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RESEARCH ARTICLE

How Intellectual Capital, Knowledge Management, and the Business Environment Affect Thailand's Food Industry Innovation

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Abstract: In 2015, Thailand employed nearly 11% of the population in agriculture, which has always been a stable and prosperous component of the economy. Having a rich natural abundance of resources, combined with significant investments in technology, food safety, and research and development (R&D) have helped contribute to Thailand being labeled as "Kitchen of the World." Given these priorities, stratified sampling was employed to select 246 individuals from the target population. Confirmatory factor analysis was used, followed by a *structural equation model* to analyze how intellectual capital, knowledge management, and the business environment affect innovation in Thailand's entrepreneurial food industry. The research survey was conducted using a questionnaire which contained a 7-level Likert type agreement scale. Results from the study revealed that the food industry's knowledge management capability was the most important factor (0.60), which was also influenced directly by the organization's intellectual capital (0.44). Of lesser importance was intellectual capital (0.39) and the business environment (0.39).

Keywords: agriculture, CFA, Food Innopolis Project, SEM, Thailand 4.0

Thailand is pioneering ways to feed tomorrow's billions, and in so doing, has also earned the designation of "Kitchen of the World" (Wipatayotin, 2017). Furthermore, due to the increasing demand of the world's billions, the United Nations Food and Agricultural Organization (2009) has reported that the world's population will need twice as much food, and 30% more drinking water by 2050. Some studies have also claimed that climate change will contribute to a dramatic decrease in the world's agricultural production (10-15%).

The food sector's strategic importance to economies such as the EU and Thailand is further affected by global economic conditions. Thailand as the second largest economy in ASEAN (Association of Southeast Asian Nations), is also a major global tourist destination which in 2016 had over 30 million foreign tourists (Vuthisopon & Srinuan, 2017). As such, tourism is a primary driver for the demand for imported food and beverages, as well a contributing factor for domestic development within the Thai food industry. Thailand's location and vast natural resources have also

contributed to its rich agriculture productivity. Thailand also has a year-round growing season, relatively low labor costs, and a skilled and well-educated workforce. Therefore, Thailand currently possesses a tremendous competitive advantage in the food and agricultural arena.

Furthermore, 41% of the total land area in the country is used for agriculture. As a result, more than 80% of raw materials are sourced from domestic producers at low prices (*Thailand Investment Review*, 2014). This economic feature immensely benefits the Thai food processing industry, with the food and agricultural sectors accounting for as much as 28% of the country's gross domestic product (GDP). Also, within the sector, there are over 116,000 companies, which are comprised of 96% small-medium enterprises (SMEs).

The importance of the food sector is also important in the European Union (EU), as the food sector is the EU's largest sector, and is one of the primary drivers of the EU economy in terms of high economic output and a significant role in employment (Baregheh, Rowley, Sambrook, & Davies, 2012).

In recent years, however, the Thai food industry has been subject to a range of changes in society, which has necessitated a response to far-reaching technical and economic changes in the production and processing of food (CPG Official Channel, 2012). Such changes continue to have significant impacts on the entire agricultural and food production chains, through food processing to the distribution of food to end consumers (Menrad, 2004). Consequently, innovation is deemed to be one of the most critical factors in enhancing competitiveness within the food sector (Baregheh et al., 2012). There are increasing signs that Thai food entrepreneurs, especially in the seafood and food ingredients areas, can increase or expand the volume and value of exports of food products to other regions.

Thailand's Agribusiness Sector (Smart Farmers)

As the Kitchen to the World under Thailand 4.0, the focus is being shifted to increase the farmer's "life quality" (CPG Official Channel, 2012; Wipatayotin, 2017). Also, under the Thailand 4.0 model (a hybrid of Industry 4.0 and the Internet of Things), emphasis will be given to upgrading SMEs and ushering in an era of *smart farmers* who can make the most of advances in technology to prosper (Sattaburuth, 2017). Additionally, Thailand 4.0 provides an excellent opportunity for laborers and farmers to obtain higher incomes and a better quality of life (Jones & Pimdee, 2017).

The Thai Agriculture and Cooperatives Ministry has been stated by government leaders as key to helping farmers adapt to technology-led cultivation via the more than 2,000 learning centers nationwide (Wipatayotin, 2017). Furthermore, farmers should have proper plantations in line with soil quality and geographic locations, as suggested by the "Agri-Map" developed by the ministry ("Agri-Map," 2017; Wipatayotin, 2017).

