# A Decision Making Model for Outsourcing Flexible Automation System in Automotive Industry to SMEs Entrepreneurs and Executives in Thailand

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## Abstract

For everyday society, the competition in automotive industry is highly competitive. Moreover, most of SMEs cannot survive by merely relying on their source of production. Hence, using contractor is considered as an effective strategy for handling the competition. Therefore, the investment was found that executives who proceeded the process by themselves required higher capital and they also had confidence that they could handle the changing of products easily and rapidly. The integration in cost unit was also low. On the other hand, if the outsource was used, no capital was needed. The new revolution was found that the government support had a positive effect of long-term capacity to the statistical significance causing the highest value to the path coefficient. This research aimed to analyze the relationship of latent variables as process improvement, government support, long-term capacity, and competitive priority for influence of adopting flexible automation. The survey was conducted by questionnaires to 311 management level samples by using structural equation model to analyze the outsourcing flexible automation system in automotive Industry to SMEs entrepreneurs and executives in Thailand. The confirmatory model of the variable question was consistent with the empirical data. The results of research findings had statistically significant relationships between all paths. and it is found that government support have a direct effect in positive to long-term capacity and the statistical significance is at the level of 0.01 and path coefficient has the highest value at 0.785. The significant finding illustrated that factors that mostly affect entrepreneurs' decision-making are competitive factors in quality, price, durability and quantity or flexibility of flexible automation system. However, an external factor that matters is Thailand's 20-year strategy, which mentioned that the government will support automotive industry

**Keywords**: process improvement; structural equation model; flexible automation system

## Introduction

In the past 250 years, starting from the beginning of the industrial revolution, the world encountered the biggest change. At present, we are in the 4th industrial revolution which is expected to have an influence on the industry significantly ( Jeehee Min, Yangwoo Kim, Sujin Lee, Tae-Won Jang, Inah Kim, & Jaechul Song, 2019).The new competition direction is developing and this leads us to " The New Way of Competition" in this 21st century that

some people might call the technology transformation. For this industry, it means that the existing process and parts of the inflexible process can be transformed by high technology computer with powerful internet. The products and intelligent machines can exchange technological basic data. Thus, it provides flexibility to either customized mass production or production quantity (Agus, A. & M.S. Hajinoor, 2012).Thailand has a competitive advantage over competitors since it is located on the center of the Association of Southeast Asian Nations (ASEAN) which has massive domestic market maintaining the strong supply chain as well as government' s policies that encourage investment. These factors have unceasingly attracted the world' s leading automobile manufacturers to set up production base in Thailand. The automobile manufacturers, who had more than 75% of production and turnover in the market, set Thailand as a one-ton pickup truck and eco cars' production base for the export in 2016. While the actual production produced 1.94 million units, it ranked the 12th of the world and the 1st of ASEAN. Moreover, the growth of 2017 and 2018 could be accelerated to 6-8% YoY and 8-10% YoY or approximately 2.1-2.4 million units and 2.3-2.33 million units of the production amount, respectively (Wanna Yongpisanphob, 2016). According the structure and situation happened, Small and Medium Enterprises (SMEs) involving in automotive parts market development required to seek new process such as Flexible Automation System (FAS), the outsourcing innovation created to satisfy clients' desires. As such, what they acquired was the continuous growth of cooperation in the future and their international activities that extremely attracted academic interests (Abebe & Angriawan, 2011).

