“Analyzing factors influencing SME readiness for smart retail: A structural equation model approach”

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ANALYZING FACTORS INFLUENCING SME READINESS FOR SMART RETAIL: A STRUCTURAL EQUATION MODEL APPROACH

Abstract

The objective of this study is to explore factors influencing the readiness to enter smart retail businesses. This paper employed a quantitative approach. The sample consisted of 323 retail entrepreneurs in Thailand. Data were collected through questionnaires and analyzed using structural equation modeling (SEM) to verify whether the model constructed in this analysis is consistent, coherent, and suitable for practical application. The influencing factors are as follows: 1) The acceptance and use of technology by entrepreneurs ($\beta = 0.63$, $p < 0.05$), 2) The resource base of entrepreneurs ($\beta = 0.52$, $p < 0.05$), 3) The aspect of business networking by entrepreneurs ($\beta = 0.48$, $p < 0.05$), and 4) The competencies of entrepreneurs ($\beta = 0.40$, $p < 0.05$). These factors significantly affect the readiness to enter the retail market, aligning with empirical data. The structural equation model analysis examines the factors influencing the readiness of small and medium enterprise operators to enter the retail trade. The model meets the specified criteria, as indicated by the following compliance indices: CMIN/df = 2.841, CFI = 0.945, IFI = 0.942, and RMR = 0.036.

Keywords acceptance of technology, resource base, networking, competencies, smart retail

JEL Classification L26, M15, O32, L81

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INTRODUCTION

The retail industry is undergoing a significant transformation that entrepreneurs cannot ignore (Townsend et al., 2018). Modern retail stores are increasingly aligned with consumer needs compared to traditional wholesale stores (Kerssens, 2017), and emerging technologies are profoundly impacting consumer behavior (Pantano & Timmermans, 2014). The advent of the Internet and new online channels has notably reshaped the retail landscape over the past two decades (Verhoef et al., 2015). Inman and Nikolova (2017) emphasize that technological advancements and shifts in consumer behavior are critical to the retail sector. Technology not only provides consumers with enhanced benefits and quicker, more tailored offers but also helps retailers reach target customers more cost-effectively.

According to Frost & Sullivan's (2019) prediction, by 2025, the convergence and integration of technologies will enable retailers to merge digital, virtual, and physical dimensions into a single hybrid "Bricks and Clicks" business, forming new retail business models. The main differences between future retail businesses and traditional ones lie in the scope of channels and management, network design, information technology, procurement data sharing, inventory operations, product

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diversity, readiness, business capabilities, and environment. Future retail will integrate channels and technologies to create customer experiences. Additionally, what distinguishes new retail formats from traditional retail and contributes to retail success is data management, technology, and supply chain management.

Despite this, most research has concentrated on assessing technological readiness (Huang et al., 2004; Hourali et al., 2008; Rizk, 2004), followed by human resource management readiness (Rodprayoon, 2017). The existing studies are often fragmented, indicating a need for a comprehensive analysis of multiple factors. To address this, the development of a structural equation model to assess the readiness to enter smart retailing aims to support entrepreneurs' preparation and optimize long-term benefits.

1. LITERATURE REVIEW AND HYPOTHESES

Smart retail is defined as modern retail that utilizes technology in traditional retail stores. It leverages data management and technology of diverse skills in the retail business as tools to create a comprehensive great experience for consumers.

Resource-based view (RBV) theory states that any organization possessing resources valuable to the business is rare, inimitable, and non-substitutable (Barney, 1991) and is considered necessary for organizational readiness and a crucial factor for competitive advantage, leading to better performance than competitors in the industry (Porter, 1980). However, organizations must have management approaches to integrate those values into the organization and develop unique capabilities that differentiate them from competitors (Barney, 2001). Barney (1991) proposed that resources refer to assets, capabilities, organizational processes, firm attributes, information, and knowledge that organizations can utilize.

Caro et al. (2020) indicated that data management, technology, and supply chain management distinguish new retail formats from traditional retail and contribute to retail success. The concept is based on the technology acceptance model (TAM) theory developed by Davis et al. (1989), which stemmed from the theory of reasoned action (TRA). TAM focuses on studying factors influencing the acceptance or decision to use technology or innovation, including perceived ease of use, usefulness, and attitude. Ultimately, behavioral intention to use technology influences the intention to use and adopt the technology. von Briel (2018) stated that technological factors affect performance in the retail industry, which is consistent with Grewal et al. (2017), who identified technology and tools as one of the factors driving future retail. Roy et al. (2018) also found that rapid advancements in Internet technology over the past decade have led to numerous innovative and smart technologies.

Entrepreneurship refers to the dynamic process of vision, change, and creative processes that require strong driving forces to bring feasible ideas into willing execution by effectively building organizations, expertly acquiring resources, clearly formulating business plans, and envisioning opportunities (Nguyen et al., 2024). Entrepreneurial competencies thus rely on the entrepreneur's abilities, skills, and characteristics. The study revealed that utilizing knowledge capital can create dynamic capabilities and positively influence business performance. This requires knowledge application to enhance and develop capabilities among emerging opportunities while generating innovations for the business, which is considered the characteristic of innovation capability (Wilden & Gudergan, 2015). Piyawongwattana (2012) studied organizational learning and dynamic capabilities influencing performance, confirming empirical evidence that dynamic capabilities represent a strategic framework developed under the resource-based theory that could integrate unique resources aligned with future opportunities. Such an aspect recognizes that environments are not static but dynamic, requiring organizations to develop new capabilities and acquire or divest resources to adapt. Besides, dynamic capabilities are not about interacting with the environment but transcending it, but it is then the ability to adapt and overcome change (Nguyen et al., 2024).

