

Guidelines to Increase Competitiveness of SMEs in the Manufacturing Sector in the Digital Economy

By

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Abstract

Increasing the competitiveness of SMEs is considered as strengthening and stabilizing the country's economic system. The purpose of this study was to investigate guidelines to increase the competitiveness of SMEs in the manufacturing sector in the digital economy. Both qualitative and quantitative studies were conducted. Questionnaires were used to collect the quantitative data from 500 executives in SMEs in manufacturing sector. Descriptive, referential, and multivariate statistics were used to analyze the data.

It was found that guidelines to increase the competitiveness of SMEs in the manufacturing sector in the digital economy were of 5 aspects arranged in the order of the obtained means of importance as follows: workforce ($\bar{X} = 4.30$), finance ($\bar{X} = 4.26$), marketing ($\bar{X} = 4.25$), internal process ($\bar{X} = 4.24$), and production process ($\bar{X} = 4.23$) respectively. The most important guideline item found in each aspect was: continuously developing personnel' skills to increase productivity; maintaining financial liquidity; keeping customer confidentiality; analyzing strengths, weaknesses, opportunities, and threats; and inspecting the product quality at every stage of production process, respectively. As for the hypothesis test, the study showed, as a whole, that executives in SMEs in manufacturing sector in the digital economy similarly recognized the importance of the studied guidelines at the statistical significance level of 0.05.

The analysis of the developed structural equation model revealed that it passed the assessment criteria and was consistent with the empirical data. The calculated values of probability of chi-square, the relative chi-square, the index of consistency, and the root mean squared error of approximation were 0.128, 1.098, 0.954, and 0.014, respectively.

Keywords: Competitiveness, SMEs, Manufacturing Sector, Digital Economy

Introduction

Strengthening Thailand's capacity through the 20-year national strategy under the vision of "Thailand is stable, prosperous, and sustainable as a developed country based on Sufficiency Economy Philosophy" aims to promote its role in more economic SMEs. However, it was found that the GDP structure of SMEs in the manufacturing sector to the national GDP declined as

shown in Figure 1

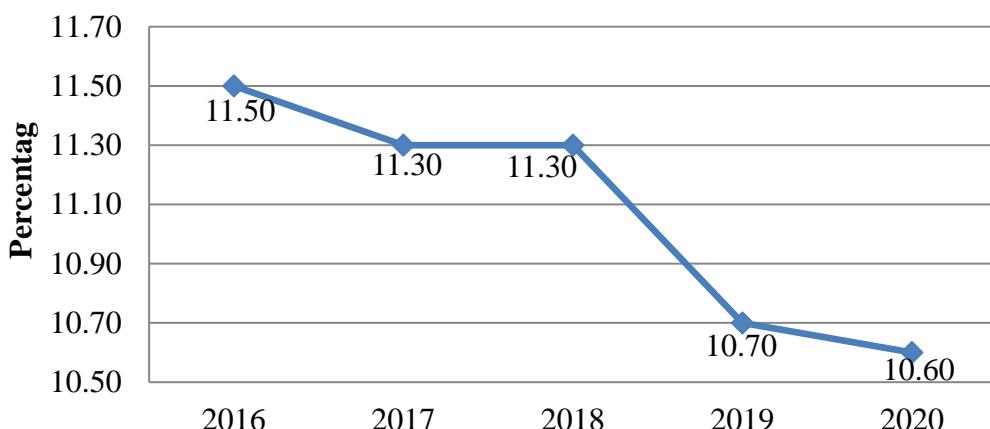


Figure 1: Comparison of SMEs' GDP proportion in the manufacturing sector during 2016-2020 (Office of Small and Medium Enterprises Promotion, 2021)

In Figure 1, the GDP structure of SMEs in the manufacturing sector during 2016-2020 accounted for 11.5, 11.3, 11.3, 10.7 and 10.6 percent, respectively. Over the past 5 years, the proportion of GDP of SMEs in the manufacturing sector has continued to decline.

Research objectives

- 1 To study the components of the approach to increasing the competitiveness of SMEs in the manufacturing sector in the digital economy.
- 2 To develop a structural equation model of the approach to increasing the competitiveness of SMEs in the manufacturing sector in the digital economy. Sustainable.

