THE SECOND ORDER CONFIRMATORY FACTOR ANALYSIS STRATEGIES TOWARD SUSTAINABLE EXCELLENCE IN THE INDUSTRIAL SECTOR

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ABSTRACT

Increasing the efficiency of management of industrial business sector is the foundational growth of Gross National Product (GDP), which affects sustainable competitiveness of a country in a long term. The research objective is to study the management strategy toward sustainable excellence in the industrial sector. It is a survey research to collect quantitative data from 500 executives about quality systems and sustainability in industrial organizations by using Second order Confirmatory Factor Analysis, consisting of 5 elements: Planning, Digital Technology, Workforce, Customer Focus, and Leadership. The analyzed model shows evaluation criteria, consistent with the empirical data, Chi-square at the probability level at 0.077, Relative Chi-square is 1.125, Goodness of fit Index is 0.992, and Root Mean Square Error of Approximation is 0.016.

Keywords: Strategy toward Excellence, Business Sustainability, Second Order Confirmatory Factor Analysis.

INTRODUCTION

National Economic and Social Development Council is the main unit of planning and formulating a balanced and sustainable national development strategy use important information Thailand's competitiveness ranking from International Institute for Management Development (IMD). From the ranking of the competitiveness of Thailand found that Thailand is still trapped in middle-income countries from the issues of the competitiveness of Thailand during 2017 - 2018, dropping 3 rank as shown in Table 1.

Table 1
WORLD COMPETITIVENESS RANKING DURING 2015- 2018

	2015	2016	2017	2018
Thailand	30	28	27	30

Source: IMD World Competitiveness Center (2018)

Table 2
BUSINESS EFFICIENCY AT 2017- 2018

Minor Category	**2017**	**2018**
1. Productive and Efficiency	41	40
2. Labour Market	8	6
3. Finance	24	24
4. Management	20	24
5. Attitude and Value	23	17

Source: IMD World Competitiveness Center (2018).

For the ranking of each factor in the efficiency of the business sector, it was found that the management dropped to 4 rank as shown in Table 2.

For sustainability information for national development According to the SDGs Index and Dashboards report produced by the Sustainable Development Solutions Network (SDSN), Thailand has also seen worse sustainability rankings in 2018, as shown in Table 3, which demonstrates the need for Thailand to devote resources and accelerate the development of industrial sector that will enhance competitiveness and the sustainability of the country.

Table 3
SUSTAINABLE DEVELOPMENT GOALS IN THAILAND COMPARED WITH NEIGHBORS

Sustainable Development Goals (SDGs Index)	2017	2018
Singapore	61	43
Malaysia	54	50
Vietnam	68	57
Thailand	55	59

Source: UN Sustainable Development Goals, 2018.

Therefore, the researcher is interested in developing model of modern management to increase the competitiveness of the industrial sector. Able to respond to stakeholders in a balanced and sustainable manner. The research on second-order confirmatory factor analysis of strategies toward to business excellence and sustainable in the industrial sector will contribute to achieving the goals of the national competitive advantage.

LITERATURE REVIEW

Polit & Beck (2008) define Factor analysis is a statistical method used to describe variability among observed, correlated variables in terms of a potentially lower number of unobserved variables called factors. Factor analysis searches for such joint variations in response to unobserved latent variables. The observed variables are modelled as linear combinations of the potential factors, plus error terms. Factor analysis aims to find independent latent variables devided in 2 types of factor analysis 1.) Exploratory factor analysis (EFA) is used to identify complex interrelationships among items and group items that are part of unified concepts. The researcher makes no a prior assumptions about relationships among factors and 2.) Confirmatory factor analysis (CFA) is a more complex approach that tests the hypothesis that the items are associated with specific factors. CFA uses structural equation modeling to test a measurement model whereby loading on the factors allows for evaluation of relationships between observed variables and unobserved variables. Structural equation modeling approaches can accommodate measurement error, and are less restrictive than least-squares estimation. Hypothesized models are tested against actual data, and the analysis would demonstrate loadings of observed variables on the latent variables (factors), as well as the correlation between the latent variables. In this paper, a model of second-order confirmatory factor analysis (S-CFA) to form a strategy to create excellence and sustainability.