When considering the characteristics of entrepreneurs regarding the compilation of related documents, scholars have provided diverse definitions. Somwethee et al. (2023) examined the influence of entrepreneurial and innovation capabilities on sustainable organizational performance and the mediating role of innovation capabilities in the relationship between entrepreneurial capabilities and sustainable organizational performance. The results revealed that entrepreneurial capabilities are crucial in fostering innovation capabilities and sustainable organizational efficiency. Additionally, Pavitt (1992) stated that intrapreneurs should possess characteristics similar to traditional entrepreneurs with high motivation and desire for independence. However, strong political and social skills with decision-making abilities are required for modern entrepreneurs, especially regarding product invention, management, and growth.

According to Beamish and Munro (2011), business networking of global businesses, including multinational firms, can provide various competitive advantages. Dess et al. (2012) found that for retail businesses to avoid failure and compete globally, they need to find new ways to maintain the agility of small businesses while establishing mechanisms called "business networks" to gain competitive advantages against larger businesses. Qiao et al. (2014) pointed out that business networks positively relate to the performance of SMEs, allowing organizations to access information, resources, and knowledge. This is consistent with Tavani et al. (2019), who stated that external business networks contribute to driving the performance of SMEs. Expanding collaboration within business networks impacts the ability to develop sustainable competitive advantages.

In addition, Kazimoto (2023) stated that the general characteristics of entrepreneurs, skills, abilities, and leadership experience play a crucial role in their readiness, and financial support also directly affects entrepreneurial readiness. Similarly, Bai et al. (2023) mentioned that personality traits, motivation, and commitment are key factors influencing the entrepreneurial success of small and medium-sized enterprises. Additionally, the availability of financial resources and government support significantly impact the success of SMEs.

Regarding organizational management, Nguyen et al. (2024) discovered that the dynamic capabilities of entrepreneurs directly influence company performance, acting as a mediator linking entrepreneurial leadership and direction to company outcomes. Da Costa et al. (2022) supported this view, stating that entrepreneurship and effective management under a conducive external environment affect entrepreneurial readiness and success.

In the retail sector, Caro et al. (2020) noted that what distinguishes new retail from traditional retail, leading to success, is the management of data, technology, and the supply chain. Dias et al. (2019) added that dynamic capabilities enable entrepreneurs to identify and seize business opportunities, enhancing human resources (HR) capabilities to capitalize on those opportunities. From a technological perspective, Roy et al. (2018) explained that in the past decade, rapid advances in Internet technology have led to numerous innovative smart technologies. The technology acceptance model, system readiness, and store reputation are linked to customer attitudes and behavioral intentions, showing that technology readiness not only directly influences customer attitudes but also indirectly through the perception of innovation characteristics. Finally, Cabrera and Mauricio (2017) mentioned that, within organizations, human capital, education, and entrepreneurial experience influence the opportunity identification process and access to and use of resources effectively. Tavani et al. (2019) further emphasized that external business networks help drive SME performance and foster sustainable competitive advantage.

Based on the review of prior findings, the following hypotheses were proposed:

H1: The influence model of technology acceptance and usage, resource base, business network creation, and entrepreneurial competencies on the readiness to enter smart retail is consistent with empirical data.

H2: Technology acceptance and usage have a direct positive influence on the readiness to enter smart retail.

H3: The resource base has a direct positive influence on the readiness to enter smart retail.

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H4: Business network creation has a direct positive influence on the readiness to enter smart retail.

H5: Entrepreneurial competencies have a direct positive influence on the readiness to enter smart retail.

2. METHOD

This study employed a quantitative approach, using questionnaires and analyzing the results with structural equation modeling (SEM). This paper utilized SEM to verify and confirm whether the model constructed in this analysis is coherent and suitable for practical application.

The sample group includes retail entrepreneurs in Thailand. The sample size was determined using the G* Power program (Faul et al., 2007), with an effect size of 0.30, the gold standard for determining the minimum sample size. With an effect size of 0.3 and 17 observed variables, the required sample size was 323 participants.

The research tool is the questionnaire used for measuring factors influencing the readiness of entrepreneurs to enter smart retail, consisting of 85 items in total. Part 1 contained seven items on entrepreneurs' basic information. Part 2 consists of 12 items on entrepreneurs' technology acceptance and use. Part 3 consists of 24 items on the entrepreneurs' resource base. Part 4 consists of 20 items on entrepreneurs' business networking. Part 5 consists of 22 items on entrepreneurs' competencies.

Descriptive statistics present the general characteristics of data collected from the sample group that responded to the questionnaire. Such statistics provide detailed information about the data values by presenting percentages, frequency distributions, mean, and standard deviation.

