Factor Analysis of a Decision Making Model for Outsourcing Flexible Automation System in Automotive Industry to SMEs Entrepreneurs and Executives in Thailand

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Abstract

In the current globalization era, in the automotive parts industry. Thailand has become an important hub for automotive parts manufacturing and plays an important role in global economics become to important hub for automotive parts production due to low labor and production costs. In the new era, entrepreneurs and managers are extremely important in building a business survival method in a competitive environment and implementing change. In addition, flexible automation has become an important, as it provides system efficiency,which results in sustainable growth. Outsourcing has become very popular. In general, a sustainable system should have sufficient capacity to provide services without disruption. Especially in an economic crisis. Therefore, this article aims to examine the importance of change management to enable sustainable outsourcing in automotive parts.

The survey was conducted by using questionnaires to 260 SMEs, at least managers within SMEs manufacturer context. The results suggested significant relationship among SMEs decision to shift toward smart manufacturing by using by the outsourcing. If the changes emanating from outsourcing are managed satisfactorily, it would result in possible free of not disruptions. However, to make changes happen successfully is one of the most challenging tasks faced by the leadership and corporate management of the organizations.

This research contributes to the knowledge regarding the relationships among SMEs decision to smart manufacturing, flexible automation and benefit of outsourcing. To achieve a high level of SMEs decision to shift toward smart manufacturing in consistent quality, profitability, productivity and growing business to sustainability. SMEs must concentrate on inspirational motivation and utilization to improved manageability, improve flexibility, and achieve to advantage technologies to shift toward smart manufacturing.

The statistical significance has the highest value of factor loading not lower than 0.819. The significant finding illustrated that factors, mostly affect entrepreneurs' decision-making are competitive factors in quality, price, durability and quantity or flexibility of flexible

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automation system. Confirmatory model of the variable in 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 และ AGFI = 0.911

Keywords: SMEs, Smart Manufacturing, Flexible Automation, Outsourcing

Introduction

In the last 250 years since the beginning of the industrial revolution The world has experienced the biggest change. We are now in the 4th industrial revolution which is expected to have a great influence on the industry(Womack, Jones & Roos, 2008). New competitive direction That is developing and this requires us to use "New competitive methods" in the 21st century, which some may call it a change technology for the industry. This means that the process and the existing part of the process is flexible, which can be changed with advanced technology. Computer with efficient internet Intelligent products and machines are able to exchange basic technology information, therefore allowing for flexibility in custom production or production quantity (Agus, A. and M.S. Hajinoor, 2012).

Thailand has a competitive advantage over its competitors because it is located in the center of the Association of Southeast Asian Nations (ASEAN), which has a large domestic market that maintains a strong supply chain, including government policies that promote invest These factors have consistently attracted the world's leading car manufacturers to establish production bases in Thailand. Automobile manufacturers with more than 75% of production and turnover in the market make Thailand the one ton pick-up and eco-car production base for exports in 2016 while the actual production produced 1.94 million units. No. 12 in the world and No. 1 in ASEAN. In addition, the growth of 2017 and 2018 can accelerate to 6-8% YoY and 8-10% YoY, or about 2.1-2.4 million units and 2.3-2.33 million units of volume. Sequential production (Wanna Yongpisanphob, 2016. According to the structure and situation that occurs, small and medium-sized enterprises (SMEs) involved in the development of the automotive parts market need to seek new processes such as Flexible Automation System (FAS), which is an innovation created to meet the needs of Customer need What they have received is the continued growth of future cooperation and international activities that attract a lot of academic attention. (Abebe & Angriawan, 2011). The rapid change of business environment brought organizations this trend (Hui & Tsang, 2004). (Willcocks, 2010) 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 (McIvor ,2005). 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).

Therefore, the aim of this study is to study the influence of process improvement ,government support process, long-term capability, competitive priority, flexible automation. The results of this study will create a model for sustainable development and competition in the field.

Literature Review

This study for establish the conceptual models form latent variables to study.