However, SMEs were still notable for their high failure rate in international context. The unsatisfying performance was always executed by senior executives who lacked of international strategic decision-making (Musso, Fabio & Francioni, Barbara,, 2012). The rapid change of business environment brought organizations this trend (Utpal & Pragya, 2017) This trend increased the expenses for outsourcing, yet, it now became one of the strategies of organizations. Nevertheless, using an outsource related to the new organization's boundary and structure settings which might lead to the transition of number of employees, their roles and responsibilities (Sinha, P., Akoorie, M., Ding, Q. & Wu, Q. 2011). Adapting all changes to the process and personals was one of the most challenging tasks for managers in initiating outsourcing (Brown & Wilson, 2012). In order to handle possible changes after outsourcing,

the organizations were demanded to apply a smart way ( Sridarran & Fernando, 2013). The details about kinds of outsourcing consist of the Professional outsourcing , Manufacturing outsourcing, Process-Specific outsourcing, Operational outsourcing.The Manufacturing outsourcing this type is probably the most is the cost of creating your own product in the entrepreneur's area is very high. Worker's salaries and raw material costs are highly valued. However, if you outsource production from Thailand to China, you will receive a much lower cost per product. If comparing locally produced this is a rising trend. Companies are changing direction. To reduce costs as well as car manufacturers that use this process to reduce time and cost in assembling products Including monotonous processes such as installing windows in every car model.

Therefore, the aims of this study were to investigate the influence of process improvement, government support, long-term capacity, competitive priority, and flexible automation system. The results of this study will create formulation model for sustainable development and competition in the fields.

## Hypotheseis of research

This study was the influence of process improvement. While the terms process improvement would seem to imply the common goal of improvedoperational performance, there has been considerable of the Plan/Do/Check/Act with Eliminate/Combine/Rearrange/Simplify. (Anupama Prashar, 2017) suggests that continuous improvement is regarded as the extension of process improvement. (Boulos., 2015) From the above it is the origin of this hypothesis H1,H2,H3,H4 ; government support .The government set five more growth targets to accelerate Thailand’s future growth including automation systems .From the above it is the origin of this hypothesis H5,H6; long-term capacity. Thus, production capacity planning problems are mostly related to allocation of production capacity between orders and routing depending on different production environment(Yin-Yann Chen., Tze-Li Chen., & Cheng-Dar Liou, 2012) From the above it is the origin of this hypothesis H7,H8.and competitive priority. Five priorities in primary classic competition consisted of cost, quality, time, Innovation and flexibility (Jitpaiboon,2014) From the above it is the origin of this hypothesis H9.The involvement of each influencing factor, resulting in adopting flexible automation system in automotive Industry to SMEs entrepreneurs and executives in Thailand, thus the following as below.

**H1**: PRI. has a significantly positive and direct influence on COP.

**H2**: PRI. has a significantly positive and direct influence on AFA.

**H3**: PRI. has a significantly positive and direct influence on LTC.

**H4**: PRI. has a significantly positive and direct influence on GOS.

**H5**: GOS. has a significantly positive and direct influence on COP.

**H6**: GOS. has a significantly positive and direct influence on AFA.

**H7**: LTC. has a significantly positive and direct influence on COP.

**H8**: LTC. has a significantly positive and direct influence on AFA.

**H9**: COP. has a significantly positive and direct influence AFA.

## Research Framework

This study was to investigate the influence of process improvement(PRI),government support( GOS) ,long- term capacity( LTC) ,competitive priority( COP) ,adopting flexible automation(AFA).The conceptual framework is illustrated in Fig.1.

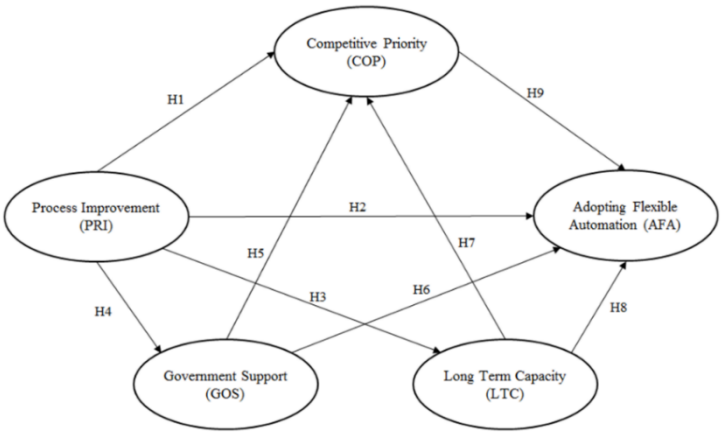


**Fig.1**. Representation of Conceptual Framework

## Research Methodology

**Methods and Questionnaires design:** The researcher used the questionnaire to design the variables of all by Conceptual Framework based on this research. The researcher used this method to gather data since the researcher studied numbers of researches with this method, subcontracting dimensions in the small and medium enterprises: study of auto components' manufacturing industry in India, as well as, the study of Barbara Francioni,