Confirmatory factor analysis (CFA) studies whether a set of latent factors can explain the correlations among observed variables. If any variable does not fit the group, it will be eliminated. Afterward, model analysis is conducted using structural equation modeling (SEM). SEM is a statistical method used to examine the relationships between variables, either between observed and latent variables or between two or more latent variables. To analyze the data and assess the model fit with empirical data, the fitness indices are considered based on the concepts and theories. These indices include testing the goodness-of-fit between the hypothesized model and the empirical data. The statistical criteria are CMIN/DF less than 3.00, GFI, AGFI, and CFI greater than 0.90, and RMSEA and SRMR less than 0.08, which align with the structural equation model analysis (Raengsoongnoen, 2011).

3. RESULTS

The second-order confirmatory factor analysis (CFA) was conducted by analyzing five latent variables in the research conceptual framework. Each variable was analyzed with the observed variables one by one, which are: 1) entrepreneur's technology acceptance and use, 2) entrepreneur's resource base, 3) entrepreneur's business networking, 4) entrepreneur's entrepreneurial competence, 5) readiness of small and medium-sized enterprise entrepreneurs to enter smart retail.

The second-order confirmatory factor analysis of the entrepreneur's technology acceptance and use variable consisted of three observed variables: perceived ease of use with four questions (TA1-TA4), perceived usefulness with four questions (TB1-TB4), and attitude toward technology with four questions (TC1-TC3). They are shown in Table 1. Based on theoretical reasoning and modification indices (MI), after model modification to achieve a good fit, the values met the criteria: (x2/df) = 2.433, less than 3 as required. The model fit statistics were: CMIN/df = 2.482, CFI = 0.950, IFI = 0.951, RMR = 0.045, RMSEA = 0.047, and *p*-value of Chi-square = 0.000.

The regression weight of the observed variables used to measure the organizational performance latent variables ranges from 0.471 to 0.910, and the component weight of each observed variable has a C.R. (critical ratio) > 1.96. Therefore, every ob-

Table 1. Statistics for the consistency of the model before and after adjusting the model for entrepreneurs' acceptance and use of technology

Index of Congruence (IOC)	Consideration Criteria	Before adjusting	After adjusting
Relative Chi-Square (x^2/df)	< 3.00	5.211	2.482
CFI	> 0.90	0.654	0.950
IFI	> 0.90	0.842	0.951
RMR	< 0.05	0.474	0.045
RMSEA	< 0.05	0.512	0.047

served variable has a component weight not equal to zero, which is statistically significant at the 0.05 level (p-value < 0.05), indicating that these observed variables are essential indicators of the latent variables. When considering the weight of the question elements of all three variables, every question indicates the importance of those elements because each has a C.R. (critical ratio) > 1.96. Thus, every question has an element weight not equal to zero, statistically significant at the 0.05 level (p-value < 0.05). The model was adjusted by eliminating question number TA1 from the structural equation model. The highest latent variable was perception of benefits from use, followed by difficulty of use. They are shown in Table 2.

Table 2. Secondary confirmatory factor analysis of entrepreneurial technology acceptance and use

Questions		Variable	Estimate	S.E.	C.R.	P
TA	←	Ttotal	.910			
TB	←	Ttotal	.965	.075	12.377	***
TC	←	Ttotal	.884	.071	12.255	***
TA4	←	TA	.821			
TA3	←	TA	.775	.058	15.022	***
TA2	←	TA	.743	.067	14.251	***
TB4	←	TB	.743			
TB3	←	TB	.787	.073	14.094	***
TB2	←	TB	.805	.072	14.450	***
TB1	←	TB	.836	.073	15.024	***
TC4	←	TC	.764			
TC3	←	TC	.712	.075	12.872	***
TC2	←	TC	.859	.069	15.839	***
TC1	←	TC	.789	.076	14.438	***

Note: TA = perceived ease of use; TB = perceived usefulness; TC = attitude toward technology. *** means Statistically significant at the 0.001 level.

The second-order confirmatory factor analysis of the entrepreneurial resource-based variable consists of six observed variables. They include assets with four questions (RA1-RA4), capabilities with four questions (RB1-RB4), organization's operation process with four questions (RC1-RC4), business properties with four questions (RD1-RD4), information with four questions (RE1-RE4), and knowledge with four questions (RF1-RF4), as shown in Table 3. Based on theoretical considerations and the model adjustment index (MI), the adjusted model was harmonious and met the specified criteria. This was determined by a (x^2/df) value of 2.337, which is less than 3, meeting the specified criteria. The statistical values measuring the consistency of the model included: CMIN/df = 2.337, CFI = 0.937, IFI = 0.938, RMR = 0.036, RMSEA = 0.044, with a Chi-square p-value of 0.000.

