

INNOVATION AND TECHNOLOGY OF COCONUT SUGAR SMALL AND MEDIUM ENTERPRISES (SMES) IN THAILAND 4.0 ERA

Potjanajaruwit P., Wajeetongratana P., Dhienhirun A.*

Abstract: The objective of this research is to study the causal factors influencing the innovation and technology of small and medium enterprises (SMEs) producing coconut sugar in Samut Songkhram province in Thailand 4.0 era. This research adopted mixed methods approach, which includes qualitative research through in-depth interviews and quantitative research through data collection using questionnaire. The sample group are 395 people determined using cluster random sampling. The data are analysed through Structural Equation Modeling: SEM and interviews with focus group to confirm the result of the research. It was found that Thailand 4.0 policy and leadership variables have direct positive effect on innovation and technology of coconut sugar SMEs and technology has direct positive effect on SMEs competitiveness. Apart from these, it was found that Thailand 4.0 policy and leadership have indirect positive effects on the competitiveness through innovation and technology where all the influential variables have statistical significance.

Keywords: Innovation and technology, Thailand 4.0 Policy, Leadership Style, SMEs Competitiveness

DOI: 10.17512/pjms.2019.19.2.26

Article's history:

Received February 10, 2019; *Revised* May 02, 2019; *Accepted* May 10, 2019

Introduction

The review of literature done by (Garengo and Trotta, 2018) revealed that SMEs in the present days proved to be an important factor that affect the economy system of the country because they provide employment to the locals which further results in income distribution throughout the country. They also motivate new entrepreneurs who are keen on starting their own businesses. In addition, more SMEs are now dependent on technologies and innovations for sustainable business growth because they can bring about effective business competitiveness and facilitate learning and communication to further support the operation of the business. SMEs have started focusing on new innovations in technologies that could enhance their competitiveness since 1950s, especially in European countries. Not long after that, the United States of America have introduced a policy to improve the condition of SMEs in the country where the government persuades the SMEs and startup

* Doctor **Pisit Potjanajaruwit**, Asst. Prof. Dr. **Prateep Wajeetongratana**, Assoc. Prof. Dr. **Auemporn Dhienhirun**; Suan Sunandha Rajabhat University, Faculty Management Science

✉ Corresponding author: pisit.po@ssru.ac.th

✉ jokenalove@gmail.com

businesses to focus on using innovations and technologies to enhance their business values in terms of employees knowledge, internal and external communication and business operation and even made this a national agenda (Bagheri et al., 2019). Therefore, innovations in technologies help bring benefits that an organization should get whether it is in the fields of machinery development, maximizing the use of equipment or increasing the overall production. However, the management of innovations and technologies of each organization is diverse because the organization culture and leadership style of the entrepreneurs in each business are different and this could affect occurrence of new ideas in terms of products, services, production process or even management style (Genc et al, 2019). In reality, SMEs have the ability to absorb new innovations and technologies differently depending on the business environment. The SMEs entrepreneurs who have applied innovations and technologies to their businesses only at a low level will naturally achieve low results and low business competence. (Wajeetongratana, 2017).

Table 1. Expansion rate of Gross Domestic Products in 2012-2016 [percentage]
(Regnier, 2017)

Number	Enterprise type	Expansion rate of Gross Domestic Products in 2012-2016 (percentage)					
		2012	2013	2014	2015	2016	Reduction rate
1	Agriculture sector	2.7	0.7	-0.6	-5.7	0.6	90.2%
2	Non-agriculture sector	7.8	3.0	1.1	3.9	3.5	43.68%
3	Startups and SMEs	7.6	3.2	0.9	5.2	4.8	46.52%

In summary, this research aims at analyzing, studying and confirming the concept that innovation and technology influence the competitiveness of SMEs by focusing on the causal factors influencing the innovation and technology of small and medium enterprises (SMEs) producing coconut sugar in Samut Songkhram province in Thailand 4.0 era. These are done to gather beneficial knowledge that are precise and could further support the development of the competitiveness of coconut sugar SMEs in Thailand 4.0 era.

The Relationship Between Innovation and Technology and Competitiveness of Coconut Sugar SMEs in Thailand 4.0 Era.