Fabio Musso, & Marco Cioppi, (2015), decision-maker characteristics and international decisions for SMEs. Thus, preliminary evidence of this method was that the aggregation allowed the use of complete data and the reinforcement rather than separation of collections, and quantitative data analysis. This research is a quantitative study with the objectives of surveying practices occurred at the same time of SME entrepreneurs and executives. Thailand has given a consistent opportunity to this study in achieving the third objective of capital, quality, and period of time. Before the questionnaire was deployed to starting a draft questionnaire was tested for validity by three experts, including academics and practitioners, using the Internal Objective Congruence (IOC) technique. From the calculation, the highest Cronbach's alpha coefficient value is 0.974. We can indicate that since every value is greater than 0.7(Tenenhaus et al.2005), the test can be concluded that there is the internal consistency and the operated test is reliable and accurate.

**Research population and sample size:** In the quantitative study, The population of companies in Thailand's automotive supply chain was approximately 1,700 companies in 2018, Thailand Automotive Institute, the targeted population in this study including positions relating to each part of Thailand's automotive industry.The targeted population of this study is from companies in Thailand's automotive. Therefore, the size of samples analyzed by SEM (Path Analysis) depended on the amount of latent variables. For normal distributed data, Kline, (2010) suggested the ratio of five to one and in this case, latent variables equal 26. To be more accepted and recommended that with rule of thumb, the ratio of ten to one is considered a lower bound for a suitable amount of sample sizes. Thus, the ratio of ten was selected. Two hundreds of sample sizes can analyze SEM. In this research, there are 26 of latent variables and the total amount needed is 260. In order to prevent errors, the researcher adjusted to sample sizes to 311.

**Data Analysis:** The researcher used the Confirmatory factor analysis and SEM to finding the direct, indirect and total effect each of the latent variables.

## Results

**Data reliability analysis:** The results of the data analysis shown in Table 1 portrayed that the Cronbach's Alpha of latent variables PRI (Process Improvement) equaled to 0.817, GOS (Government Support) equaled to 0.958, LTC (Long-Term Capacity) equaled to 0.956, COP (Competitive Priority) equaled to 0.914, AFA (Adopting Flexible Automation) equaled to

0.938. Cronbach's Alpha values of all variables used in this research were not lower than 0.700 ,which could be considered that the data were reliable and suitable for analysis of structural equations in this research.

**Structural Equation Model Analysis**: Structural equation model had an influence on applying flexible automation system, either in the form of investment or outsourcing, of auto-parts manufacturers in Thailand. It was found that the components consisted of 5 factors of latent variables including process improvement, government support, long-term capacity, competitive priority, and adopting flexible automation. Confirmatory model of the variable question was consistent with the empirical data considered from $\chi 2$ = 275.34, df = 251, p-value = 0.13952, RMSEA = 0.018, GFI =0.936 and AGFI = 0.911.