Table 3. Index of congruence (IOC) before and after adjusting the entrepreneur's resource-base model

Index of Congruence (IOC)	Consideration Criteria	Before adjusting	After adjusting
Relative Chi-Square (x^2/df)	< 3.00	3.933	2.337
CFI	> 0.90	0.709	0.937
IFI	> 0.90	0.711	0.938
RMR	< 0.05	0.063	0.036
RMSEA	< 0.05	0.176	0.044

The regression weight of the observed variables used to measure the resource-based variables of the entrepreneurs ranges from 0.768 to 0.852. The weight of each component has a C.R. (critical ratio) > 1.96, indicating that every observed variable has a non-zero component weight, statistically significant at the 0.05 level (p-value < 0.05). This signifies that these observed variables are critical indicators of the latent variables. According to the weight of six variables, every question indicates the importance of those elements since each one has C.R. (critical ratio) > 1.96 Therefore, every question has a non-zero element weight that is statistically significant at the 0.05 level (p-value < 0.05). The model was adjusted by eliminating questions RA1, RB1, and RC2 from the structural equation model. The highest latent variable was the organization's operation process. They are shown in Table 4.

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Table 4. Second confirmatory component analysis of the entrepreneurial resource base

Questions		Variable	Estimate	S.E.	C.R.	P
RA	←	RTotal	.833			
RB	←	RTotal	.904	.091	11.890	***
RC	←	RTotal	.962	.110	12.955	***
RD	←	RTotal	.867	.098	11.409	***
RE	←	RTotal	.951	.098	12.327	***
RF	←	RTotal	.871	.099	12.428	***
RA4	←	RA	.794			
RA3	←	RA	.750	.070	13.774	***
RA2	←	RA	.757	.071	13.933	***
RB4	←	RB	.787			
RB3	←	RB	.788	.068	14.784	***
RB2	←	RB	.707	.071	13.022	***
RC4	←	RC	.822			
RC3	←	RC	.816	.055	17.039	***
RC1	←	RC	.737	.052	14.787	***
RD4	←	RD	.768			
RD3	←	RD	.828	.073	15.477	***
RD2	←	RD	.838	.080	15.679	***
RD1	←	RD	.745	.069	13.690	***
RE4	←	RE	.782			
RE3	←	RE	.821	.063	16.004	***
RE2	←	RE	.791	.066	15.277	***
RE1	←	RE	.767	.066	14.702	***
RF4	←	RF	.852			
RF3	←	RF	.843	.054	18.839	***
RF2	←	RF	.839	.057	18.721	***
RF1	←	RF	.794	.064	17.147	***

Note: RA = assets; RB = capabilities; RC = organization's operation process; RD = business properties; RE = information; RF = knowledge. *** means Statistically significant at the 0.001 level.

The second-order confirmatory factor analysis of entrepreneurs' business networking variables consists of five observable variables. They include procurement with four questions (CA1-CA4), product and service with four questions (CB1-CB4), marketing with four questions (CC1-CC4), pricing with four questions (CD1-CD4), and shipment with four questions (CE1-CE4), as shown in Table 5. According to the theoretical reasoning and model adjustment index (MI), the adjusted model was harmonious and within the specified criteria. This was determined by a (x^2/df) value of 2.399 and met the specified criteria. The statistical values measuring the consistency of the model were: CMIN/df = 2.399, CFI = 0.948, IFI = 0.948, RMR = 0.045, RMSEA = 0.038, with a Chi-square *p*-value of 0.00.

Table 5. Index of congruence (IOC) before and after adjusting the business networking model

Index of Congruence (IOC)	Consideration Criteria	Before adjusting	After adjusting
Relative Chi-Square (x^2/df)	< 3.00	4.543	2.399
CFI	> 0.90	0.700	0.948
IFI	> 0.90	0.629	0.948
RMR	< 0.05	0.044	0.045
RMSEA	< 0.05	0.113	0.038

The regression weight of the observed variables used to measure the business network variables of entrepreneurs has a value between 0.763-0.839, and the weight of the components of every observed variable has a value of C.R. (critical ratio) > 1.96. It can be concluded that every observed variable has a component weight not equal to zero, statistically significant at the 0.05 level (*p*-value < 0.05), indicating that those observed variables are essential indicators of the latent variables. When considering the weight of five variables, every question indicates the importance of those elements because it has a C.R. (critical ratio) > 1.96. Every question's weight element is not equal to zero, with statistical significance at the 0.05 level (*p*-value < 0.05). The model was adjusted by eliminating question number CA1 from the structural equation model. The highest variable is in terms of marketing, followed by product and service. They are shown in Table 6.

Table 6. Second confirmatory factor analysis of entrepreneurs' business networking

Questions		Variable	Estimate	S.E.	C.R.	P
CA	←	CTotal	.831			
CB	←	CTotal	.937	.073	12.874	***
CC	←	CTotal	.941	.078	13.543	***
CD	←	CTotal	.833	.066	11.377	***
CE	←	CTotal	.873	.087	12.722	***
CA4	←	CA	.839			
CA3	←	CA	.813	.059	16.747	***
CA2	←	CA	.808	.051	16.612	***
CB4	←	CB	.790			
CB3	←	CB	.808	.064	15.933	***
CB2	←	CB	.844	.064	16.846	***
CB1	←	CB	.834	.067	16.600	***
CC4	←	CC	.836			
CC3	←	CC	.783	.058	16.116	***
CC2	←	CC	.722	.058	14.401	***
CC1	←	CC	.715	.065	14.236	***
CD4	←	CD	.763			
CD3	←	CD	.758	.072	13.629	***
CD2	←	CD	.839	.076	15.207	***

Table 6 (cont.). Second confirmatory factor analysis of entrepreneurs' business networking

Questions		Variable	Estimate	S.E.	C.R.	P
CD1	←	CD	.757	.071	13.616	***
CE4	←	CE	.829			
CE3	←	CE	.834	.053	17.625	***
CE2	←	CE	.860	.050	18.432	***
CE1	←	CE	.738	.050	14.839	***

Note: CA = procurement; CB = product and service; CC = marketing; CD = pricing; CE = shipment. *** means Statistically significant at the 0.001 level.