The review of literature showed that (Vrchota et al., 2019) has effectively explained the factors related to the relationship between innovation and technology and competitiveness of SMEs in 4.0 industry that technology and innovation in terms of communication can help improve the relationship between business and

customers effectively because the target customers in the present days have different lifestyles. Due to this, the entrepreneurs must use the correct communication technology to best suit their target market. Moreover, technologies also help improve the operational process with great effectiveness because the machines, equipment and software that are up-to-date will help reduce the cost of operation tremendously as well as reducing the cost of labor. More than that, the business will also be benefited from the response given by the customers that are properly kept in the system using technology such as E-market place etc. this will help that particular business to have the necessary data related to their customers for future business planning and help them to respond better to their target market. The same idea was discussed by (Durana et al., 2019) who explained that technology and innovation affect the increase rate of external business network because communication technology allows the entrepreneurs to contact their business partners for sharing operational resources and maintaining the relationship with other businesses in the same industry which could effectually reduce the cost of operation for SMEs. It was also found that applying technology and innovation for marketing communication will help stimulate brand awareness and purchase decisions of the customers and related parties and allow the business to have unique marketing communication strategies to differentiate themselves from other businesses. This will also help reduce the limitations in terms of business sizes because they can make use of technology for online marketing channels thereby increasing their business competitiveness to compete with large-scale business. (Grenčíková et al., 2019) also explained that small businesses tend to have more expenses related to marketing and cost of production because of lower quantity of production and lack of serious support from the management team and entrepreneurs. This is different with the case of businesses that makes use of technology and innovation to increase the knowledge of the personnel in the organization as well as communicating the benefits to interested parties both internally and externally.

Nevertheless, (Stojanova et al., 2019) explained that E-market place innovation and technology have relationship with responding to the needs of selected groups of customers because websites can categorize the products and services. All the activities that happen on the websites can make a difference effectively even though the business is small-scaled. Applying technology and innovation to business brings great result related to growth and business competitiveness. Business competitiveness majorly consists of cost leadership; unique difference and response to the needs are selected groups. The businesses that have organizational structure where the leaders are seen as change leaders will focus more on the operational result that is different from the previous ones and to do so they tend to make use of technology and innovation in order to increase the values of business operations by bringing in technologies to enhance the knowledge of the personnel. This also includes increasing the effectiveness of internal

communication and supporting operations such as using iCloud technology, social media etc.

The study of (Garcia-Muiña et al., 2018) also found that innovation and technology can help improve products and services of the business with concrete result because they bring about uniqueness that has never been presented to the market before (new product and service), new production processes, new marketing activities as well as new organizational structure. These all are the results from using innovation and technology to help improve the competitive of business to be able to compete with other SMEs in the same industry. Imran and Kantola (2018) explained that to support the relationship between technology and innovation that influence the competitiveness of SMEs, we must focus on two important factors which are internal relationship and external relationship. Technology and innovation started playing an important role in terms of cost leadership because technology can help reduce cost of operation with effective results. For example, iCloud technology helps the business to manage data more systematically. The external relationship mentioned above refers to the market place that can focus on external target market effectively by specifying and categorizing the products and services to best respond to selected groups of target market. For instance, tourists looking for trips with extreme activities etc. (Potjanajaruwit, 2018).

Research Methodology

The research on the innovation and technology of small and medium enterprises (SMEs) producing coconut sugar in Samut Songkhram province in Thailand 4.0 era adopted mixed method approach which includes qualitative research and quantitative research (Creswell, 2009). The researcher carried out the study in 3 phases which are: First, conducted research with the entrepreneurs who play important roles in developing innovation and technology of SMEs producing coconut sugar in Samut Songkhram province in Thailand 4.0 era which is a qualitative research by using in-depth interview to study the causal factors of innovation and technology that affect the competitiveness of SMEs producing coconut sugar in Samut Songkhram province in Thailand 4.0 era to use the gathered information as a guideline to create quantitative questionnaires. Second, conducted the study with 395 members of community enterprise group in Bang Kon Tee district, Samut Songkhram province about innovation and technology that affect the competitiveness of community enterprise which is a quantitative research done through survey research method using the questionnaire drafted from information gathered from the first phase to study casual factors of the innovation and technology of small and medium enterprises (SMEs) producing coconut sugar in Samut Songkhram province in Thailand 4.0 era and leadership. Third, conducted qualitative research by using focus group interview approach to study the innovation and technology of SMEs producing coconut sugar in Samut Songkhram province.