**Table 1** :Path Coefficient, Direct Effect, Indirect Effect and Total Effect of variable in SEM

| Result | GOS | | | LTC | | | COP | | | AFA | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Latent Variable | DE | IE | TE | DE | IE | TE | DE | IE | TE | DE | IE | TE |
| PRI | 0.522** | - | 0.522** | 0.304** | - | 0.304** | 0.113** | 0.428** | 0.541** | 0.203** | 0.185** | 0.388** |
| | (0.059) | - | (0.059) | (0.062) | - | (0.062) | (0.040) | (0.052) | (0.060) | (0.070) | (0.044) | (0.066) |
| GOS | - | - | - | - | - | - | 0.785** | - | 0.785** | 0.080 | 0.158* | 0.238** |
| | - | - | - | - | - | - | (0.041) | - | (0.041) | (0.096) | (0.078) | (0.065) |
| LTC | - | - | - | - | - | - | 0.060* | - | 0.060* | 0.113* | 0.012 | 0.125* |
| | - | - | - | - | - | - | (0.030) | - | (0.030) | (0.055) | (0.009) | (0.058) |
| COP | - | - | - | - | - | - | - | - | - | 0.201* | - | 0.201* |
| | - | - | - | - | - | - | - | - | - | (0.099) | - | (0.099) |
| $R^2$ | GOS | | | LTC | | | COP | | | AFA | | |
| | 0.273 | | | 0.092 | | | 0.744 | | | 0.216 | | |
| $\chi^2$= 237.47, df= 250, $\chi^2$/df= 0.950, P-value= 0.147, RMSEA= 0.017, GFI= 0.936, AGFI= 0.911 | | | | | | | | | | | | |
| Remark: DE = Direct Effect, IE = Indirect Effect and TE = Total Effect, * Significant at the level 0.05 (1.960 ≤ T-value < 2.576), ** Significant at the level 0.01 (T-value ≥ 2.576) | | | | | | | | | | | | |

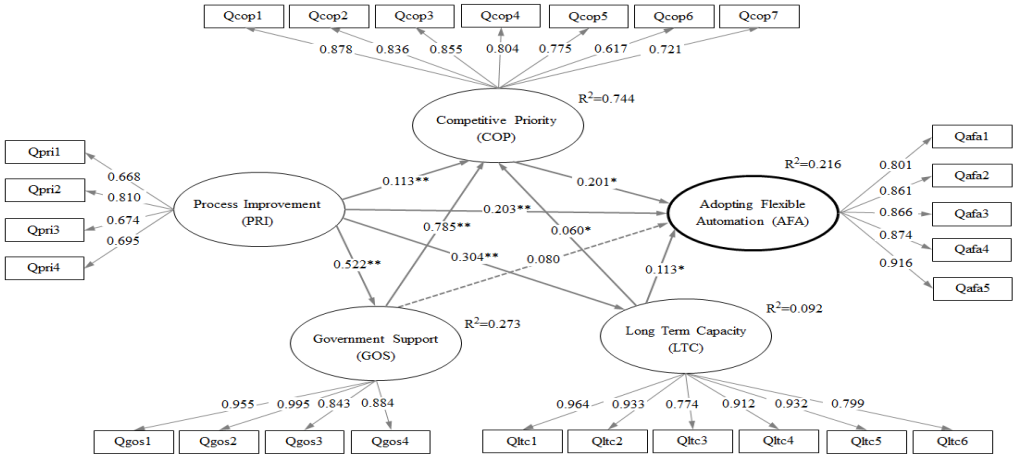


**Fig. 2** Overall Structure Equation SEM. have Influencing model to A Decision Making Model for outsourcing Flexible Automation System (FAS) in automotive industry of SMEs' Entrepreneurs and Executives in Thailand

For the Table.1 and Fig.2 was the meaning of T-Value or Critical Ratio from the Path Coefficients, Standard Errors and T-values of the adjusted Structural Equation Modeling for the * Significant at the level 0.05 (1.960 ≤ T-value < 2.576), ** Significant at the level 0.01 (T-value ≥ 2.576).