The second-order confirmatory factor analysis of the entrepreneurial competency variables consists of two observable variables: skills and competency with 12 questions (EA1-EA12) and entrepreneur's characteristics with 12 questions (EB1-EB12), as shown in Table 7. Based on theoretical reasoning and the model adjustment index (MI), the adjusted model was harmonious and within the specified criteria. This was determined by a (x^2/df) value of 2.256, which is less than 3, meeting the selected criteria. The statistical values measuring the consistency of the model are CMIN/df = 2.256, CFI = 0.947, IFI = 0.948, RMR = 0.036, RMSEA = 0.042, with a Chi-square *p*-value of 0.000.

Table 7. Index of congruence (IOC) before and after adjusting the entrepreneurial competency model

Index of Congruence (IOC)	Consideration Criteria	Before adjusting	After adjusting
Relative Chi-Square(x^2/*df*))	< 3.00	4.763	2.256
CFI	> 0.90	0.665	0.947
IFI	> 0.90	0.586	0.948
RMR	< 0.05	0.094	0.036
RMSEA	< 0.05	0.196	0.042

The regression weight of the observed variables used to measure the entrepreneurial performance variables ranges from 0.902 to 0.988. The weight of each component has a C.R. (critical ratio) > 1.96, indicating that every observed variable has a component weight not equal to zero, statistically significant at the 0.05 level (*p*-value < 0.05). This signifies that these observed variables are critical indicators of the latent variables. When considering the weight of the elements of the questions for both variables, every question indicates the importance of those elements, as each has a C.R. (critical ratio) > 1.96. Therefore, every question has a non-zero element weight, statistically significant at 0.05 (*p*-value < 0.05). The model was adjusted by eliminating questions EB7 and EB9 from the structural equation model. The highest latent variable was entrepreneurs' characteristics, followed by skills and competency. They are shown in Table 8.

Table 8. Secondary confirmatory factor analysis of entrepreneurs' entrepreneurial competencies

Questions		Variable	Estimate	S.E.	C.R.	P
EA	←	ETotal	.902			
EB	←	ETotal	.988			
EA12	←	EA	.783			
EA11	←	EA	.761	.069	14.990	***
EA10	←	EA	.727	.066	14.150	***
EA9	←	EA	.749	.062	14.692	***
EA8	←	EA	.818	.063	16.458	***
EA7	←	EA	.785	.064	15.603	***
EA6	←	EA	.834	.065	16.875	***
EA5	←	EA	.797	.061	15.911	***
EA4	←	EA	.744	.071	14.565	***
EA3	←	EA	.752	.062	14.771	***
EA2	←	EA	.731	.071	14.246	***
EA1	←	EA	.716	.070	13.903	***
EB10	←	EB	.711			
EB8	←	EB	.712	.082	12.410	***
EB6	←	EB	.821	.088	14.313	***
EB5	←	EB	.735	.087	12.824	***
EB4	←	EB	.802	.087	13.993	***
EB3	←	EB	.783	.089	13.646	***
EB2	←	EB	.761	.088	13.271	***
EB1	←	EB	.726	.081	12.666	***

Note: EA = skills and competency; EB = entrepreneur's characteristics. *** means Statistically significant at the 0.001 level.

The second-order confirmatory factor analysis of the variable for the readiness of small and medium enterprises to enter smart retailing consists of one observable variable: the readiness of small and medium enterprise operators to enter smart retail with 20 questions (ROE1-ROE20), as shown in Table 9. Based on theoretical reasoning and the model adjustment index (MI), the adjusted model was harmonious and within the specified criteria. This was determined by a (x^2/df) value of 2.890, which meets the selected criteria. The statistical values measuring the consistency of the model were as follows: CMIN/df = 2.890, CFI = 0.928, IFI = 0.907, RMR = 0.025, RMSEA = 0.036, with a Chi-square *p*-value of 0.000.

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Table 9. Index of congruence (IOC) before and after adjusting the model of small and medium enterprises' readiness to enter smart retail

Index of Congruence (IOC)	Consideration Criteria	Before adjusting	After adjusting
Relative Chi-Square (x^2/df)	< 3.00	3.571	2.890
CFI	> 0.90	0.490	0.928
IFI	> 0.90	0.494	0.907
RMR	< 0.05	0.075	0.025
RMSEA	< 0.05	0.195	0.036

The regression weight of the observed variables used to measure the readiness of small and medium enterprises to enter smart retail ranges from 0.577 to 0.768. All of them have a C.R. (critical ratio) value > 1.96, indicating that every observed variable has a component weight not equal to zero and is statistically significant at the 0.05 level (p-value < 0.05). This signifies that these observed variables are essential indicators of the latent variables. Furthermore, the weight of every question component is statistically significant at the 0.001 level (p-value < 0.001), indicating that these variables are essential indicators in each area. When considering the weight of the question components of the variables, it was found that every question was an indicator of the importance of those elements, as each has a C.R. (critical ratio) value > 1.96. Therefore, every question has a component weight not equal to zero and is statistically significant at the 0.05 level (p-value < 0.05). The model was adjusted by eliminating questions ROE1, ROE4, and ROE14 from the structural equation model. They are shown in Table 10.