Also, the Ministry of Agriculture and Cooperatives has sought to transform farmers into "smart farmers," to enable them to use technology for their plantations and to sell their products at better prices. General Prayut said that while Thailand 4.0 would not leave anyone from all walks of life behind, people must adapt with and make use of technology (Wipatayotin, 2017). Robots must not replace laborers, but they should develop labor skills. They all need to adapt and develop to be "smart people."

The Thai government recognizes the importance of food innovation with the Finance Ministry proposing establishing a US$283.8 million fund to support the Food Innopolis Project at the Thailand Science Park (TSP; Figure 1). This project aims to position Thailand as a global food innovation hub and, with the Ministry of Science and Technology coordination, plans to use the Food Innopolis Project as a hub for 3,000 researchers, 10,000 students in Food Science and Technology programs, 9,000 food factories, 150 food research laboratories, 20 pilot plants, and 70 universities (Thailand Investment Review, 2016).

In an earlier interview on CNBC Managing Asia in December 2012 (CPG Official Channel, 2012), Thailand's richest man (Dhanin Chearavanont) and CEO of Charoen Pokphand Group was quoted as saying that "CP's success is due to the use of technology" (American in particular). Additionally, CP helped farmers work less by allowing locals to gain access to modern methods of farming (8:00), modern farming management (16:20), and through the use of technology. From CP's methods, the farmer's income increased, and by extension, their life quality. Wise

Source: http://foodinnopolis.or.th/en/home/

Figure 1. Food Innopolis Project at the Thailand Science Park (TSP).

words from a wise man, which are being mirrored everywhere throughout the Thai government half a decade later.

From the preceding, we were interested in studying the development of knowledge management (KM), intellectual capital (IC), and the business environment (BE) on innovation (IN) and how they affect the Thai food industry. The BE plays a crucial role as well, with a review of the literature suggesting that IC is a driving force in business innovation and competitive advantage. Knowledge management is also vital as a coordinating mechanism which allows the use of resources more efficiently.

Conceptual Framework

After a review of the literature and related theory, we developed the conceptualized model presented in Figure 2, which depicts the causal relationships between IC, the BE, KM, and IN, as well as their related five hypotheses.

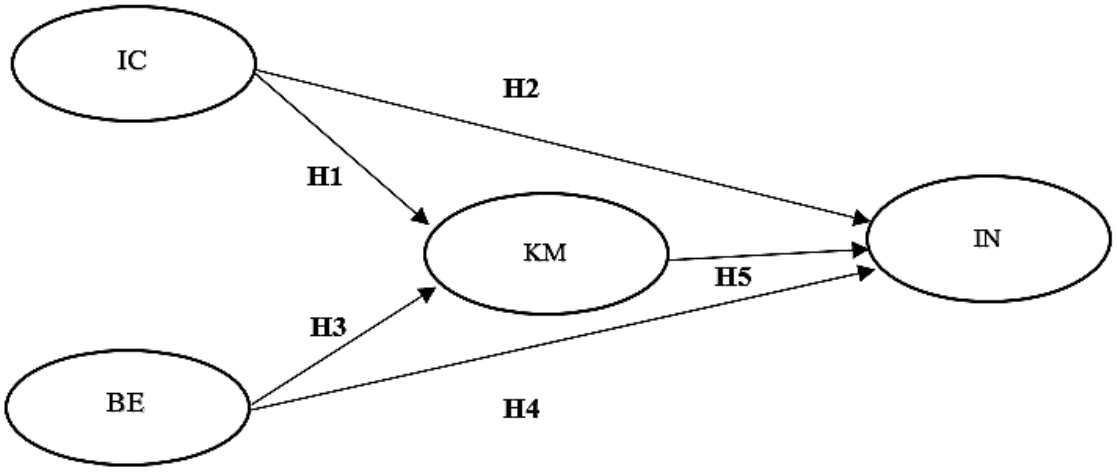


Figure 2. The conceptualized model.

H1: Intellectual Capital (IC) has a direct positive influence on Knowledge Management (KM).
H2: Intellectual Capital (IC) has a direct positive influence on Innovation (IN).
H3: Business Environment (BE) has a direct positive influence on Knowledge Management (KM).
H4: Business Environment (BE) has a direct positive influence on Innovation (IN).
H5: Knowledge Management (KM) has a direct positive influence on Innovation (IN).