Business excellence means operating a business strategy to be stable and reliable (Davison & Ou, 2017). A research has proven that different operating business strategies for organization excellence resulted in fewer risks of erroneous operations, which consequently reduced costs and created more revenues compared to competing organizations. Furthermore, they also created product value and services for customers and shareholders.

Management toward excellence is based on the Total Quality Management (TQM) concept that focuses on efficiency of deploying human resources and materials to achieve organizational objectives. There is a related research revealing that organizations used initial quality control system (QC) as the next step of quality system extension to a wider scope of quality assurance (QA) and they used TQM for quality management throughout the organization. for corporate sustainability. They also were committed to the responsibility for stakeholders regarding social, economic, and environmental impacts (Green, 2017).

Jankalová & Jankal (2018) conducted research that found the Business Excellence Model to be a tool for sustainability. This paper introduced the Business Excellence Model that creates sustainability there should be Leadership, Strategic and planning, Customers and stakeholders, Production process Social responsibility and Information Technology. There are 61 countries around the world develop quality and sustainability with the National Quality Award system, with 46% using the EFQM Excellence Model, another 24% using the Baldrige Criteria for Performance Excellence Model, and the remaining 30% using own style Excellence Model.

de Man & Strandhagen (2017) provides the concept of sustainability through systematic and continuous organizational management. There is an appropriate development of corporate culture to create sustainable competitiveness for a business. Organization excellence means to have a performing record better than that of competitors, and to be more capable of predicting future situations. The concept of sustainable competitiveness also refers to product designs that use less raw materials, utilize more recycling products, and extend the lifespan to sustainable development.

Koch & Windsperger (2017) identified business challenges at the present and the risks in various areas, such as environmental conservation, energy, climate change, human well-being, and operations of digital technology.

The brainchild of technology digital at the present is a main motivation in all elements of management toward excellence (Rachinger et al., 2018).

Theoretical concepts of the factors of business excellence and sustainable can be summarized as the source of the 5 dimensions shown in Table 4.

Table 4
THEORETICAL CONSTRUCT OF THE BUSINESS EXCELLENCE AND SUSTAINABLE MOLEL

Author	Planning	Digital Technology	Workforce	Customer Focus	Leadership
Davison & Ou (2017)			X	X	X
Green (2017)	X			X	X
Jankalová & Jankal (2018)	X	X	X	X	X
de Man & Strandhagen (2017)	X		X		
Koch & Windsperger (2017)		X			
Rachinger et al. (2018)		X			

According to previous concepts and theories, the researcher could summarize the second order confimatory factor analysis strategies toward excellence and sustainable in the industrial sector compose of 5 elements; Planning, Digital Technology, Workforce, Customer Focus and Leadership.

Research objectives

1. To analyze the second order confirmatory factor analysis strategies toward excellence and sustainable in the industrial sector.
2. To study the strategies of management toward excellence and sustainable in the industrial sector.

RESEARCH METHODS

The research instrument was a structured questionnaire with Rating Scale, setting a criterion for weighting of 5 levels according to the Likert method of 100 items. Index of Item Objective Congruence (IOC) has a value between 0.60-1.00. Power analysis is classified as Corrected Item – Total Correlation is between 0.31-0.85. The Alpha Coefficient is 0.98.

Subjects from 4,268 industrial organizations that have been certified with Quality Industrial Standard Institute, Ministry of Industry (Thai Industrial Standard Institute, 2018) were divided into 2 groups; small and medium - businesses and large industrial businesses with specifying sizes of the samples in the research. A sample of 500 subjects was chosen by simple random to be analyzed in the research (Silpcharu, 2020).