Table 10. Analysis of the second confirmatory component of the readiness of small and medium enterprises to enter smart retail

Questions		Variable	Estimate	S.E.	C.R.	P
ROE20	←	ROE	.773			
ROE19	←	ROE	.747	.069	14.268	***
ROE18	←	ROE	.753	.071	14.409	***
ROE17	←	ROE	.671	.072	12.562	***
ROE16	←	ROE	.768	.072	14.764	***
ROE15	←	ROE	.759	.075	14.556	***
ROE12	←	ROE	.577	.073	10.576	***
ROE11	←	ROE	.750	.075	14.347	***
ROE10	←	ROE	.654	.073	12.228	***
ROE9	←	ROE	.705	.073	13.341	***
ROE8	←	ROE	.756	.079	14.498	***
ROE7	←	ROE	.730	.067	13.906	***
ROE6	←	ROE	.645	.092	12.032	***
ROE5	←	ROE	.712	.076	13.499	***
ROE3	←	ROE	.646	.067	12.062	***
ROE2	←	ROE	.710	.075	13.453	***
ROE13	←	ROE	.677	.081	12.710	***

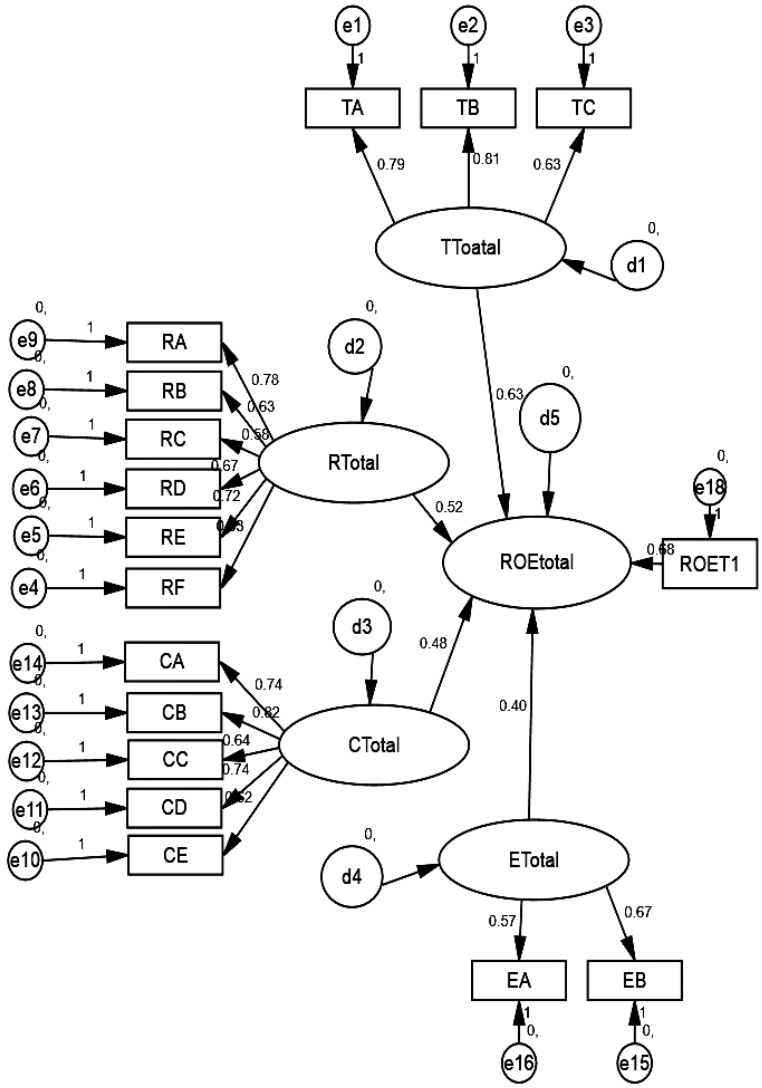
Note: ROE = readiness of small and medium enterprise operators to enter smart retail. *** means Statistically significant at the 0.001 level.

After reviewing the model for the first time, it was found that the model relates to the factors influencing the preparedness of small and medium-sized enterprise entrepreneurs to enter the retail trade. The research model developed is consistent with the empirical data. Consequently, the model was refined by considering theoretical possibilities and using the modification indices (MI).

Table 11 and Figure 1 present the results of the structural equation model analysis, which examines the factors influencing the readiness of small and medium enterprise operators to enter the retail trade. The model meets the specified criteria, as indicated by the following compliance indices: CMIN/df = 2.841, CFI = 0.945, IFI = 0.942, and RMR = 0.036.