Methods

Population and Sampling

The population for the study consisted of 4,376 intellectual property holders registered in the Department of Intellectual Property (DIP) database in Thailand. After the analysis of the database, the number was reduced to 2,317, which represented the highest concentration of firms/individuals in the Bangkok metropolitan area and the surrounding four provinces (Table 1).

The sample size was determined as a proportion of the population of each group. Using simple random sampling, each population was sampled again. Each stratum was determined to be similar, with the units located in the different layers being different. From this process, Table 1 also shows the targeted random sample plan.

Questionnaire Design

Questionnaires were constructed as the primary research tool to measure concept definitions and practice. The questionnaire used a 7-Point Likert Scale (Likert, 1932) as the measurement scale and the conceptual framework for determining the internal consistency, which was measured by Cronbach's alpha (coefficient α), which is considered to be a measure of scale reliability.

Research Instrument Quality Verification

Questionnaire validation enhancement was accomplished in a two-step process, which included the following:

1. Monitoring of both content validity and reliability was accomplished by the use of five professionals who are experts in their related fields. From their input, questionnaire validity was evaluated using the Item-Objective Congruence (IOC) which was used for the screening of the study's questionnaire items (Rovinelli & Hambleton, 1977). IOC values of 0.6 usually are considered satisfactory in test development for evaluating content validity at the item development stage.
2. Initial reliability testing for the survey items was calculated with the use of Cronbach's alpha and ranged from 0.835–0.926. From the use of reliability table developed by George and Mallery (2010), a Cronbach's alpha α of .8 is considered "good."

Additionally, the survey instrument consisted of two parts. Part 1 contained the respondent's general and personal information, whereas Part 2 consisted of the actual questionnaire items concerning food innovation. Part 2 was composed of a total of 73 items divided into four parts, with *intellectual capital* consisting of 23 items, *the business environment* with 20 items, *knowledge management* with 18 items, and

Table 1
Number of Intellectual Property Owners and Targeted Individuals by Area

Rank	Area	No.	Target
1	Bangkok Metropolitan Area	1446	199
2	Pathum Thani Province	307	42
3	Samut Sakhon Province	204	28
4	Samut Prakan Province	204	29
5	Nonthaburi Province	153	22
	Total	**2317**	**320**

Source: Department of Intellectual Property (2013)

Table 2
Thailand's Food Industry Managers Likert-Type Scale Interpretation Concerning Innovation

Mean range	Likert-type scale responses
6.14-7.00	7 = *strongly agree*
5.28-6.14	6 = *agree*
4.42-5.28	5 = *somewhat agree*
3.56-4.42	4 = *undecided*
2.70-3.56	3 = *somewhat disagree*
1.84-2.70	2 = *disagree*

finally, *innovation* with 12 questions. Respondents' perceptions of their ideas concerning innovation were noted by the use of a Likert-type agreement scale (Likert, 1932) ranging from 1 (strongly disagree) to 7 (strongly agree). Therefore, from the seven levels of frequency, the interpretation of these responses was calculated by using the following formula:

$$\text{Interval} = \frac{\text{the highest score} - \text{the lowest score}}{\text{the number of interval}}.$$

A 0.86 (rounded) interval level for the seven levels of frequency was used and is detailed in Table 2.

Quantitative Data Analysis

With the target set at 320, we sent e-mails to 300 individuals in which each individual was asked to fill out an online survey using Google forms (https://goo.gl/forms/HPMgDrG1N06Siqaz2). Ninety-seven individuals responded to the survey from this process, which represented 32% of the 300 targeted entrepreneurs. Another 300 surveys were also distributed at the THAIFEX-World of Food Asia food exhibition held from 27–30, July 2017. The response rate of 48.7% (149 questionnaires) was higher than the online process, as personal contact was made with each booth's presentation team. When the survey team returned each day to collect the requested questionnaire, it was often discovered that the owner of the represented product had never attended the show, or he/she was too busy to fill out the survey. Therefore, from the two processes, 97 (online) + 149 (show), 246 audited questionnaires were obtained.

