

# Using Structure Equation Model for Evaluating the Impact of Activity Based Costing towards Strategic Management Innovation and Performance of Firms in Industrial Estate Authority of Thailand

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## Abstract

The purposes of this research are (1) investigating the impact of activity-based costing toward strategic management innovation, (2) investigating the impact of strategic management in contributing to competitive advantages, and (3) investigating the impact of competitive advantages toward firm performance. The data were collected from firms in industrial estate authority of Thailand, composed of 53 industrial estates, for a total of 4,969 firms. 2,064 questionnaires were returned to be analyzed and described with descriptive statistics. The outcome of structure equation model, which was used to test the hypothesis, appeared to go accordingly with the empirical data. It appears that the impact activity-based costing contributes positively toward strategic management in the area of planning reliability, motivating effectiveness, and directing and quality controlling improvement ( $\beta = 0.82$ ,  $p < 0.01$ ;  $\beta = 0.76$ ,  $p < 0.05$ ;  $\beta = 0.58$ ,  $p < 0.05$ , respectively). In addition, these 3 areas of strategic management influences positively toward competitive advantages ( $\beta = 0.67$ ,  $p < 0.01$ ;  $\beta = 0.63$ ,  $p < 0.01$ ;  $\beta = 0.71$ ,  $p < 0.05$ , respectively). Moreover, the competitive advantages also give out positive influence toward firm performance ( $\beta = 0.86$ ,  $p < 0.01$ ). These findings could contribute greatly as an empirical data for firms as an importance of activity-based costing in competitive advantage and firm performance through strategic management innovation.

**Keywords:** Activity Based Costing, Strategic Management Innovation, Performance of Firms, Industrial Estate Authority

## Introduction

Purchasing Managers' Index (PMI) is widely used as an indicator of the growth of global manufacturing. As of January 2018, PMI was at 54.4 percent, slightly decreased from December 2017, but it was still higher than 50 percent, with the growing of all of the contributing factors (The Federation of Thai Industries, 2018). As PMI is above 50 percent, it indicates that the economy is growing. So it is very advisable that the manufacturers will focus on the output and associated activities to enhance production performance. The current competitiveness in the market also plays a key role in forcing many firms to adopt a new strategy in management to overcome opponents, especially in the area of production

cost. It appears that the excellent management of production cost would greatly improve the ability to manage, plan, and assess each part of the process. It is inarguable that the lower production cost along with higher sales could surely help firms in surviving through a crisis. The Industrial Estate Authority of Thailand (IEAT) is a government enterprise under the Ministry of Industry of Thailand. It was established by the Declaration of the Revolutionary Council No. 339, 13 December 1972, and became an Act in 1979, with 2nd, 3rd, and 4th revision in 1991, 1996, and 2007, respectively, to expand the development from industrial sector to service sector. The responsibilities of the authority are to create and organize industrial estates in a synergistic manner. It also has the responsibility to decentralize industrial activity away from the capital of Thailand by using 'industrial estate areas' as a mean (Industrial Estate Authority of Thailand, 2018.) This authority serves under the government of Thailand as a countermeasure to the fast growing industrialization and competitiveness. Industrial estates and the firms are the prominent part of Thailand GDP, as such the failure of this collective could result in a devastating magnitude ranging from customers, competitors, shareholders, board managers, and all of the employees. As a preventive measure, the adaptation of personnel level, firm level, sector level, and world level, is needed to survive through the crisis by increasing the profitability and improving organization effectively. The knowledge and information to assess the situation in industrial environment are hold in high regards, especially the one about production cost (Porter, 1990).

Activity-based costing is in a spotlight for both accounting management and corporate management. To respond to the growing competition in domestic trade and international trade, firms and organizations are focusing on the idea of lowering the production cost, the understanding of the cause of production cost, the validity of activity or task that needed to be re-evaluate to which improve firms performance, and the information of the cause of production cost that could be used in decision-making in planning and strategizing business model to achieve the desired goals (Panyayyingyong, 2010). The study of activity-based costing is needed to acquire for that purpose, however, the understanding of relationship of activity-based costing and management to create competitive advantages and firm performance is limited. Most of the previous researches were focusing on studying activities to reduce the cost of production for both products and services. This research will explore the expanded perspective of competitive advantages and firm performance. The objectives of this research are 1) investigating the impact of activity-based costing toward strategic management innovation, 2) investigating the impact of strategic management in contributing to competitive advantages, and 3) investigating the impact of competitive advantages toward firm performance.