Table 11. Statistics of research's consistency model with empirical data after adjusting the research model

Index of Congruence (IOC)	Consideration Criteria	Statistic	Result	Reference
Relative Chi-Square (x^2/df)	< 3.00	2.841	Pass	Bollen (2014) and Kline (2015)
CFI	> 0.90	0.945	Pass	Bollen (2014)
IFI	> 0.90	0.942	Pass	Diamantopoulos and Siguaw (2013)
RMR	< 0.05	0.036	Pass	
RMSEA	0.05-0.10	0.074	Pass	



Note: Chi-square = 980.145, chi-square/df = 2.841, df = 345, p = 0.000. CFI = 0.945, IFI = 0.942, RMR = 0.036, RMSEA = 0.074. TA = perceived ease of use; TB = perceived usefulness; TC = attitude toward technology; RA = assets; RB = capabilities; RC = organization's operation process; RD = business properties; RE = information; RF = knowledge; CA = procurement; CB = product and service; CC = marketing; CD = pricing; CE = shipment; EA = skills and competency; EB = entrepreneur's characteristics; ROE = readiness of small and medium enterprise operators to enter smart retail.

Figure 1. Results of the consistency test

Based on the results of the study, the hypotheses testing can be summarized as follows.

H1: The influence model of technology acceptance and usage, resource base, business network creation, and entrepreneurial competencies on the readiness to enter smart retail is consistent with empirical data. The results of the structural equation model analysis, which examines the factors influencing the readiness of small and medium enterprise operators to enter the retail trade, indicate that the model meets the specified criteria. This is evidenced by the following compliance indices: CMIN/df = 2.841, CFI = 0.945, IFI = 0.942, and RMR = 0.036. Therefore, the proposed hypothesis is accepted.

The influencing factors identified in the study include: 1) The acceptance and use of technology by entrepreneurs ($\beta = 0.63$, $p < 0.05$), 2) The resource base of entrepreneurs ($\beta = 0.52$, $p < 0.05$), 3) The aspect of business networking by entrepreneurs ($\beta = 0.48$, $p < 0.05$), and 4) The competencies of entrepreneurs ($\beta = 0.40$, $p < 0.05$). These factors significantly affect the readiness of small and medium-sized enterprises (SMEs) to enter the retail mar-

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ket, aligning with empirical data. As a result, the research hypotheses are accepted. Specifically, H2 states that technology acceptance and usage have a direct positive influence on the readiness to enter smart retail. H3 posits that the resource base also has a direct positive influence on the readiness to enter smart retail. Additionally, H4 suggests that business network creation positively affects the readiness to enter smart retail. Finally, H5 indicates that entrepreneurial competencies have a direct positive influence on the readiness to enter smart retail. These findings underscore the importance of these factors in enhancing the readiness of SMEs to engage in smart retail practices.

4. DISCUSSION

The acceptance and use of technology by entrepreneurs, the resource base of entrepreneurs, the aspect of business networking by entrepreneurs, and the competencies of entrepreneurs significantly affect the readiness of small and medium-sized enterprises (SMEs) to enter the retail market, aligning with empirical data. The structural equation model used in the analysis has met the necessary criteria, indicating a robust framework for assessing SME readiness in this context.

Entrepreneurship is fundamentally a dynamic process characterized by vision, adaptability, and creativity. It goes beyond merely starting and managing a business; it involves a deep commitment to bringing innovative ideas to life and implementing effective solutions. This process includes several critical activities: creating organizations that align with the entrepreneur's vision, recruiting necessary resources such as financial, human, and material assets, developing comprehensive business plans, and identifying new market opportunities. Kuratko and Hodgetts (2007) highlight these aspects as essential components of successful entrepreneurship.

Entrepreneurial competency plays a crucial role in business success. It encompasses a range of skills and characteristics that positively influence business performance. According to Davis et al. (1989 cited in Wongsumet et al., 2017), these competencies include specific abilities that facilitate effective business operations and personal traits such as resilience, creativity, and leadership that drive successful management. A well-developed entrepreneurial competency can significantly enhance an SME's performance in a competitive market.

The resource base of an organization is another vital factor. An organization's focus on its internal resources, such as financial capital, technological infrastructure, and intellectual property, can provide a competitive edge. Effective management of these resources allows businesses to differentiate themselves and maintain a strong competitive position.

Brand development is also essential for SMEs. Prioritizing the development of a strong brand can lead to improved financial outcomes and increased customer loyalty. Strong brand value enhances business performance, particularly in markets where consumer involvement is low. As noted by Tripopsakul et al. (2024), a well-established brand can significantly boost market share and profitability.

Barney (1991) proposed the resource-based view, which emphasizes that firms can achieve a sustained competitive advantage through effective management of resources. Resources such as assets, abilities, processes, and information, when managed well, can enhance a company's strategic position and operational efficiency. In the global business environment, including multinational firms, commerce networking is crucial for gaining competitive advantages. Business networks provide access to valuable information, resources, and knowledge that can enhance SME performance. Dess et al. (2012) highlight that retail businesses must leverage these networks to protect themselves from failure and compete effectively on a global scale. Qiao et al. (2014) found that business networks positively impact SME performance by offering essential resources and insights.

Additionally, Tavani et al. (2019) observed that expanding business relationships and networks contributes to developing a sustainable competitive advantage, as emphasized by Kurtz and Boone (2010). In conclusion, SMEs seeking to enter the smart retail market must consider entrepreneurial competency, resource management, brand development, and business networking to enhance their readiness and achieve long-term success. By effectively leveraging technology and strategic resources, SMEs can navigate the evolving retail landscape and secure a competitive edge in the dynamic market.