To validate if 246 was adequate for the study's 17 observed variables, we borrowed findings from various studies. According to Bearden, Sharma, and Teel (1982), if variables are reliable, the effects are strong, and the model not overly complex, smaller sample sizes will suffice. This is consistent with Anderson and Gerbing (1984, pp. 170–171), which also indicated that with "three or more indicators per factor, a sample size of 100 will usually be sufficient for convergence," and a sample size of 150 "will usually be sufficient for a convergent and proper solution." Pituch and Stevens (2016) have also reported that a sample size of 15 cases per observed variable in a typical least squares multiple regression analysis is adequate. However, Boomsma (1982) has suggested that for SEMs, a minimum of 200 as the sample size is desired. This is also consistent with Kline (2011, p. 12) who also suggested that many researchers would recommend using sample sizes of about 200 cases, with 5 or 10 cases per parameter. Therefore, given the study's 17 observed variables for the CFA and SEM, a sample size of 246 was deemed as sufficiently reliable.

The study also identified two exogenous latent variables including intellectual capital (customer capital, human capital, social capital, structural capital, and cultural capital) and the business environment (society, technology, economy, politics and law, and operating environment; Hancock & Nevitt, 1999). In addition, the endogenous latent variables consisted of knowledge management (knowledge acquisition, knowledge creation, knowledge organization, and knowledge sharing) and *innovation* (product innovation, process innovation, and technology innovation). Table 3 shows the exogenous and the endogenous latent variables, along with their related observed variables.

Table 3
Research Question Development

Research Items	Item
Intellectual Capital	IC
Customer Capital	IC1
Human Capital	IC2
Social Capital	IC3
Structural Capital	IC4
Cultural Capital	IC5
Innovation	IN
Product Innovation	IN1
Process Innovation	IN2
Technology Innovation	IN3
Knowledge Management	KM
Knowledge Acquisition	KM1
Knowledge Creation	KM2
Knowledge Organization	KM3
Knowledge Sharing	KM4
Business Environment	BE
Society	BE1
Technology	BE2
Economy	BE3
Politics and Law	BE4
Operating Environment	BE5

Confirmatory Factor Analysis (CFA)

In determining a model's fit, CFA GOF tools are used. Common criteria in this process suggest that χ^2 does not fit well if the sample size is 50 or more, but instead should be given to the value of χ^2/df being 3 or under. Also, the comparative fit index (CFI) often uses a criterion of $\geq$. 95, a standardized root mean square residual (SRMR) $\leq$ 0.05, and a root mean square error of approximation (RMSEA) as a measure of GOF in SEMs (Kline, 2011), as well as to measure the discrepancy per degree of freedom (Hu & Bentler, 1999).

Results

Respondent's Demographic and Business Characteristics

Table 4 shows that Thai food entrepreneurs were comprised of 54.47% males, while 45.53% were females. Of these, 33.33% were 31–40 years old. Additionally, 56.91% identified themselves as entrepreneurs. Educational levels were relatively low, as only 66.26% had reached the bachelor degree level. There also seemed to be two extremes in organizational age, as 34.15% had operated for five years or less, while the other extreme, 26.83%, had operated for 16 years or more.

Table 4
*Respondent and Respondent's Business Characteristics (*n = *246)*

Gender		**Frequency**	**%**
Male		134	54.47
Female		112	45.53
	Total	246	100
Age			
Less than 31 years old		49	19.92
31-40 years old		82	33.33
41-50 years old		52	21.14
Over 50 years old		63	25.61
	Total	246	100
Position			
Managing Director		92	37.40
Business Owner (entrepreneur)		140	56.91
Other		14	5.69
	Total	246	100
Highest Degree			
Less than an undergraduate degree		21	8.54
Undergraduate Degree		142	57.72
Master's Degree		82	33.33
Ph.D.		1	.41
	Total	246	100
Business years in operation			
Lower than five years		84	34.15
6-10 years		56	22.76
11-15 years		40	16.26
More than 16 years		66	26.83
	Total	246	100
Total employees			
Less than 50		133	54.07
Between 51-200		51	20.73
More than 201		62	25.20
	Total	246	100

How do you develop and produce your business?			
Products		209	84.96
Process		21	8.54
Technology		16	6.50
	Total	246	100
Does your establishment have a product design?			
once		213	86.59
never		33	13.41
	Total	246	100
Has your organization won awards for the design or innovation of its products and services?			
once		132	53.66
never		114	46.34
	Total	246	100
What kind of intellectual property (IP) has your business registered?			
Patent		53	21.54
Patent		179	72.76
Patent Design		14	5.69
	Total	246	100

