had a positive influence on the BP, which can explain 65% of the variance in Thai land transport logistics business performance (R^2). The causal variables influencing BP ranked from highest to lowest were PC, TC, PI, KAC, and SI variables with total influences of 0.79, 0.62, 0.26, 0.23, and 0.02, respectively. Additionally, hypotheses testing results from the use of LISREL 9.1 are summarized in Figure 2 and Table 10.

Table 9

Criteria, Values, Results, and Supporting Theory of the Goodness-of-Fit Appraisal Values

Criteria Index	Criteria	Values	Results	Supporting Literature
Chi-square: $\chi 2$	$p \geq 0.05$	0.14	passed	Baghaei, Yanagida, & Heene, 2017
Relative Chi-square: $\chi 2$/df	≤ 2.00	1.32	passed	Byrne, 2010
RMSEA	≤ 0.05	0.03	passed	Hu & Bentler, 1999
GFI	≥ 0.90	0.99	passed	Jöreskog & Sörbom, 2015
AGFI	≥ 0.90	0.95	passed	Hooper, Coughlan, & Mullen, 2007
RMR	≤ 0.05	0.02	passed	Hu & Bentler, 1999
SRMR	≤ 0.05	0.02	passed	Hu & Bentler, 1999
NFI	≥ 0.90	0.99	passed	Schumacker & Lomax, 2010
CFI	≥ 0.90	1.00	passed	Schumacker & Lomax, 2010
Cronbach's Alpha	≥ 0.70	0.85-0.92	passed	Cronbach, 1990; George & Mallery, 2010; Tavakol & Dennick, 2011

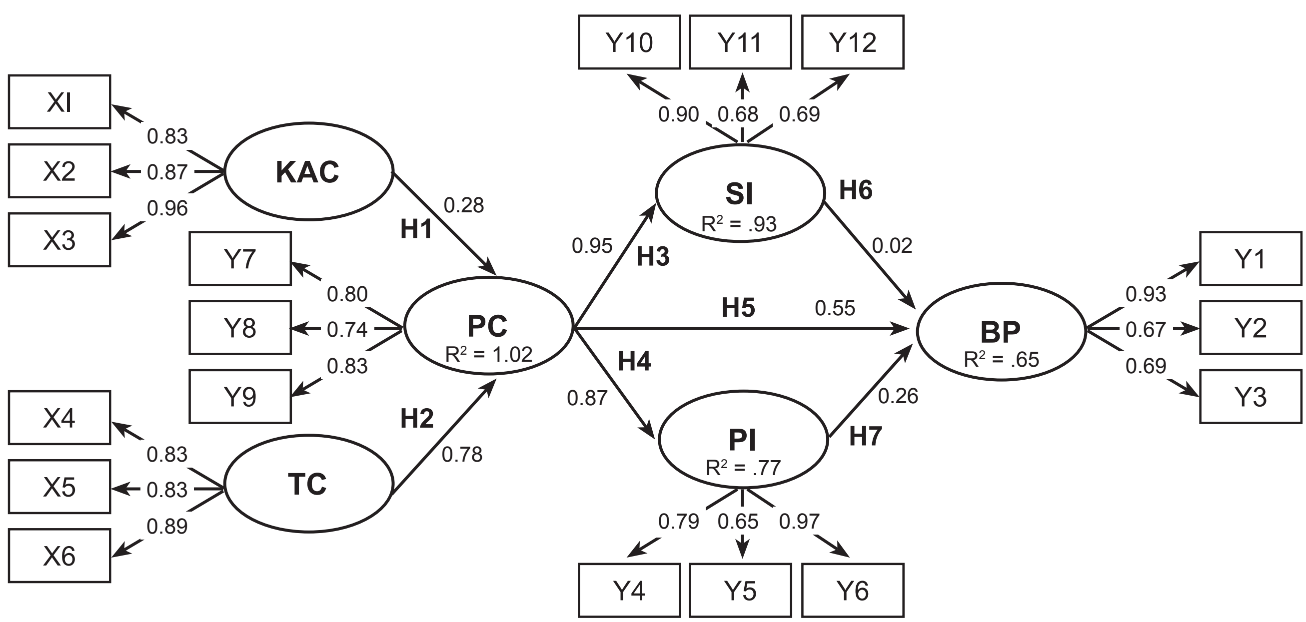

Figure 2. SEM influencing variables on Thai logistics business performance

Note. Chi-square=30.27, df = 23, *p* - value = 0.142, RMSEA= 0.026.