Research hypothesis

According to the research objectives and related literature, the researcher had formulated the hypothesis of theoretical research and could be summarized into 7 research hypotheses as follows:

- 1 H1 : Internal process directly influenced Marketing. ([Sahi, Gupta and Cheng, 2020](#)), ([Korpysa, 2020](#))
- 2 H2 : Internal process directly influenced Production process. ([Bouwman, Nikou and de Reuver, 2019](#)), ([Gamache, Abdul-Nour and Baril, 2019](#))
- 3 H3 : Internal process directly influenced Finance. ([Daxhammar et al., 2019](#)), ([Baah et al., 2021](#))
- 4 H4 : Finance directly influenced Workforce. ([Ndiaye et al., 2018](#)), ([Wahyono and Hutahayan, 2020](#))
- 5 H5 : Finance directly influenced Marketing. ([Lin, Su and Peng, 2018](#)), ([Lam et al., 2019](#))
- 6 H6 : Workforce directly influenced Production process. ([Sahoo and Yadav, 2018](#)), ([Naqshbandi and Tabche, 2018](#))

- 7 H7: Overall, the importance of the approach to increasing the competitiveness of SMEs in the manufacturing sector in the digital economy, classified by business size, was not different. ([Masood and Sonntag, 2020](#))

Methodology

This research was to create new knowledge using mixed methodology research.

Qualitative research was conducted using in-depth interview techniques. The 9 experts consisted of 3 industrial business administration experts, 3 government or related executives' experts, and 3 academic experts. The interview was conducted with open-ended questions considering the following 5 elements reviewed from relevant theories and literature: 1) internal process 2) marketing 3) production process 4) finance and 5) workforce. Index of Item Objective Congruence (IOC) was between 0.60–1.00 (acceptable > 0.5). The 100 questions of the 5 elements were tested and analyzed to determine the reliability of the questionnaire using Cronbach's alpha coefficient, resulting in a value of 0.978 (acceptable > 0.8). The results of the discriminant index analysis of the checklist were analyzed by standard deviation and the values were between 0.46–2.62. Similarly, the rating scale was performed by analyzing "Corrected Item–Total Correlation" and the values were between 0.38–0.66.

Quantitative research was conducted by sending questionnaires to SMEs executives in the manufacturing sector in the digital economy. There was a three-month process for collecting data from a total of 3,120 populations. The sample size of 500 cases (Comrey and Lee, 1992 referenced in Thanin, 2020) consisted of 250 from medium-sized enterprises and 250 from small-sized enterprises. The questionnaire was a checklist and rating scale. A weighted criterion based on the Likert 5-level scale was applied. Data analysis consisted of descriptive statistics and reference statistics using the SPSS package. Multiple statistical analyses and structural equation modeling were developed using the AMOS software package. There were four criteria for Evaluating the Data-Model Fit: 1) The chi-square probability was greater than 0.05. 2) The relative chi-square was less than 2.00. 3) The index of consistency was greater than 0.90. 4) The Root Mean Square Error of Approximation was less than 0.08.

Qualitative research was conducted using group discussion techniques. 11 experts had vouched for the Structural Equation Model as a way to increase the competitiveness of SMEs in the manufacturing sector in the digital economy.

Research results

Table 1: The results of the level of importance in the way to increase the competitiveness of SMEs in the manufacturing sector in the digital economy

Guidelines to increase competitiveness of SMEs in the manufacturing sector in the digital economy	Small-sized enterprises			Medium-sized enterprises		
	\bar{X}	S.D.	Level	\bar{X}	S.D.	Level
Overall	4.23	0.38	high	4.28	0.39	high

1. Internal Process	4.23	0.45	high	4.25	0.46	high
2. Marketing	4.20	0.44	high	4.30	0.40	high
3. Production Process	4.17	0.41	high	4.28	0.40	high
4. Finance	4.25	0.39	high	4.28	0.41	high
5. Workforce	4.29	0.38	high	4.32	0.45	high

Table 1 showed the overall importance level and the five factors of the structural equation model in the approach to increasing the competitiveness of SMEs in the manufacturing sector in the digital economy. Overall, small-sized enterprises were at a high level and the average was 4.23. When considering each aspect, it was found that all aspects were at a high level. In terms of workforce, the average was highest ($\bar{X} = 4.29$), followed by finance ($\bar{X} = 4.25$), internal process ($\bar{X} = 4.23$), marketing ($\bar{X} = 4.20$), and production process ($\bar{X} = 4.17$), respectively.