CFA for the Exogenous Latent Variables IC and BE

Using SEM, we specified the CFA model (Hox & Bechger, 1998), where the exogenous latent variable *IC* was influenced by customer capital (IC1 = 0.54), human capital (IC2 = 0.65), social capital (IC3 = 059), structural capital (IC4 = 0.55), and cultural capital (IC5 = 0.52). Also, BE is influenced by customer capital (BE1 = 0.56), human capital (BE2 = 0.55), social capital (BE3 = 0.53), structural capital (BE4 = .044), and cultural capital (BE5 = 0.62). From the modeling, the χ^2 was indicated to be 7.26, with a *p*-value of 0.99, and a RMSEA = 0.000, a SRMR = 0.018, a goodness-of-fit index (GFI) = 0.994, and an adjusted goodness-of-fit index (AGFI) = 0.983, which all indicated an acceptable fit with the model. This ensured that the observed variables were sensitive to IC and BE and were suitable for further analysis.

CFA for the Endogenous Latent Variables KM and IN

Using SEM, the researchers also specified the CFA model for the exogenous latent variable KM, which was determined to be influenced by knowledge acquisition (KM1 = 0.72), knowledge creation (KM2 = 0.66), knowledge organization (KM3 = 0.81), and knowledge sharing (KM4 = 0.66). Also, we can see that IN is influenced by product innovation (IN1 = 0.66), process innovation (IN2 = 0.66), and technology innovation (IN3 = 0.64). From the modeling, the χ^2 was indicated to be 2.91, with a *p*-value of 0.89, and RMSEA = 0.000, SRMR = 0.012, GFI = 0.997, and AGFI = 0.986, which indicated an acceptable fit with the model. This ensures that the observed variables were sensitive to KM and IN and were suitable for further analysis.

Measurement Models Analysis

Analysis of the measurement model with CFA was conducted with the use of LISREL 9.1 software and the *maximum likelihood estimation* (*MLE;* Kline, 2011, p. 154). When SEM is used for normality assessments, the MLE is relatively robust to skewness greater than 1.0 in absolute value (Awang, 2012). This is interpreted to mean that further SEM analysis is appropriate, if the sample size is larger than 200, even if the data distribution is slightly abnormal. Another method for normality assessment is at the multivariate kurtosis statistic. However, SEM using MLE is also robust to kurtosis violations of multivariate normality as long the sample size is significant, and the CR for the kurtosis does not exceed 3.0 (Kline, 2011, p. 60).

Also, convergent validity and discriminant validity can be examined through CFA modeling with the three criteria recommended by Fornell and Larcker (1981) for establishing convergent validity being:

1. All indicator factor loadings should be significant and exceed 0.707 so that over 50% of the variance is captured by the latent construct (Straub, Boudreau, & Gefen, 2004).
2. Construct reliabilities should exceed 0.70.
3. Average variance extracted (AVE) of each construct should exceed 0.50.

When measuring variables with reflective analysis, convergent validity has been used with loading used as consideration criteria which must be a positive quantity and indicator with the loading of more than 0.707. All values are statistically significant ($|t| \geq 1.96$) as all values and R^2 are between 0.20 and 0.69, which is not less than 0.20, indicating that the scale is reliable.

Furthermore, the SEM results of the hypotheses testing revealed five significant correlations, which included H1, H3, H4, and H5 (0.44, 0.28. 0.22, and

0.60, respectively; Table 5, Figure 3). Support for this comes from the correlation coefficient values suggested in the Pearson product-moment correlation coefficient (PPMCC-Pearson's *r*) and Spearman's rho in which the strength of the relationship is interpreted as follows (Pumim, Srinuan, & Panjakajornsak, 2017; Table 6):

- Small/weak: $r = 0.10$ to 0.29
- Medium/moderate: $r = 0.30$ to 0.49
- Large/strong: $r = 0.50$ to 1

However, a non-significant relationship was found in H2 (IC and IN; Table 6, Table 7, and Figure 3).

Additionally, the analysis of the direct effect (DE), indirect effect (IE), and total effects (TE) of the latent variables (IC, BE, KM, and IN) on Thai food industry innovation are presented in Table 7.