Table 10

Hypotheses Testing Results

Hypotheses	Coef.	t-value	Results
H1: *Knowledge absorption capability* (KAC) directly influences *process capability* (PC).	0.28	6.50**	Passed
H2: *Technology capability* (TC) directly influences *process capability* (PC).	0.78	14.54**	Passed
H3: *Process capability* (PC) directly influences *service innovation* (SI).	0.95	17.07**	Passed
H4: *Process capability* (PC) directly influences *product innovation* (PI).	0.87	17.24**	Passed
H5: *Process capability* (PC) directly influences *business performance* (BP).	0.55	2.13*	Passed
H6: *Service Innovation* (SI) directly influences *business performance* (BP).	0.02	0.10	Rejected
H7: *Product innovation* (PI) has a direct positive influence on *business performance* (BP).	0.26	3.33**	Passed

Note. *Sig. < .05, **Sig. < .01

Discussion

The results of the research into Thai's land transport logistics business performance revealed that all causal factors in the model had a positive influence on the business performance variables, which can be explained by the variance of the factors influencing business performance (R^2) at 65%. From the study's results, PC was determined to have the most significant effect. This was followed by TC, PI, KAC, and SI. As such, innovation has been recognized as a central source of business growth and a key determinant of competitive advantage for many organizations (Omar, Nazri, Alam, & Ahmad, 2016). Gunday, Ulusoya, Kilica, and Alpkanb (2011) also reported that innovation is an essential factor in firm competitiveness.

Furthermore, an organization's performance has been defined as the final result of many factors, including communications, job processes, teamwork, interaction, corporate culture, commitment, innovative climate, satisfaction, loyalty, and the business environment (Li, Ragu-Nathan, Ragu-Nathan, & Rao, 2006). A logistics business performance entails a multiplicity of these factors, with a country's infrastructure and logistics systems development playing a crucial role in building competitiveness (Ojala, & Çelebi, 2015).

Knowledge Absorption Capability

The results from the hypothesis H1 concerning KAC's role in PI was a positive one. This was consistent with Hsieh (2007), which determined that system orientation and human orientation strategies play a significant role in knowledge management process capability, knowledge management enablers, and knowledge management performance.

Technology Capability

Hypothesis H2 also was shown to be consistent with the theory and study's model, which determined that TC had a positive and direct effect on PC. This is supported by Lin and Lai (2017), who found that, in Taiwan, logistics capabilities positively influence firm performance. Information technology capability was also found to be the most critical logistics capability in the photonics industry, followed by warehousing capability and transportation capability. Numerous other studies support this, with Brunswicker and Vanhaverbeke (2015) having examined 1,411 small and medium-sized enterprises (SMEs) in Europe engaged in external knowledge sourcing, a form of open inbound innovation. From their study, the results indicated that engaging in external knowledge sourcing is a sensible move for SMEs as it offers performance benefits, can improve innovation performance, increase the success of the innovation's launching, as well as the appropriation of financial value from new products and services.

Process Capability

Results from the study also confirmed the positive and direct relationships between PC and SI (H3), PI (H4), and BP (H5). These results are consistent with the study of Annan, Boso, Mensah, and Eliza (2016), which indicated that in developing economies, supply chain sustainability performance is all about people, where there is a balance between technical and social controls. Also, according to Spanish SME research by Hervas-Oliver, Sempere-Ripoll, and Boronat-Moll (2014), the strategy of process innovation is determined by the acquisition of embodied knowledge, which acts as a critical mechanism for countering a firm's weak internal capabilities. In Indonesia, Najib and Kiminami (2011) also determined that in SMEs, business performance is significantly affected by innovation.

Service Innovation

Study results also determined the positive and direct relationships between SI and BP (H6). Often, SI has been used either with or in place of "technological innovation," as it is hard in a smartphone-enabled, social media world how technology does not play a major role in providing better service to a business which contributes to their bottom line (Suebsaiaun & Pimolsathean, 2018).

Product Innovation

Concerning H7 and the hypothesized positive relationship between customer PI and BP, the study confirmed it. According to the OECD (2018), creating innovation requires the ability to discover, create, and develop ideas to refine them into useful forms and to use them to earn profits, increase efficiency, or reduce costs. Furthermore, the term "innovation" may also be used for changes that are new within the local context, but the contribution to global knowledge is minimal. In this broader sense, innovation may be as relevant to the developing part of the world as elsewhere (Fagerberg, Mowery, & Nelson, 2004).

Tung (2012) examined variables affecting the impact of product innovation on firm performance and reported that when organizations decide to allocate resources to product innovation, they expected to gain leverage regarding competitiveness and performance. It was also concluded that product innovation is essential for an organization's performance and survival. Later, Tuan, Nhan, Giang, and Ngoc (2016) determined that organizational and process innovation is more crucial to innovative and firm performance than product and marketing innovation.

Conclusion

The study investigated the Thai trucking logistics business performance as although Thailand has made rapid advances in its' global logistics rankings, when compared to its regional neighbors, it has much to work on. Although infrastructure development is an essential focus, one must examine the costs and methods involved to reach the goals stated. Innovation, technology, and ISO standards are also crucial elements, but this requires a new breed of knowledge worker who is digitally enabled. However, at the moment, companies find obtaining these 21st-century knowledge workers a difficult task, with educational systems hard-pressed to deliver them. Road and driver safety is also another great concern in Thailand, and methods must be found to improve both within and outside the road transport logistics industry.

Declaration of ownership

This report is our original work.

Conflict of interest

None.

Ethical clearance

This study was approved by the institution.

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