Data collection was done by means of meeting the subjects in the sample for interviews. Data analysis employed descriptive statistics by using SPSS. The multivariate statistical analysis used AMOS with 4 criteria according to the evaluation of data-model fit in the Arbuckle, which are 1) Chi-square Probability Level is greater than 0.05 2) Relative Chi-square is less than 2 3) Goodness of fit Index is greater than 0.90 and 4) Root Mean Square Error of Approximation less than 0.08 (Silpcharu, 2020).

RESEARCH RESULTS

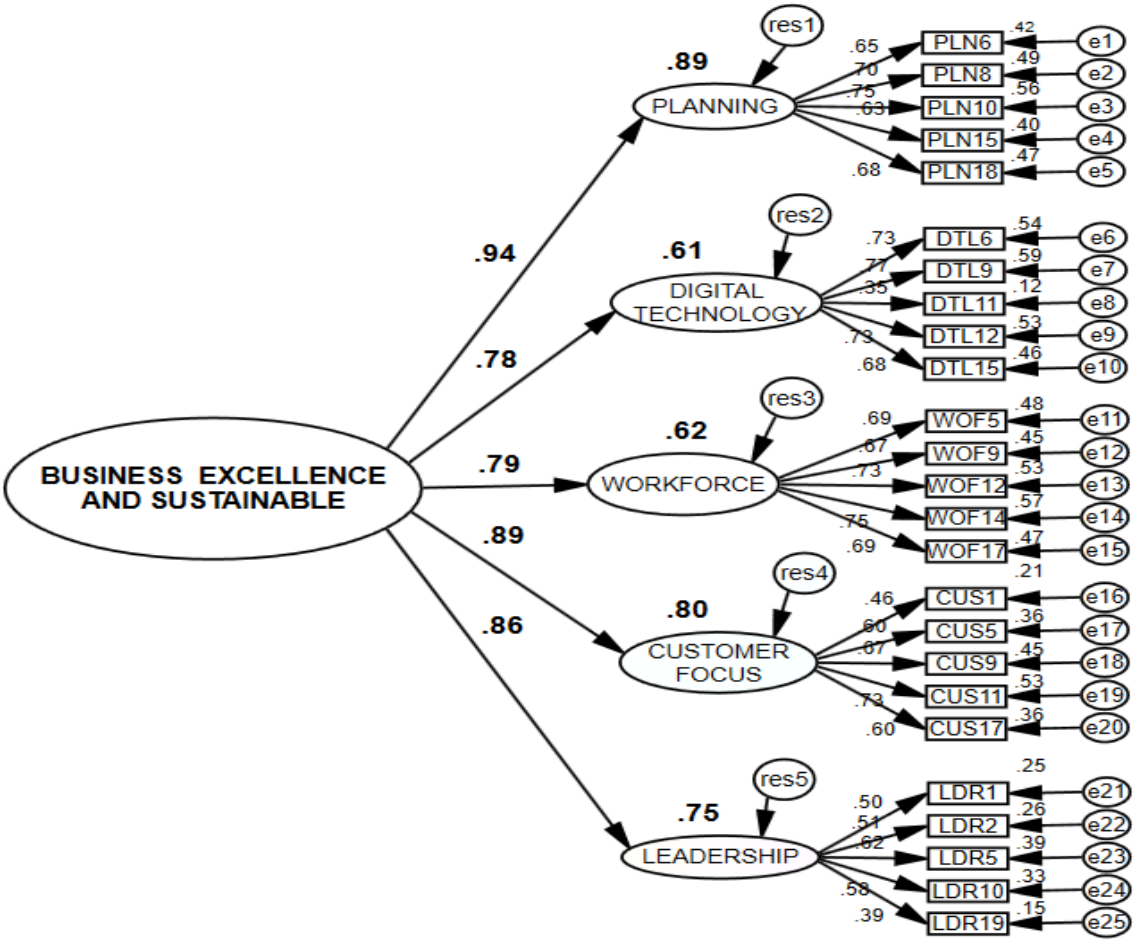
The results of the second order confirmatory factor analysis strategies toward excellence and sustainable in the industrial sector, as a whole. From Figure 1, it shows the statistical values, evaluates the consistency of the second order confirmatory factor analysis model, management strategy toward sustainable excellence in the industrial sector. After model improvements by modifying from the Modification Indices, Chi-square Probability Level = 0.077, Relative Chi-square = 1.125, Goodness of fit Index = 0.992 and Root Mean Square Error of Approximation = 0.016. Therefore, the second order confirmatory factor analysis model for strategies toward sustainable excellence in the industrial sector. After the improvement, it is in harmony with the empirical data. Strategy toward sustainable excellence in industrial sector consists of 5 latent variable can be ranked in descending order as follows: 1) Planning components have Regression Weight = 0.94, R^2 = 0.89 2) Customer Focus component has Regression Weight = 0.89, R^2 = 0.80 3) Leadership component has Regression Weight = 0.86, R^2 = 0.75 4) Workforce component has Regression Weight = 0.79, R^2 = 0.62 and 5) Digital Technology component has Regression Weight = 0.78, R^2 = 0.61