Table 2. Sample size of SMEs producing coconut sugar at Bang Kon Tee district, Samut Songkhram province, classified by sub-districts (Regnier, 2017)

SMEs producing coconut sugar at Bang Kon Tee district, Samut Songkhram province, classified by sub-districts.	Population	Sample group	Percentage
1. Kra Dang Nga	5,688	67.88	17.18
2. Bang Kra Sae	2,070	24.70	6.25
3. Bang Yee Rong	1,932	23.05	5.83
4. Heep Rong	2,192	26.15	6.62
5. Bang Kon Tee	2,393	28.55	7.22
6. Don Manora	4,200	50.10	12.68
7. Bang Phrom	2,826	33.72	8.53
8. Bang Kung	1,636	19.52	4.94
9. Jom Pluak	3,377	40.30	10.20
10. Bang Nok Khwaek	1,366	16.42	4.15
11. Yai Paeng	1,553	18.67	4.72
12. Bang Kra Bue	1,962	23.41	5.92
13. Ban Pramod	1,903	22.88	5.79
Total	33,098	395	100

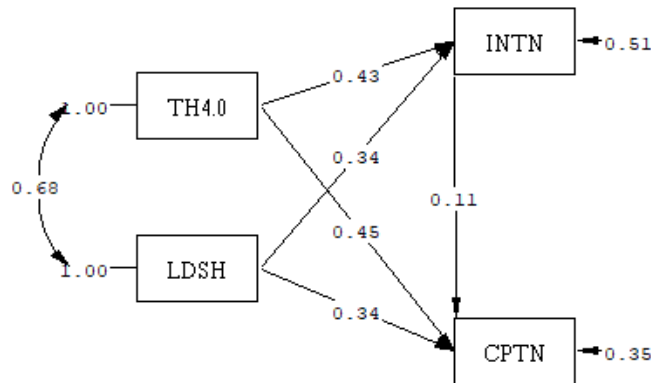
The sample group of this research are determined using cluster random sampling method by randomly picking samples from the population that are scattered or the population that are naturally group together (by geographic territory) (Ribeiro et al., 2018) where each group have similar overall characteristics. However, each group will have differences and similarities to reduce the discrepancy of population parameters estimation through the use of probability sampling. Step 1: classify the community enterprise group producing coconut sugar in Bang Kon Tee district, Samut Songkhram province that is divided into 13 administrative sub-districts which are 1. ,Kra Dang Nga2. ,Bang Kra Sae3. ,Bang Yee Rong4. ,Rong Heep5. ,Bang Kon Tee6. ,Don Manora 7. ,Bang Phrom 8. ,Bang Kung9. ,Jom Pluak 10. ,Bang Nok Khwaek11. ,Yai Paeng 12. Bang Kra Bue and 13. ,Next .Ban Pramod the researcher determined the sample size from the population and calculated the Medium Office of Small and) samples 935The result is .sample amount (Enterprises Promotion. As for data collecting, the researcher distributes documents containing a letter asking for assistance in answering the questionnaires, introduction letter of the researcher, questionnaires and directions to fill the questionnaires. The envelop addresses the researcher's address with stamp to facilitate the process of submitting the completed questionnaires which was the method done by Dillman (2000). The researcher started gathering information and carried out the research from 4 October 2018 to 30 March 2019.

The researcher used the above information to analyze and build a structural equation model:SEM to find the cause and effect of innovation and technology of coconut sugar businesses in Thailand 4.0 era. The theory and related researches were also studied to build own conceptual framework and determined that this

model of research must be related to empirical data by using LISREL for Windows version 8.80 program and carried out assessment of model fit to verify the linear structural relationship of research model and empirical data. This was done by using Chi-square, χ^2/df , CFI, GFI, AGFI, RMSEA and SRMR.