SEM Modeling Results

The analytical results for the SEM indicated multiple values for the GFI indices, which confirmed the accuracy of the model fit. Analysis of the SEM was conducted with the use of LISREL 9.1, from which multiple values were determined to indicate the accuracy of the model fit from the GFI indices (Table 8).

As confirmation of this, Hair, Hult, Ringle, and Sarstedt (2016) have indicated that factor loadings or regression weight estimates of latent to observed variables should have values higher than 0.50, which indicates that all the constructs conform to the construct validity test and validity convergence. Also, in the study, the SRMR was equal to 0.03. This indicates a good fit as the value was ≤ 0.05 (Hu & Bentler, 1999). Further confirmation was established as the

Table 5
Hypotheses Testing Results

Hypotheses	Coef.	t-test	Results
H1: *Intellectual Capital (IC)* has a direct positive influence on *Knowledge Management (KM)*.	0.44	3.87**	Accepted
H2: *Intellectual Capital (IC)* has a direct positive influence on *Innovation (IN)*.	0.13	0.96	Rejected
H3: *Business Environment (BE)* has a direct positive influence on *Knowledge Management (KM)*.	0.28	2.73**	Accepted
H4: *Business Environment (BE)* has a direct positive influence on *Innovation (IN)*.	0.22	1.99*	Accepted
H5: *Knowledge Management (KM)* has a direct positive influence on *Innovation (IN)*.	0.60	5.13**	Accepted

Table 6
Correlation Coefficients Between Latent Variables (Under the Diagonal) Construct Reliability (ρC) and the Average Variance Extracted (AVE)

Latent Variables	IN	KM	IC	BE
Innovation (IN)	1			
Knowledge Management (KM)	.574	**1**		
Intellectual Capital (IC)	.424	.425	1	
Business Environment (BE)	.514	.513	.590	**1**
ρC (Construct Reliability)	0.690	0.806	0.710	0.675
ρV (AVE)	0.426	0.511	0.330	0.296
	0.652	0.715	0.574	0.544

Note: AVE is shown on the diagonal of the matrix (in bold). Square of inter-construct correlation is shown under the diagonal.

Table 7
SEM Standard Coefficients of Influence

Dependent Variables		Independent Variables			
		R^2	IC	BE	KM
Innovation (IN)	DE		0.13	0.22**	0.60**
	IE	.53	0.26**	0.17**	-
	TE		0.39**	0.39**	0.60**
Knowledge Management (KM)	DE		0.44**	0.28**	-
	IE	.44	-	-	-
	TE		0.44**	0.28**	-

Table 8
Criteria, Goodness-of-Fit Appraisal Values, and SEM Related Theory

Criteria Index	Symbol	Criteria	Values	Scholars
Chi-square	χ^2	Ns.(p>.05)	57.87	(Hair et al., 2016).
Relative Chi-square	χ^2/df	χ^2/df ≤ 2.00	0.75	(Ullman, 2001).
The goodness of Fit Index	GFI	≥ .90	0.97	(Hair et al., 2016).
Comparative Fit Index	CFI	≥ .95	1.000	(Hair et. al., 2016).
Normal Fit Index	NFI	≥ .90	0.98	(Hu & Bentler, 1999).
Adjusted Goodness of Fit Index	AGFI	≥ .90	0.95	(Kenny & McCoach, 2003).
Root Mean Square Error of Approximation	RMSEA	≤ .05	0.000	(Hair et al., 2016).
Standardized Root Mean Square Residual	SRMR	≤ 0.05	.03	(Hu & Bentler, 1999).
Cronbach's Alpha	α	≥ 0.70	0.835-0.926	(Tavakol & Dennick, 2011).

results of the GFI = 0.97, and the AGFI = 0.95 (Kenny & McCoach, 2003). The RMSEA was equal to 0.000 as well, further confirming the model's fit.