Moreover, overall medium-sized enterprises were at a high level and the average was 4.28. When considering each aspect, it was found that all aspects were at a high level. In terms of workforce, the average was highest ($\bar{X} = 4.32$), followed by marketing ($\bar{X} = 4.30$), production process ($\bar{X} = 4.28$ S.D. = 0.40), finance ($\bar{X} = 4.28$ S.D. = 0.41), and Internal process ($\bar{X} = 4.25$), respectively.

The results of the comparison of the importance level of the approach to enhancing the competitiveness of SMEs in the manufacturing sector as a whole according to the size of the industrial business found that there was no statistically significant difference at the 0.05 level

The congruence assessment criteria of the structural equation model in the approach to increasing the competitiveness of SMEs in the manufacturing sector in the digital economy were shown in Table 2.

Table 2. Statistics that assess the fit of the structural equation model before and after the model adjusted

Statistic	Criteria	Before	After
CMIN-p	Greather than 0.05	0.000	0.128
CMIN/DF	Less than 2.00	1.955	1.098
GFI	Greather than 0.90	0.692	0.954
RMSEA	Less than 0.08	0.044	0.014

In Table 2, the researcher adjusted the model according to Arbuckle's recommendation, using a program-derived evaluation method to exclude some of the improper observational variables one by one (Thanin, 2020). After adjusting the model, the chi-square probability (CMIN-p) was 0.128, which was greater than 0.05. The relative chi-square (CMIN/DF) was 1.098, which was less than 2.00. The index of consistency (GFI) was 0.954 which was greater than 0.90. The Root Mean Square Error of Approximation (RMSEA) was 0.014 which was less than 0.08. It was concluded that the model passed the assessment criteria and was consistent with the empirical data.