The results of the second order confirmatory analysis strategy toward excellence and sustainable in the industrial sector, in list. From Figure 1, the results of the second order confirmatory analysis strategy toward excellence and sustainable in industrial sector in 5 components are as follows:

Planning components consist of 5 observable variables which can be sorted by descending weight as follows: 1) PLN 10 has a logistics management system 2) PLN 8 supports research and new innovation. 3) PLN 18 has invested in modern production and maintained to

increase efficiency. 4) PLN 6 has been organized. Priority of the plan by creating a Critical Paths, and 5) PLN 15 has technology to control or reduce waste from production.

Digital Technology components consist of 5 observable variables, sorted by high to low weights as follows: 1) DTL 9 develops personnel to have knowledge and expertise in digital technology. 2) DTL 12 builds trust in the state of technological change. 3) DTL 6 educate s personnel about computer crime laws. 4) DTL 15 uses digital technology in electronic meetings and 5) DTL 11 employs digital technology experts to work as consultants for advices.



Chi-square = 303.736, df = 270, p = .077
CMIN/DF = 1.125, CFI =.992 , RMSEA = .016

FIGURE 1
THE SECOND ORDER CONFIRMATORY FACTOR ANALYSIS STRATEGIES TOWARD SUSTAINABLE EXCELLENCE IN THE INDUSTRIAL SECTOR

Workforce components consist of 5 observable variables, sorted by high to low weights as follows: 1) WOF 14 has an effective Knowledge Management 2) WOF 12 uses a performance evaluation system, clear and fair work 3) WOF 17 sets a clear Career Path for everyone to see

growth opportunities. 4) WOF 5 creates managers at all levels to have knowledge in human resource management, and 5) WOF 9 allocates employees' time to adhere to the concept of work-life balance.

The Customer Focus component consists of 5 observable variables which can be arranged in descending order by weight as follows: 1) CUS 11 creates a network to communicate with customers for efficiency. 2) CUS 9 surveys customer necessity for marketing planning. 3) CUS 5 suggests that products or services offered to customers must be diverse. 4) CUS 17 aims to support customers to succeed in their business operation, and 5) CUS 1 reveals company information that customers should know in order to show sincerity.

Leadership component consists of 5 observable variables which can be sorted by high to low weights as follows: 1) LDR 5 indicates a need for a vision and creativity to lead the organization to a sustainable success 2) LDR 10 suggests delegation and appropriate decentralization 3) LDR 2 has a good connection with all stakeholders 4) LDR 1 shows propensity to take risks and to make decisions in business operations, and 5) LDR 19 has the ability to use English or other foreign languages for effective communication

Results of the analysis of the important management strategies towards sustainable excellence in industrial sector, as a whole.