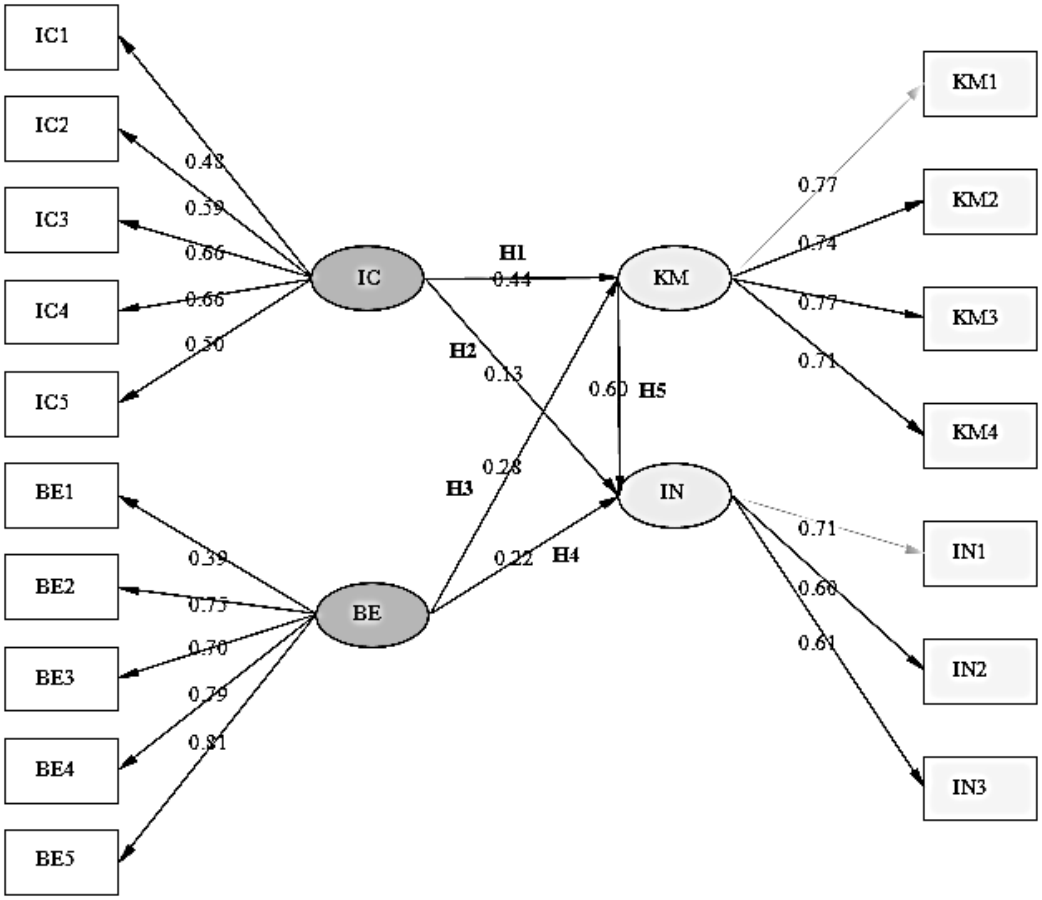
All variables in the model had a positive influence on IN. They can describe the variance of factors influencing IN (R^2) by 53%. Four factors affect the Thai food industry innovation. These include KM, IC, and BE, at 0.60, 0.39, and 0.25, respectively. Results from the study revealed that the food industry's KM capability was the most important factor (0.60), which was also influenced directly by the organization's IC (0.44).

Discussion

The results of the research on intellectual capital, knowledge management, and the business environment affecting the Thai food industry' innovation are discussed as follows:

Results from the study showed H1 to be supported, as Thai food entrepreneurs perceived their IC to have a direct and positive impact on their organization's KM capabilities, as the correlation coefficient between the variables was determined to be 0.44. This is consistent with the findings from Budiarti (2017), which analyzed journals concerning IC and KM and determined that human resource strategies and practices involving KM and management of IC give potential opportunities to gain innovation and competitive advantages.

Hypothesis H2 was surprising rejected after the analysis, which gave us much "food for thought." However, the core reasons appear to be related to existing IP laws in Thailand, and the food industry entrepreneur's perception of their value. Patent and petty patent (a subset of IC) are important, but in Thailand, the understanding concerning IP law is not clear and smaller entrepreneurs rarely license a patent or petty patent. This was determined from items (11) and (24) which is low, and cultural capital (28), (31), and (32), which is also low (Table 9).



Note. Chi-Square=57.87, df=77, p-value=0.94918, RMSEA=0.000

Figure 3. SEM final model.