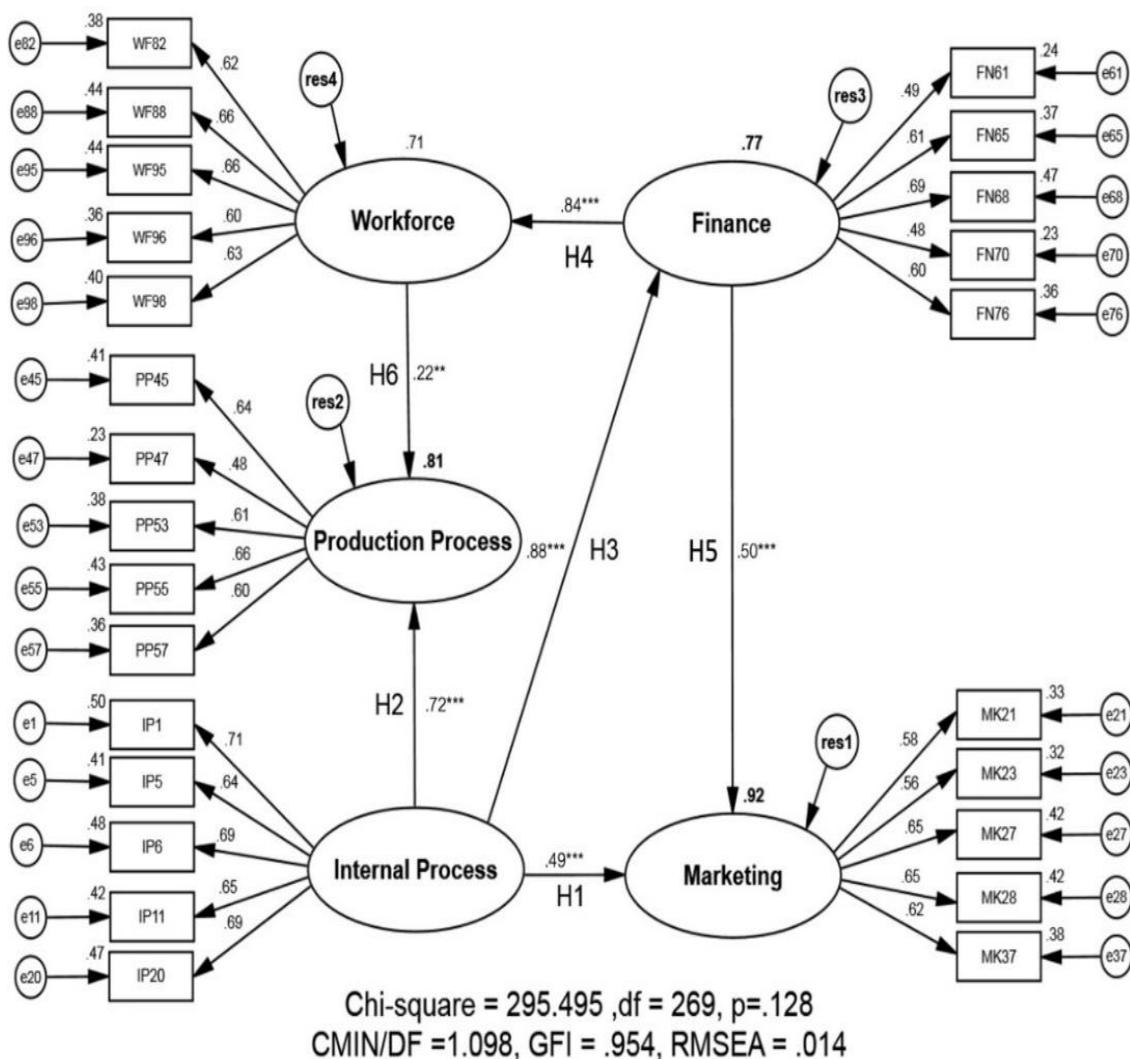


Figure 2: Structural equation model of the approach to increasing the competitiveness of SMEs in the manufacturing sector in the digital economy in Standardized Estimate mode.

In Figure 2, the results of the analysis of the causal influence between the variables in the structural equation model of the approach to increasing the competitiveness of SMEs in the manufacturing sector in the Standardized Estimate mode, it was found that Hypothesis 1: The internal process variables had a statistically significant direct influence on the marketing variables at the 0.001 level. The Standardized Regression Weight was 0.49. Hypothesis 2: The internal process variables had a statistically significant direct influence on the production process variables at the 0.001 level. The Standardized Regression Weight was 0.72. Hypothesis 3: The internal process variables had a statistically significant direct influence on the financial variables at the 0.001 level. The Standardized Regression Weight was 0.88. Hypothesis 4: The financial variables had a statistically significant direct influence on the workforce variables at 0.001 level. The Standardized Regression Weight was 0.84. Hypothesis 5: The financial variables had a statistically significant direct influence on the marketing variables at 0.001 level. The Standardized Regression Weight was 0.50. Hypothesis 6: The workforce variables had a statistically significant direct influence on the production process variables at 0.01 level. The Standardized Regression Weight was 0.22. The statistical values from the model analysis after adjusting the model were shown in Table 3.

Table 3: The statistics values from the analysis of the structural equation model after adjusting the model

Variables	Estimate		R^2	Variance	C.R.	P
	Standard	Unstandard				
INTERNAL PROCESS						
IP1	0.71	1.00	0.50	0.20		
IP5	0.64	1.00	0.41	0.29	13.28	***
IP6	0.69	1.28	0.48	0.36	14.35	***
IP11	0.65	1.01	0.42	0.28	13.57	***
IP20	0.69	1.19	0.47	0.32	14.29	***
MARKETING						
MK21	0.58	1.00	0.33	0.30		
MK23	0.56	0.99	0.32	0.32	10.23	***
MK27	0.65	1.16	0.42	0.28	11.28	***
MK28	0.65	1.11	0.42	0.26	11.27	***
MK37	0.62	1.16	0.38	0.33	10.94	***
PRODUCTION PROCESS						
PP45	0.64	1.00	0.41	0.26		
PP47	0.48	0.72	0.23	0.31	9.36	***
PP53	0.61	0.95	0.38	0.27	11.44	***
PP55	0.66	1.19	0.43	0.34	12.07	***
PP57	0.60	0.93	0.36	0.29	11.19	***
FINANCE						
FN61	0.49	1.00	0.24	0.47		
FN65	0.61	1.00	0.37	0.25	9.33	***
FN68	0.69	1.26	0.47	0.26	9.96	***
FN70	0.48	0.75	0.23	0.28	8.07	***
FN76	0.60	1.04	0.36	0.28	9.31	***
WORKFORCE						
WF82	0.62	1.00	0.38	0.25		
WF88	0.66	1.12	0.44	0.25	11.59	***
WF95	0.66	1.04	0.44	0.22	11.58	***
WF96	0.60	0.94	0.36	0.25	10.78	***
WF98	0.63	1.13	0.40	0.30	11.20	***