Result

The analysis of the effects of the variables in the causal model of innovation and technology of SMEs producing coconut sugar in Thailand 4.0 era (direct, indirect and overall effects) according to hypothesis and empirical data revealed that such model conforms to the empirical data.



Chi-Square=1.42, df=1, P-value=0.23358, RMSEA=0.033

Figure 1. Analysis of the effects of variables of causal model of innovation and technology of SMEs producing coconut sugar in Thailand 4.0 era.

It was found that the model conforms to the empirical data which are when considering the model fit indices which are Chi-square = 1.42, df = 1.00, P-value = 0.23358. It can be seen that the value of Chi-square is greater than 0 with no significance which implies that the acceptance of the main hypothesis that the causal model of innovation and technology of SMEs producing coconut sugar in Thailand 4.0 era conforms to the empirical data that matches with the analysis of GFI (Goodness of Fit) = 1, AGFI (Adjusted Goodness of Fit Index) = 0.98 which is close to 1 and RMR (Root Mean Square Residual) = 0.02 which is close to 0. When considering the direct effect that influence the innovation and technology (INTN) variable, it was found that such variable receive direct effect from Thailand 4.0 policy (TH4.0) and leadership (LDSH) where the direct effect is equals to 0.43 and 0.34 respectively which are the values that have statistical significance of 0.01. Apart from the direct effect that influence innovation and technology (INTN) variable, there are other variables that receive direct effect which are

competitiveness (CPTN) that is directly affected by Thailand 4.0 policy (TH4.0), leadership (LDSH) and innovation and technology (INTN) at the values of 0.45, 0.34 and 0.11 respectively which are the values that have statistical significance of 0.01. Additionally, it is also indirectly affected by Thailand 4.0 policy (TH4.0) and leadership (LDSH) through innovation and technology (INTN) at the values of 0.05 and 0.04 respectively, which are the values that have statistical significance of 0.01 and 0.05. Therefore, it can be concluded as follows:

1. Thailand 4.0 policy (TH4.0) has direct positive effect on innovation and technology (INTN) with direct influence value of 0.43, which is the value that has statistical significance of 0.01.
2. Leadership (LDSH) has direct positive effect on innovation and technology (INTN) with direct influence value of 0.34, which is the value that has statistical significance of 0.01.
3. Thailand 4.0 policy (TH4.0) has direct positive effect on competitiveness (CPTN) with direct influence value of 0.45, which is the value that has statistical significance of 0.01.
4. Leadership (LDSH) has direct positive effect on competitiveness (CPTN) with direct influence value of 0.34, which is the value that has statistical significance of 0.01.
5. Innovation and technology (INTN) has direct positive effect on competitiveness (CPTN) with direct influence value of 0.11, which is the value that has statistical significance of 0.01.
6. Thailand 4.0 policy (TH4.0) and leadership (LDSH) have indirect positive effects on competitiveness (CPTN) through innovation and technology (INTN) with indirect influence values of 0.05 and 0.04 respectively, which are the values that have statistical significance of 0.01 and 0.05.

Table 3. The result of hypothesis testing

No.	Hypothesis	Result
1	Thailand 4.0 policy has direct effect on innovation and technology of SMEs producing coconut sugar	Accept hypothesis
2	Leadership has direct effect on innovation and technology of SMEs producing coconut sugar	Accept hypothesis
3	Innovation and technology affect the competitiveness of SMEs producing coconut sugar	Accept hypothesis
4	Thailand 4.0 policy has direct effect on the competitiveness of SMEs producing coconut sugar	Accept hypothesis
5	Leadership has direct effect on the competitiveness of SMEs producing coconut sugar	Accept hypothesis

Discussion

The research on innovation and technology of small and medium enterprises (SMEs) producing coconut sugar in Thailand 4.0 era can be discussed in accordance to the research objectives as follows

Objective 1: To investigate the cause and effect of innovation and technology of small and medium enterprises (SMEs) producing coconut sugar in Thailand 4.0 era.