Table 9. *Perceptions of the Need for Patent Registration and IP Protection by Thai Food Entrepreneurs*

Questionnaire Item	Mean	S.D.	Skewness	Kurtosis
24. My organization establishes intellectual property protection and technology transfer agreements.	4.47	1.46	-.60	-.07
28. My organization uses internal knowledge to produce products.	4.82	1.28	-.63	.64
31. My organization uses local culture and knowledge to produce products and services.	4.70	1.25	-.58	.48
32. My organization has its own local culture and foreign culture, or a mix of cultures to create products.	4.71	1.19	-.56	.53

It must also be noted that patent and petty patent are forms of IP, the definition of which may differ from one country (where such protection is available) to another. A utility model is similar to a patent, and in fact, utility models are sometimes referred to as petty patents or *innovation patents* (World Intellectual Property Organization, n.d). In the case of Thailand, however, it seems only large, international conglomerates such as CP Group view the necessity for IP innovation registration (through patents; CPG Official Channel, 2012).

It must also be noted that there is a lack of understanding from the survey's entrepreneurs about copyright, patent, intellectual property, and their use and definitions. Furthermore, in Thailand, the protection and use of IP are still relatively new, with

entrepreneurs not paying attention to the process of IP registration, as many do not know what kind of work can be protected under Thai law.

While many people still cling to the old idea that IP is a tool of foreigners, we contend that if Thai organizations used IP protection available to them, it would be beneficial. It is also noteworthy that in Thailand IP use is still quite scattered, which is partly due to the technical details of each type of intellectual property that requires expert oversight.

Results from the study also supported H3, as the Thai food entrepreneurs' BE had a direct and positive impact on their organization's KM capabilities, as the correlation coefficient between the variables was determined to be 0.28. Furthermore, H4 was additionally supported, in which the BE also had a direct and positive impact on their organization's IN (0.22).

Concerning the final hypothesis H5, it was also supported and showed that KM had a direct and positive effect on IN (0.60). Support for this comes from Rahim, Mahmood, and Masrom (2016), which studied Malaysian SMEs and their relationships concerning effective KM strategies and technological and organizational innovation in sustaining SMEs performance. The authors felt that in Malaysia, SMEs have a very high potential in supporting the nations' economic development and wealth creation, but despite all the governments' support, SMEs still experience difficulties at the early stages of their organizational growth. Therefore, the SME needs to evaluate their survival ability, and improve their innovative strategies to be competitive and sustainable within their markets.

Lai, Hsu, Lin, Chen, and Lin (2014) also determined the importance of KM to corporate innovation performance in Taiwanese industrial and export park clusters. They suggested that the interaction and exchange within an industrial cluster center on KM, and how these firms use their resources and relationships. Additionally, how they use KM to obtain or create new knowledge influences the performance of innovation activities. Furthermore, Wang and Wang (2012) also found that both explicit and tacit knowledge sharing practices facilitate innovation and performance, with explicit knowledge sharing having more significant effects on innovation.

Conclusion

As discussed, the Thai government has placed a great emphasis on the development of the Thai food industry through smart farmers and 2,000 learning centers, under the priorities outlined in the Thailand 4.0 agenda. Also, as recently as January 2018, the National Science Technology and Innovation Policy Office (NSTIPO) announced that it would increase the number of researchers four-fold by 2036 to bolster innovation across all targeted sectors.

Agricultural cluster development is also underway through the Food Innopolis Project at the Thailand Science Park (TSP) cluster, similar to Indonesia's food processing clusters and Taiwan's export clusters, which significantly affects the business performance of co-located SMEs.

However, there must also be an advance in each entrepreneur's understanding of how IP and patent registration can positively affect the organization's long-term strategic growth and sustainability. There must also be a mechanism put in place which connects the Thai legal system, and its specialist in domestic and foreign IP, to the food industry entrepreneurs and SME owners who need the knowledge.

Therefore, innovation is critical to the long-term success of Thailand's firms as well as the economic health of the *agricultural and food sector*s and the overall Thai economy. Innovation is also critical for responding to society's major challenges, such as climate change and global warming, but the innovation will be in terms of products, services and processes to help improve the effectiveness and efficiency of responses.

Organizations need to be aware that the basis for competitive advantage is innovation, which is the use of knowledge to build new knowledge based on the ability to compete. Creating the ability to innovate, which develops the ability of people to use knowledge to create new knowledge continuously and at all times.

ETHICAL CLEARANCE:

The study was approved by the institution.

CONFLICT OF INTEREST:

None.

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