*** It was statistically significant at the 0.001 level

In Table 3, The statistics values from the analysis of the structural equation model after adjusting the model of five factor as detailed below.

Internal process consisted of five observational variables: Strategic planning clarity (IP1), the Standardized Regression Weight was 0.71. Benchmarking activities with business partners in the same group (IP6), the Standardized Regression Weight was 0.69 (C.R.=14.35).

Adoption of government policies related to SMEs (IP20), the Standardized Regression Weight was 0.69 (C.R.=14.29). Adoption of digital technology in business operation (IP11), the Standardized Regression Weight was 0.65. Strategic planning adaptation to changing circumstances (IP5), the Standardized Regression Weight was 0.64.

Marketing consisted of five observational variables: Building a customer database for quick browsing (MK27), the Standardized Regression Weight was 0.65 (C.R.=11.28). Skill development for salespeople (MK28), the Standardized Regression Weight was 0.65 (C.R.=11.27). Finding problems in the distribution and merchandising system (MK37), the Standardized Regression Weight was 0.62. Market research to study customer needs (MK21), the Standardized Regression Weight was 0.58. Product differentiation (MK23), the Standardized Regression Weight was 0.56.

Production process consisted of five observational variables: Adoption of Kaizen's suggestion to continuously improve the production process (PP55), the Standardized Regression Weight was 0.66. Production process planning for continuous product flow (PP45), the Standardized Regression Weight was 0.64. Application of innovation and modern technology to the development of production processes (PP53), the Standardized Regression Weight was 0.61. Machine maintenance planning (PP57), the Standardized Regression Weight was 0.60. Waste reduction (Defect) (PP47), the Standardized Regression Weight was 0.48.

Finance consisted of five observational variables: The establishment of freight cost control system (FN68), the Standardized Regression Weight was 0.69. Preparing accurate cost control reports (FN65), the Standardized Regression Weight was 0.61. Creating an organization database system to link the work system of every department (FN76), the Standardized Regression Weight was 0.60. Low-Interest Financing (FN61), the Standardized Regression Weight was 0.49. Capital optimization control (FN70), the Standardized Regression Weight was 0.48.

Workforce consisted of five observational variables: Promoting knowledge management to the workforce as a learning organization (WF88), the Standardized Regression Weight was 0.66 (C.R.=11.59). Establishing a clear and fair workforce performance appraisal system (WF95), the Standardized Regression Weight was 0.66 (C.R.=11.58). Organizing activities to build relationships between the workforce in the organization (WF98), the Standardized Regression Weight was 0.63. Manpower planning by the labor demands of business operations (WF82), Standardized Regression Weight was 0.62. Encouraging a good relationship between management and workforce (WF96), the Standardized Regression Weight was 0.60

Discussion

Research on ways to increase the competitiveness of SMEs in the manufacturing sector in the digital economy focuses on building sustainable competitiveness in today's rapidly changing technological environment. To create long-term success, the researchers summarized the key points by referring to five relevant research papers as detailed below.

When comparing the composition of SMEs' competitiveness enhancement in the

manufacturing sector as a whole, there were no statistically significant differences at the 0.05 level because SMEs had the same business practices. This was due to limitations in finance, knowledge of personnel, and production processes, as well as a lack of access to modern technology ([Masood and Sonntag, 2020](#)).