**The Result of research finding from the framework:**

From the result of this study, There are problems of suppliers in automotive industry. Most of entrepreneurs have different visions and missions, including identifying a clear return and outcome to make everyone understand that it is able to measure and identify the measurement criteria. Furthermore, it is also possible to accomplish purposes following existing business conditions, time, resources, and other relevant purposes. For the process improvement had a positive direct effect on competitive priority. The result of the research showed that the process improvement could directly influence on competitive priority in a positive way with statistical significance at the 0.01 and path coefficient 0.113 ;process improvement had a positive direct effect on adopting flexible automation in a positive way with statistical significance at the 0.01 and path coefficient 0.203 ;process improvement had a positive direct effect on long term capacity. The result of the research showed that the process improvement could directly influence on long term capacity in a positive way with statistical significance at the 0.05 and path coefficient 0.304 ;process improvement had a positive direct effect on government support. The result of the research indicated that the process improvement could directly influence on long term capacity in a

positive way with statistical significance at the 0.01 and path coefficient 0.522 ; government support had a positive direct effect on competitive priority. The result of the research depicted that the government support could directly influence on long term capacity in a positive way with statistical significance at the level of 0.01 and path coefficient = 0.785, which was the highest value in path coefficient of SEM,

Government support had a positive direct effect on adopting flexible automation. The result of the research showed that the government support could directly influence on adopting flexible automation in a positive way with no significance and path coefficient 0.080 .The result of the test was null but indirect had statistical significance at the level of 0.05 and path coefficient 0.158, The Government Thailand aims at economic value creation and innovative drive by changing from product manufactures into innovative products. Moreover, the country also emphasizes on supporting technology, creativity, and innovation in the targeted industries. Long term capacity had a positive direct effect on competitive priority. The result of the research portrayed that the long term capacity could directly influence on competitive priority in a positive way with statistical significance at the 0.05 and path coefficient 0.060, which was the smallest value in path coefficient of SEM. Long term capacity had a positive direct effect on adopting flexible automation.

The result of the research showed that the long-term capacity could directly influence on adopting flexible automation in a positive way with statistical significance at the 0.05 and path coefficient 0.113. Competitive priority had a positive direct effect on adopting flexible automation. The result of the research showed that the competitive priority could directly influence on adopting flexible automation in a positive way with statistical significance at the 0.05 and path coefficient 0.201. For the coefficient of determination ($R^2$), the causal variable in the model that was the latent variable was variance in variable of competitive priority at the percentage of 74.4 which meant that the coefficient of determination equaled 0.744, the highest value.,The coefficient of determination ($R^2$), the causal variable in the model that was the latent variable was variance in variable of government support at the percentage of 27.3 which meant that the coefficient of determination equaled 0.273., The coefficient of determination ($R^2$), the causal variable in the model that was the latent variable was variance in variable of adopting flexible automation at the percentage of 21.6 which meant that the coefficient of determination

equaled 0.216., The coefficient of determination ($R^2$), the causal variable in the model that was the latent variable was variance in variable of government support at the percentage of 9.2 which meant that the coefficient of determination equaled 0.092.As see in figure 5.1 there was model creation from equations in the field of flexible automation system which had an influence on the accomplishment by adjusting it to the outsourcing of Thailand's automotive parts.

## Conclusion

The result from general information illustrated that most of the samples were matured male and had families. Their educations were higher than bachelor's degree, their incomes were in executive level, and their years of experience were between 5-10 years (at the time of answering the questionnaire). This might be caused by the lack of labors. From the recent assessment of The Global Competitiveness Report 2019 or further development of eastern economic development plan or Eastern Seaboard, Thailand 4.0 strategic plan aimed at spatial development and Eastern Economic Corridor project preparation. Thailand was located in an important economic position having its middle and southern borders connected to seas while the northern part was connected with neighboring countries and China, each entrepreneur has foreseen opportunities and far-reaching economic potential. Their goals are to develop their businesses in Thailand and their future businesses to be a part of global economy and this is a strategic plan under Thailand 4.0. Therefore, from the past to the present, most of the participants have been knowledgeable in administration and engineering.Some of them graduated in engineering and further studied in administration. However, some of them graduated in administration and had a further study in computer sciences, technology, or production-related fields which can significantly respond to AFA of Thai entrepreneurs.

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