The results of the study showed that innovation and technology (INTN) has direct positive effect on competitiveness (CPTN) with direct influence value of 0.11, which is the value that has statistical significance of 0.01. This implies that if the business makes use of technology, for example, smart phones for payment of products or services (mobile payment) to enhance convenience to customers, makes use of cloud solutions for storing data online to reduce the cost of data storage, have electronic data systems to reduce operation costs and makes use of GPS tracking system to be one of the tools to help enhance the effectiveness of transportation, these will help increase competitiveness of SMEs producing coconut sugar in Samut Songkhram province. This conforms to the study of (Durana et al., 2019) who explained that technology and innovation in terms of communication can help improve the relationship between business and customers effectively because the target customers in the present days have different lifestyles. Due to this, the entrepreneurs must use the correct communication technology to best suit their target market. Moreover, technologies also help improve the operational process with great effectiveness because the machines, equipment and software that are up-to-date will help reduce the cost of operation tremendously as well as reducing the cost of labor. More than that, the business will also be benefited from the response given by the customers that are properly kept in the system using technology such as E-market place etc. this will help that particular business to have the necessary data related to their customers for future business planning and help them to respond better to their target market.

It was also found that Thailand 4.0 policy (TH4.0) and Leadership (LDSH) have positive indirect effect on competitiveness (CPTN) through innovation and technology (INTN) with indirect influence value of 0.05 and 0.04 respectively which are the values that have statistical significance of 0.01 and 0.05. This conforms to the study of (Grenčíková et al., 2019), which explained that governmental policies can play important roles in supporting and motivating the economy by introducing policies that support the growth of technologies for businesses and communicate such technologies to SMEs entrepreneurs to help increase their business values and reduce the cost of operations. In the initial stage, the government will impose a specific direction for the policy by limiting some of the rights to prevent excessive competition in the industry but will still provide enough independence for business operation. The government tries to solve the problem of business failures of SMEs and help them to survive better. (Garcia-Muiña et al., 2018) further provided an explanation on the important challenges of SMEs entrepreneurs.

It was found that most of the management teams, especially the highest manager of the organization who controls the overall business strategies, have started giving more importance to educating the employees of the business. It is seen that they try

to enhance the skills of the personnel by using technology and innovation to help bring effectiveness to the business operations and management. This positively affects the business competency of SMEs in long run.

Conclusion

Since innovation and technology variable influence the competitiveness of SMEs producing coconut sugar in Samut Songkhram province with statistical significance, it can be concluded that the entrepreneurs or any party that plays an important role in determining the innovation and technology of SME business must emphasize on activities or employees training related to information technology to bring about great values to business. Additionally, it will also help provide sustainable growth in terms of sales and increase competitiveness to further differentiate the company from the competitors within the same industry. For example, using applications to track information and apply them to employee training or making use of mobile payments for products and services to enhance customer's convenience and using cloud solutions for storing data to reduce cost of data storage and have electronic data systems to reduce operation costs as well as making use of GPS tracking system to be one of the tools to help enhance the effectiveness of transportation. These solutions will help increase competitiveness of SMEs and support business operation, which conforms to the concept of Thailand 4.0 etc.

References

- Bagheri M., Mitchelmore S., Bamiatzi V., Nikolopoulos K., 2019, *Internationalization Orientation in SMEs: The Mediating Role of Technological Innovation*, "Journal of International Management", 25(1).
- Creswell J.W., 2009, *Mapping the field of mixed methods research*, "Journal of Mixed Methods Research", 3(2).
- Dillman D.A., 2000, *Mail and Internet surveys: The tailored design method-2007 Update with new Internet, visual, and mixed-mode guide*, John Wiley & Sons.
- Durana P., Kral P., Stehel V., Lazaroiu G., Sroka W., 2019, *Quality Culture of Manufacturing Enterprises: A Possible Way to Adaptation to Industry 4.0*, Social Sciences, 8(4).
- Garcia-Muiña F., González-Sánchez R., Ferrari A., Settembre-Blundo D., 2018, *The Paradigms of Industry 4.0 and Circular Economy as Enabling Drivers for the Competitiveness of Businesses and Territories: The Case of an Italian Ceramic Tiles Manufacturing Company*, Social Sciences, 7(12).
- Garengo P., Trotta D., 2018, *Industry 4.0 key research topics: A bibliometric review*, 7th International Conference on Industrial Technology and Management (ICITM), IEEE.
- Genc E., Dayan M., Genc O.F., 2019, *The impact of SME internationalization on innovation: The mediating role of market and entrepreneurial orientation*, Industrial Marketing Management.
- Grenčíková A., Kordoš M., Sokol J., 2019, *The Approach to Industry 4.0 within the Slovak Business Environment*, Social Sciences, 8(4).