Process Improvement

Globalization must increase the efficiency of wealth creation. Product and process innovation has been identified as a key success factor (Anand et al. 2009). While process improvement, conditions seem to indicate the common goal of improving operational efficiency, there is a Plan / Do / Check. / Act. with a eliminate / combine / rearrange / simplify (Bateman, 2005) shows that continuous improvement is considered an extension of process improvement (Boulos., 2015). Material Requirements (Nidaul H.,Effrizka P.,Nunung N. & Syarif H.,2019). Total Quality Management (Srinidhi K. Parthasarathi, PN Reddy & Rajeswara Rao KVS, 2017) Hill, 1987) Customer Relationship Management (Payne, 2006). Product durability (Boulos et al., 2015) Just In Time (Kinyua, 2015).

Government Support: Thailand is continuously developing economic models. The Thailand 4.0 Development Plan focuses on 10 target industries which can be divided into two parts. Developing existing industries adds value with advanced technology in five industries, including future cars, smart electronics, medical tourism, and obtaining high, efficient agriculture and biotechnology and innovation. The government sets five growth goals to accelerate Thailand's future growth, including automation and robots, aerospace, bioenergy and bio-chemicals and medicine and healthcare. Changes and developments in Thailand are important for the government, therefore increasing awareness among Thai and foreign investors is important in highlighting important opportunities and trends for domestic investment (Thailand Investment Review, January 2017)

Competitive Priority: The capability can display duty which must be done by production division in order to support business strategy and the significance of each group in order to explain the happened matters. Special attentions in manufacturing competition and considerable factors in competition of competing orders are topics of many empirical studies (Barney, J.B. and W.S. Hesterly, 2010). Four priorities in primary classic competition consisted of capital, quality, time, Innovation and flexibility (Jitpaiboon,2014). They mentioned similar issues in terms of product durability, confidence, reliability, efficiency, cost, investment,

quality, speed, rapid changing, and before and after-sales services. Our study focuses on David Z.Zhang (2011) which could illustrate in at least basic level. The difference of flexibility could be categorized into five different factors including price (Boksberger & Melsen, 2011; Piyapa Daengdet, 2014;), quality in Deming Cycle (Dudin, Frolova, Gryzunova, & Shuvalova, 2015),reliability (Zio E., 2013), product flexibility (Meriem, Luc, Stéphane, & Marc, 2015), and quantity flexibility(Abdulkareem S. Awwad, Adel A. Al Khattab, & John R. Anchor, 2013).

Long-Term Planning: The mission will be separated into three parts according to the planning scope. In expectation of new technology, procedures, and new products, including to support business strategic plans In the medium term, capabilities can be changed by buying and dismantling. It is worth noting that the production capacity is increasing with many machines, so most of the capacity planning problems are related to the allocation of production capacity between orders and routing depending on the different production environments. together Such problems of production capability can be divided into three main categories: single-site production planning, multi-site capacity planning without having to install a new website, supply chain network design (Yin-Yann Chen and Tze-Li Chen and Cheng-Dar Liou 2012)

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

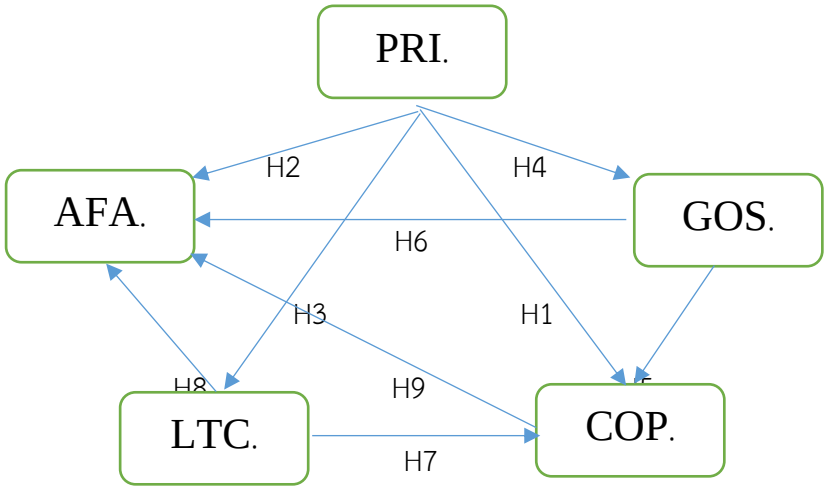

Fig. 1.Representation of Conceptual Framework

Hypotheses:This study was the influence of process improvement, government support, competitive priority and long-term capacity practice is 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 bellows.