Table 5
MEAN AND STANDARD DEVIATION MANAGEMENT STRATEGIESTOWARD SUSTAINABLE EXCELLENCE IN INDUSTRIAL SECTOR

Management Strategies Toward Excellence and Sustainable for Industrial Sector	$\bar{x}$	S.D.
Management Strategy toward excellence	4.09	0.42
1. Planning	4.13	0.56
2. Digital Technology	3.88	0.59
3. Workforce	4.08	0.56
4. Customer Focus	4.17	0.49
5. Leadership	4.18	0.45

From Table 5, it is found that the importance of management strategies towards excellence and sustainable in the industrial sector as a whole is at a high level with an average of 4.09. Regarding the important management strategies for excellence and sustainable in each aspect, it is found that all aspects are at high levels, and they can be arranged in descending order as follows: 1) Leadership has an average of 4.18 2) Customer Focus has an average of 4.17 3) Planning has an average of 4.13 4) Workforce has an average of 4.08, and 5) Digital Technology has an average of 3.88.

Important level analysis of management strategies toward excellence and sustainable in the industrial sector: regarding the importance of a management strategies toward sustainable excellence in each item, it was found that all items were significant at high levels and they could be arranged in descending order from each side. The first 3 are as follows.

Planning: 1) the mean of Investing in modern production and maintenance to increase efficiency is 4.17, 2) the mean of Supporting research and new innovations has is 4.16, and 3) the mean of Having technology to control or reduce waste from production is 4.14.

Digital Technology: 1) Developing personnel to have knowledge and expertise in digital technology has a Mean at 3.95, 2) Building trust in technological changes has a Mean at 3.89, and 3) Using digital technology electronic meetings has a Mean at 3.87.

Workforce: 1) the mean of Creating executives at all levels to have knowledge in human resources management is 4.11, 2) the mean of Using a clear and fair performance evaluation system is 4.10, and 3) the mean of Having an efficient Knowledge Management is 4.09.

Customer Focus: 1) the mean of Focusing on supporting customers to be successful in business operations is 4.28, 2) the mean of Creating communication networks with customers for efficiency, convenience and speed is 4.17, and 3) the mean of Surveying customers' needs for marketing plans is 4.16.

Leadership: 1) the mean of Having a vision and creativity in leading an organization to a sustainable success is 4.48, 2) the mean of Having good relationships (Connection) with all stakeholders is 4.27, and 3) the mean of Bold thinking, risk taking and decision making in terms of how to conduct business is 4.10.

DISCUSSION & CONCLUSIONS

The most influential component of management strategies toward excellence and sustainable in industrial sector is Planning, with the weight of (Standardized Regression Weight) 0.94 and statistical significance at 0.001 due to good planning in production systems and ability to control costs to be lower than those of competitors. Findings from a research by Ribeiro et al. (2017) indicated that planning innovation products to create customer satisfaction was a means to create competitive advantage to become a leader in the industry. In addition, a production plan should focus on an attempt to reducing wastes and negative impacts on communities, society, and environments. This will adhere to the concept of sustainable development suggested by Del Baldo & Baldarelli (2017).

Having a vision and creativity in leading an organization to a sustainable success is a strategy toward excellence, as Leadership is of the utmost importance. A good leader should have a long-term vision and definite goals; an important reason is that vision can shape attention, designate a focus of organization management by combining various different components in the organization. It also determines the direction to achieve the goals. Having a good and long-term vision will enable the team, leaders and subordinates to follow a good and suitable direction. It is consistent with the Visionary Leadership in a Team-Oriented Setting article in the book Engaged Leadership by Worley (2018). It is safe to say that visionary leaders have a profound effect on employees' satisfaction and directly affect customer satisfaction, and they will make the organization ultimately successful. This corresponds to the Ph.D. research of Nwachukwu et al. (2017), of which the findings revealed that leaders with an organizational vision would be able to lead the organization to be socially accepted.