- Imran F., Kantola J., 2018, *Review of Industry 4.0 in the Light of Sociotechnical System Theory and Competence-Based View: A Future Research Agenda for the Evolute Approach*, International Conference on Applied Human Factors and Ergonomics, Springer, Cham.
- Potjanjaruwit P., 2018, *Competitive advantage effects on firm performance: A Case study of startups in Thailand*, "Journal of International Studies", 11(3).
- Regnier P., 2017, *Small and Medium Enterprises in Distress: Thailand, the East Asian Crisis and Beyond: Thailand, the East Asian Crisis and Beyond*, Routledge.
- Ribeiro D.C., Milosavljevic S., Abbott J.H., 2018, *Sample size estimation for cluster randomized controlled trials*, *Musculoskeletal Science and Practice*, 34.
- Stojanova H., Lietavcova B., Raguž I.V., 2019, *The dependence of unemployment of the senior workforce upon explanatory variables in the European Union in the context of Industry 4.0*, *Social Sciences*, 8(1).
- Vrchota J., Volek T., Novotná M., 2019, *Factors Introducing Industry 4.0 to SMEs*, *Social Sciences*, 8(5).
- Wajeetongratana P., 2017, *Environmental Accounting for Modern Business: Social Responsibility or Economic Competitiveness? (The Case of Thailand)*, "International journal of ecological economics & statistics", 38(4).

INNOWACJE I TECHNOLOGIE W MAŁYCH I ŚREDNICH PRZEDSIĘBIORSTWACH (MŚP) WYTWARZAJĄCYCH CUKIER KOKOSOWY W TAJLANDII W ERZE 4.0

Streszczenie: Celem tych badań jest zbadanie przyczynowych czynników wpływających na innowacyjność i technologię małych i średnich przedsiębiorstw (MŚP) produkujących cukier kokosowy w prowincji Samut Songkhram w erze Tajlandii 4.0. To badanie przyjęło podejście oparte na metodach mieszanych, które obejmuje badania jakościowe poprzez wywiady pogłębione i badania ilościowe poprzez zbieranie danych za pomocą kwestionariusza. Grupa próbna to 395 osób określonych przy użyciu losowego próbkowania klastra. Dane są analizowane poprzez Modelowanie Równań Strukturalnych: SEM i wywiady z grupą fokusową w celu potwierdzenia wyników badań. Stwierdzono, że zmienne polityki i przywództwa w Tajlandii 4.0 mają bezpośredni pozytywny wpływ na innowacje i technologię MŚP z cukru kokosowego, a technologia ma bezpośredni pozytywny wpływ na konkurencyjność MŚP. Poza tym stwierdzono, że polityka i przywództwo Tajlandii 4.0 mają pośredni pozytywny wpływ na konkurencyjność poprzez innowacje i technologię, gdzie wszystkie wpływowe zmienne mają znaczenie statystyczne.

Słowa kluczowe: innowacja i technologia, polityka Tajlandii 4.0, styl przywództwa, konkurencyjność MŚP

中国椰子糖中小企业 (SMES) 的创新与技术 4.0 时代

摘要: 本研究的目的是研究影响泰国 4 月份 Samut Songkhram 省生产椰子糖的中小企业 (SMEs) 创新和技术的原因。本研究采用混合方法, 包括通过深入访谈进行定性研究, 并通过问卷调查数据收集进行定量研究。样本组是使用整群随机抽样确定的 395 人。通过结构方程模型分析数据: SEM 和焦点小组访谈以确认研究结果。结果发现, 泰国 4.0 政策和领导变量对椰子糖中小企业的创新和技术有直接的积极影响, 技术对中小企业的竞争力有直接的积极影响。除此之外, 还发现泰国 4.0 政策和领导层通过创新和技术对竞争力产生间接正面影响, 其中所有有影响的变量具有统计意义

关键词: 创新与技术, 泰国 4.0 政策, 领导风格, 中小企业竞争力