The results of the confirmatory factor analysis with observed variables include acceptance and use of technology, resource base, business networks, entrepreneurial competency, and readiness of small and medium enterprise entrepreneurs to enter smart retail. Based on theoretical reasoning and the model adjustment index (MI), the adjusted model was harmonious and within the specified criteria. The results of the structural equation model analysis of the variables affecting the readiness of small and medium-sized operators to enter the retail trade met the determined criteria. These research findings provide a guideline for developing and preparing small and medium-sized operators for entry into smart retailing in a more concrete manner, maximizing the long-term net benefits for users.

Sukheewattana et al. (2024) provide several theoretical contributions that are relevant to SME readiness for smart retail in Thailand using the aesthetic-based technology acceptance model (TAM). One notable contribution is the introduction of perceived aesthetics as a significant factor within the TAM framework. The study identifies key service quality factors, namely platform quality, interaction quality, information quality, and personalized quality, which significantly influence perceived value attributes such as perceived usefulness, perceived ease of use, perceived trust, and perceived aesthetics. The findings suggest that integrating aesthetic and emotional factors with traditional TAM variables can lead to a more holistic understanding of technology acceptance, particularly in the context of consumer-facing applications in smart retail. In addition, strategic environmental intents, such as eco-branding and eco-production practices, can be effectively translated into actionable eco-marketing practices, enhancing both environmental and economic performance. This approach can be adapted to SME retail businesses to leverage environmental strategies for competitive advantage (Sannamwong et al., 2023).

The analysis of SME readiness for smart retail highlights several critical factors: technology acceptance, resource management, business networks, entrepreneurial competency, and overall readiness. Each of these elements plays a significant role in determining how well SMEs can transition into the smart retail sector. Future research should focus on the following areas to further enhance understanding and support for SMEs.

First, a notable contribution from recent studies is the introduction of perceived aesthetics within the technology acceptance model (TAM). Future research should delve deeper into how perceived aesthetics – such as design elements and user interface aesthetics – affect technology acceptance. By integrating aesthetic and emotional factors with traditional TAM variables, a more comprehensive understanding of user acceptance can be gained, leading to more effective technology adoption strategies in smart retail.

Second, key service quality factors – platform quality, interaction quality, information quality, and personalized quality – have been shown to significantly impact perceived value attributes like perceived usefulness and perceived trust. Future studies should explore how these service quality factors interact with technology acceptance. Understanding these relationships will help SMEs optimize their service offerings, align with consumer expectations, and enhance overall satisfaction.

Third, the integration of eco-branding and eco-production practices into actionable eco-marketing strategies presents a promising research avenue. Future research should examine how SMEs can leverage environmental strategies to differentiate themselves and attract environmentally-conscious consumers. This approach not only benefits the environment but also enhances SMEs' economic performance, aligning their business practices with growing consumer demand for sustainability.

Fourth, longitudinal studies are essential for tracking changes in SME readiness and technology adoption over time. Future research should involve repeated measures to assess how SMEs' technological capabilities, resource bases, and business networks evolve. This will provide insights into the dynamic nature of SME readiness and identify long-term trends and factors influencing sustained success.

Finally, comparative research across various geographic and economic contexts can reveal how different market conditions, cultural factors, and economic environments impact SME readiness and technology adoption. By studying SMEs from diverse regions, tailored strategies can be developed based on regional characteristics, addressing unique market challenges and opportunities.

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Pursuing these research directions will deepen the understanding of factors affecting SME readiness for smart retail. By exploring the roles of aesthetics, service quality, environmental strategies, and longitudinal changes and conducting comparative studies, actionable insights can be provided to SMEs to enhance technology adoption, service offerings, and overall performance in the smart retail sector.

CONCLUSION

This study focuses on internal factors influencing the readiness of small and medium-sized enterprises (SMEs) to transition into smart retailing, excluding external influences such as social, cultural, economic, or political factors. Key factors examined include technology acceptance and utilization, which assesses entrepreneurs' willingness and ability to adopt new technologies; resource availability, including financial, human, and technological assets required for implementation; business networks, which evaluate the strength of collaborations with suppliers and partners to support technological integration; and entrepreneurial competency, measuring skills in strategic decision-making, problem-solving, and adaptability to change. The structural equation model developed in this analysis was refined to align with empirical data and theoretical frameworks. Adjustments made using modification indices enhanced its consistency with predefined criteria. The findings provide practical insights for SMEs to assess and enhance their preparedness for smart retailing, facilitating successful adaptation in an evolving retail environment.

AUTHOR CONTRIBUTIONS

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Data curation: Kantaphon Phanitrat.
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Resources: Kantaphon Phanitrat.
Software: Kantaphon Phanitrat.
Supervision: Wilert Puriwat, Danupol Hoonsopon.
Validation: Kantaphon Phanitrat.
Visualization: Kantaphon Phanitrat.
Writing – original draft: Kantaphon Phanitrat.
Writing – review & editing: Kantaphon Phanitrat, Wilert Puriwat, Danupol Hoonsopon.

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