Focusing on supporting customers to be successful in business is a strategy toward excellence, as Customer Focus is of the utmost importance because customers' needs and expectations are important aspects of doing business. Needs are responded by personnel at all levels with customer-centricity (Hardcastle et al., 2017). It is important to motivate customers to become successful by focusing on supporting them. When customers are successful in business, they will have higher brand loyalty, and they will make the organization sustainably successful, which is consistent with the research findings of Iglesias et al. (2018).

Human resource development to cultivate digital expertise to support digital operation is a strategy to manage toward sustainable excellence, as Digital Technology is of the utmost importance, as digital technology recently has causes consumer behavior changes rapidly. The enabling factors are wireless communication via smart phone and the emergence of IoT (Internet

of Things). Another important factor is the availability of various applications on smart phones, including the cloud technology (Cloud) in the corner of processing and storing data at a low cost, data analytics that creates new information services, new business operations, and different ways of living. Cultural changes in many countries have generated similar behaviors globally. An important factor is managers must prepare people within the organization by educating and familiarizing themselves with the transition to the digital age. They must provide technologies to support daily work, work tracking, and system evaluation of those technologies (Paritala et al., 2017; Fisher, 2018).

From the results of the research suggested to industrial business organizations in Thailand focusing on development in 5 dimensions, including Planning, Customer Focus, Leadership, Workforce and Digital Technology will enable Thailand to manage and enhance the country's competitiveness. To escape from the middle-income trap country (Praewpailin & Ratchaphon, 2017) becoming a high-income country, in line with the goals of the National Economic and Social Development Council finally responding to improved competitiveness and sustainability rankings.

RECOMMENDATIONS

The private sector should operate with the principles of benchmarking management. The effectiveness of management for industrial sector in Thailand should be used as a guideline for evaluating the relative potential of key management strategies. Moreover, the principles will enable an organization to improve the development capability of industrial business and lead to an appropriate development. They will also create long-term organizational competitive advantage and national economic stability.

An important characteristic of strategies toward excellence factor is a focus on instilling values of strong corporate culture aiming at compliance with the principles of excellence, social responsibility, integrity and transparency. All of the characteristics mentioned above should be fostered as a principle. Basic improvement activities such as Total Productive Maintenance (TPM), Small Group Activities for loss reduction, and Standards of Work Safety System. These are the important priorities for a fundamental measure to achieve competitive competency.

The initial process of management toward excellence and sustainable in the organization consists of 5 steps. Step 1: establishing the basics of workplace safety systems, cleanliness, participatory maintenance by using 5 activities (5S) and production group activities as a starting point. Step 2: the ISO 9000 system should be established to lay out the work process with a uncompromising unified standard. Step 3: top executives must focus on having a vision, setting strategies and goals to lead the organization excellence, as well as caring for the community, society, and environments. They must cultivate the value focusing on excellence among employees in the organization awareness among the people in organization. This value must the norm underlining all activities in the organization. This is the most difficult step. Step 4: assessing the potential of excellence of the organization by using internal personnel or external experts through entering a contest for National Quality Award. The assessment can be used as feedbacks for improvement. Step 5: reviewing evaluation results to improve the organization according to the guidelines as provided. Repeating this process for many times will ultimately increase competitiveness, and it is a way to strive for excellence

Human resource management in the organization must look after employees individually according to their ages. Y or Z Generation employees (born after 2000s) should be considered to

be an important base of the workforce, and sooner, they will move up to management positions in the organization and become a major force to move the organization forward. Many successful organizations in the business sector pay attention to this group. From the survey concerning the commitment to large organizations, it was found that this employee group had an average score lower than a total average, and has a tendency to have needs different from those of Baby Boomers or Generation X groups. Therefore, work development in accordance with the behavior of this generation is needed, such as providing co-working spaces for them to feel more independent and more flexible working times that let decide when to work for 8 hours a day. They should be allowed to work at home 2 days a week, if there is no need to come to work in the office. All of these make employees feel more relaxed. The organization must adapt the culture to take risks from their ideas to create learning and lead to innovation. All of these reflect higher efficiency and effectiveness of work.

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