H1:Process Improvement has significant a positive and direct influence on Competitive Priority

H2:Process Improvement has significant a positive and direct influence on Adopting Flexible Automation

H3:Process Improvement has significant a positive and direct influence on Long Term Capacity

H4:Process Improvement has significant a positive and direct influence on Government Support

H5:Government Support has significant a positive and direct influence on Competitive Priority

H6:Government Support has significant a positive and direct influence on Adopting Flexible Automation

H7:Long Term Capacity has significant a positive and direct influence on Competitive Priority

H8:Long Term Capacity has significant a positive and direct influence on Adopting Flexible Automation

H9:Competitive Priority has significant a positive and direct influence Adopting Flexible Automation

Methods and Questionnairs design: The researcher used the questionnaire to design all variables using the conceptual framework of the research. The researcher used data collection method because the researcher studied the number of research by this method such as subcontracting dimension. In small and medium-sized enterprises: a study of the automotive parts manufacturing industry in India, including the study of Barbara Francis, Fabio Musso, Marco Siop (2015). Decision makers and international decisions Therefore, the primary evidence of this method is the consolidation, allowing the use of complete data and reinforcement rather than separating the collection and analyzing the quantitative data. This research is a quantitative study with the objective of investigating the practice that occurs. At the same time, of SME entrepreneurs and executives Thailand has provided an opportunity consistent with this study to achieve the third objective of capital, quality and duration. Prior to the implementation of the questionnaire to begin the drafting, the questionnaire was tested for accuracy by three experts, including academics and practitioners, using the Internal Objective Congruence (IOC) technique based on the alpha coefficient calculation. The highest Cronbach is 0.974. We can specify that since all values

are greater than 0.7 tests, it can be concluded that there is internal consistency and the tests performed are reliable and accurate.

Sample population and sample size: In the quantitative study of the population of approximately 1,700 companies in the automotive supply chain in Thailand in 2018, Thailand Automotive Institute (TAI) (2010), the target population in this study includes positions related to the automotive industry. Each part of Thailand The population of this study comes from companies in Thailand. Therefore, the size of the sample analyzed by Path Analysis depends on the amount of latent variables. For normal distribution data, Kline, (2011) Bentler and Chou (1987) recommend a five-to-one ratio, and in this case, the underlying variable is 26.To make it more accepted and recommended using the rule of thumb, a ten-to-one ratio. Considered to be a lower scope for a suitable sample size. Therefore choose the ratio of ten to be Two hundred sample sizes can be analyzed. In this research there were 26 hidden variables and the total required number was 260. To prevent errors, the researchers adjusted the sample size to 311.

Data Analysis: The researcher use the Confirmatory factor analysis is a technique used to finding the direct, indirect and total effect each of the latent variables.

Results And Discussion

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, COP (Competitive Priority) equaled to 0.914, LTC (Long-Term Capacity) equaled to 0.956, 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 factor analysis in this research.

Confirmatory Factor Analysis Model: Confirmatory factor analysis 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 consist of 5 factors of latent variables including process improvement, government support, competitive priority ,long-term capacity, 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 และ AGFI = 0.911. to show in Fig. 2

Table 1 Data reliability analysis

(Total Items = 26, n = 311)

Latent Variable	Items	Corrected Item-Total Correlation	Cronbach's Alpha
PRI			0.817
	Qpri1	0.626	
	Qpri2	0.697	
	Qpri3	0.590	
	Qpri4	0.640	
GOS			0.958
	Qgos1	0.918	
	Qgos2	0.952	
	Qgos3	0.850	
	Qgos4	0.871	
LTC			0.956
	Qltc1	0.933	
	Qltc2	0.927	
	Qltc3	0.750	
	Qltc4	0.892	
	Qltc5	0.902	
	Qltc6	0.778	
COP			0.914
	Qcop1	0.793	
	Qcop2	0.792	

	Qcop3	0.775	
	Qcop4	0.721	
	Qcop5	0.732	
	Qcop6	0.624	
	Qcop7	0.739	
AFA			0.938
	Qafa1	0.822	
	Qafa2	0.877	
	Qafa3	0.792	
	Qafa4	0.839	
	Qafa5	0.839	

The results on the measurement Model of a Latent variable show result in Table 2 and the Confirmatory model of the variable shown in Fig. 2