The approach to increasing the competitiveness of SMEs in the manufacturing sector in the digital economy in the workforce sector averaged 4.30, which was the highest average. It reflected the importance of the workforce directly affecting the manufacturing sector. Acquiring a competent and relevant workforce, motivating, building resilience, and HR development based on SHRM principles maintained the workforce within the organization (Sustainable Human Resources Management) ([Piwowar-Sulej, 2021](#)). There were three approaches to human-centered thinking: 1) ability development 2) working procedure and 3) conducive working environment to make the workforce work happily ([Flores, Xu, and Lu, 2020](#)).

Approaches to increase the competitiveness of SMEs in the manufacturing sector in the digital economy in terms of workforce, when considered on a case-by-case basis, found that continuous improvement in productivity skills for the workforce was averaged 4.55 and was at the highest level. This was the highest-average item for organizations to promote continuous learning in the workforce. The skills development outcomes for SMEs' workforces showed that the integrated learning model from technological infrastructure had a positive and significant influence on the level of productivity and profitability of SMEs ([Valdez-Juarez, Solano-Rodriguez, and Martin, 2018](#)). Empowering the workforce through the enhancement of productivity skills made the workforce more engaged in the organization, thus SMEs needed to focus on the training and motivation system that influenced the workforce ([Sahoo and Yadav, 2018](#)). Developing workforce skills to become proficient in digital technology increased productivity and supports sustainable and appropriate change ([Silpcharu and Noongam, 2020](#)).

The hypothesis testing results found that Internal processes had a direct influence on finances and the Standardized Regression Weight was 0.88, demonstrating that internal process management was essential for an organization's financial stability. Continuous product innovations made organizations more competitive, affecting the financial system and success of SMEs ([Daxhammer et al., 2019](#)). The adoption of green practices brought enormous benefits to reputation and overall performance, as well as positively affected corporate financial performance and competitive advantage ([Baah et al., 2021](#)). More importantly, access to funding sources was a key to entrepreneurs' business operations, especially acquiring low-interest funding sources from government policies ([Thawornsujaritkul, 2018](#)).

The hypothesis testing results showed that internal processes had the highest overall influence on marketing and the Standardized Regression Weight was 0.93 which was considered the highest. The empirical data showed that internal process management was essential to provide organizations with a marketing strategy that responded to customer needs. Product differentiation greatly affected market response ([Sahi, Gupta,](#)

and Cheng, 2020). Creativity and strategic transformation had a positive impact on the organization in terms of enhancing its corporate market position (Korpysa, 2020) (Boonnual and Thawornsujaritkul, 2021). Gaining an edge over competitors in the marketplace required creating innovative and differentiated products that delivered superior value to consumers (Srihabut, Jariyapoom, and Roopsing, 2021). and use digital technology to expand networks for marketing (Noorit, Thapayom, and Pornpundejwittaya, 2020)

Conclusion

The approach to increase the competitiveness of SMEs in the manufacturing sector in the digital economy consisted of 5 main components as follows.

Internal process: analysis of strengths, weaknesses, opportunities, and threats, clarity of business strategy, and optimal resource utilization

Marketing: confidentiality of customers, fair pricing, and building integrity and ethics for salespeople

Production process: product quality inspection, targeted production process management, and building a safe system of work

Finance: maintaining liquidity, generating a profitable return on investment, and clarity of payment systems and contracts.

Workforce: continuous improvement of workforce productivity skills, encouraging workforce participation, and conducive work environment.

Suggestions for next research

1. According to research, SMEs in the manufacturing sector have a shortage of skilled personnel, so all parties should focus on workforce and productivity skills development for the workforce. The education sector should research the development of SMEs' workforce in the manufacturing sector.
2. According to research, SMEs in the manufacturing sector still lose their business turnover and access to technology. Therefore, it is worthwhile to study the factors concerning access to funding and access to digital technology for the production process.
3. According to research, SMEs in the manufacturing sector cannot compete at the international level, and the products are not innovative to create value. Thus, the factors for creating product innovations and increasing the international competitiveness of SMEs in the manufacturing sector should be studied to elevate the organization towards future growth, including building long-term corporate competitive advantages and national economic stability.

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