Table 2 :CFA results on the measurement Model of a Latent variable/Items

Latent Variable	Items	Factor Loading	SE	T-values	R^2	AVE	CR
PRI						0.531	0.819
	Qpri1	0.864	0.042	13.040	0.491		
	Qpri2	0.864	0.041	15.555	0.642		
	Qpri3	0.905	0.042	12.500	0.460		
	Qpri4	0.805	0.041	13.750	0.533		
GOS						0.850	0.958
	Qgos1	0.931	0.030	22.731	0.909		
	Qgos2	0.931	0.029	24.493	0.988		
	Qgos3	0.906	0.032	18.826	0.717		

Latent Variable	Items	Factor Loading	SE	T-values	R^2	AVE	CR
	Qgos4	0.926	0.033	20.166	0.785		
LTC						0.791	0.957
	Qltc1	0.984	0.029	22.888	0.932		
	Qltc2	0.891	0.029	22.027	0.894		
	Qltc3	0.838	0.033	16.103	0.598		
	Qltc4	0.984	0.030	20.688	0.830		
	Qltc5	0.891	0.030	21.141	0.854		
	Qltc6	0.838	0.034	16.871	0.637		
COP						0.632	0.925
	Qcop1	0.818	0.034	18.574	0.839		
	Qcop2	0.802	0.034	18.349	0.757		
	Qcop3	0.924	0.035	16.411	0.675		
	Qcop4	0.833	0.038	15.997	0.645		
	Qcop5	0.833	0.037	14.796	0.571		
	Qcop6	0.691	0.038	12.743	0.417		
	Qcop7	0.845	0.037	14.344	0.518		
AFA						0.699	0.921
	Qafa1	0.864	0.033	15.228	0.641		
	Qafa2	0.864	0.032	16.489	0.732		
	Qafa3	0.864	0.034	16.492	0.728		
	Qafa4	0.905	0.032	17.814	0.784		
	Qafa5	0.805	0.032	14.648	0.615		

The development and improvement of flexible automation is used to survive the business of automobile parts manufacturers in Thailand, whether it is investment or outsourcing. The results of the confirmatory factor analysis are performed by including all the questions of each variable and then finding the mean used to represent each latent variable for use in the analysis of the confirmative factors, shown in Table 2 for loading the 5 factor factors. Of latent variables include government process support, long-term production capacity, competitive priorities, and the use of flexible automation. All latent variables have a load factor greater than 0.5 and the confirmation model of the variable question corresponds to the empirical data, which is determined by $\chi 2 = 275.34$, df = 251, p-value = 0.13952, RMSEA = 0.018, GFI = 0.936 and AGFI = 0.911.

In summary, all questions have passed the research criteria that influence the decision-making model for flexible automation outsourcing in the automotive industry of SMEs and top executives in Thailand, as shown in the table. 3

Goodness of Fits	Model Fit	Represent a Significant at
1)Factor Loading	0.645-0.994	>0.5
2)Chi_square (χ^2)/ Degree of Freedom (df)	1.0969	<2.00
3)P-Value	0.13952	>0.05
4)Root Mean Square Error of Approximation(RMSEA)	0.018	<0.05
5)Goodness of Fit Index (GFI)	0.936	≥ 0.9
6)Adjusted Goodness of Fit Index (AGFI)	0.911	≥ 0.9

Conclusion

The results of the general data show that most of the samples are male and mature and have families. Their education is higher than a bachelor's degree. Their income is at the executive level and their experience is between 5-10 years (at the time of answering the questionnaire). This may be due to lack of labor. Based on the latest assessment of the Global Competitiveness Report 2019 or the Eastern Seaboard's Eastern Development Board, Thailand 4.0 strategic plan focuses on spatial development and preparation of the Eastern Economic Corridor project. Since Thailand is in an important economic location that borders the sea in the center and the south, while the north connects with neighboring countries and China, each operator sees a broad economic opportunity and potential. far Their goal is to develop their business in Thailand and their future business to be part of the global economy and this is a strategic plan under Thailand 4.0. Therefore, from the past to the present, most participants have knowledge of Administration and Engineering Some people graduate in engineering and continue to study administration. However, some have graduated in management and have further education in computer science, technology, or production-related fields, which can significantly respond to AFA of Thai entrepreneurs.

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