## Literature Review

### Concept of Activity-Based Costing (ABC)

The information of production cost is vital in planning, deploying, and controlling within the firms. Firms could gain advantages in competition by using this information in an appropriate manner. However, firm with multiple services or products could not apply the manufacturing cost from the plant directly to the products themselves. The cost allocation is needed to assign the activities or resources rate as they were demanded in the process. The inappropriate and unjustified of cost allocation of shared resources or activities could lead to a misinformation, thus resulted in poor decision making. This information of cost allocation must be precise, appropriate, and traceable which is crucial for managerial positions to make decision for any related matters. The production cost of products could be classified into 3 categories: direct resources, direct labor cost, and manufacturing cost. As mentioned earlier, manufacturing cost is an indirect cost which could be allocated in 3

ways 1) Plant-Wide Overhead Rate, 2) Departmental Overhead Rate, and 3) Activity-Based Costing: ABC (Ditkaew, 2018). Even though departmental overhead rate could yield better precision in calculating the production cost than plant-wide overhead rate, both ways prove to lack accuracy in firms with complicated manufacturing process or disparate products. To get an accurate information, activity-based costing (ABC) could be used to get close to a true cost. ABC is effective in both job order cost system and process cost system. This method put the rate of activity in manufacturing process and allocate production cost as it was needed. To adopt this method of calculation, the firms must know the activities in the process of product and services production and the rate of activities. This system could help in strategizing, long-term planning, and creating production cost advantages in competition by focusing on activities. It puts the focus on indirect cost based on objective activities such as event or unit of tasks. This will describe the characteristics, timing, and output of those activities.

Yang (2018) said that activity-based costing (ABC) as developed by Cooper and Kaplan in 1988 that provide improvement accurate information in product and service cost. The ABC and its application in manufacturing environments have been widely discussed, e.g. Thyssen et al., 2006; Liu and Pan, 2007; Askarany et al., 2010; Israelsen and Jørgensen, 2011; Esmalifalak et al., 2015. Moreover, ABC has been widely used in various areas, such as sustainable public transport infrastructure planning, green building project cost assessment (Tsai et al., 2014; Yang et al., 2016). Hence, the concept of ABC in this study is applied to renewable many firms in industrial estate to provides evaluation costs for improving opportunities. The ABC model is composed of both the cost assignment view and the process view with activities as the intersection of these two views (Yang, 2018). The cost assignment view provides information about resources, activities, and cost objects. The process view provides financial and non-financial information about cost drivers and performance measures for each activity or process. This enables ABC to provide an understanding of how costs are driven by the demands for activities within a process, and more accurate product cost information for evaluating the profitability of the firm's product lines (Cooper et al., 1992). It allocates production cost as it is required in the production process based on the activities by using cost driver of those activities as a measurement or base. This cost driver is factors or tasks that make a change in activities and the cost of activities. To identify the cost driver, the amount of work and effort in doing that activity will be considered. The steps to identify the activity-based cost in cost allocation are as of the following (Ditkaew, 2018; Tsai and Lai, 2007; Schulze et al., 2012).

**Step 1: Categorizing and classifying the cost of activities** - This important beginning step is to analyze activities and cost driver. By analyzing activities, firms will know details, the number of responsible individuals, the consumption of resources, the time needed to finish, and the outputs of such activities. Activities defining could help in finding related individuals of that activity and further helping in categorizing and classifying the cost of activities.

**Step 2: Identifying the cost driver** - In identifying the cost driver, the factors contribute to the production cost must be analyzed to set up the base cost of activities. According to the theory, the cost driver could be classified into 2 types: volume driver and duration driver.

**Step 3: Calculating activity rate** - This step is to calculating the base cost of activity to be used in allocating the production cost to products, as it depends on the number of involved activities.

**Step 4: Cost allocation** - This final step is to assign and allocate indirect production cost into products accordingly to their number of required activities, and calculating the base production cost of each product which could reflect the true cost.

Many past researches used ABC as a tool to gain a better understanding of the ratio of production cost like in the work of Kingphadung and Woottichaiwat (2017). They integrated activity-based costing in the process of dairy pasteurization of a small plant to analyze various activities, both main and sub activities. They found that this system could reflect the true cost of all dairy-pasteurization related process. The comparison between the old system and this new system also revealed different of the base production cost of each flavored milk, and could even be used to decrease the production cost in each flavor. Srichan (2015) also researched in applying ABC in plastic wares importing firm. The revealed information proved to be helpful in budgeting to order products and preparing for firm's business model. In service industry, Panyayyingyong (2010) used this system to analyze a delivery firm to understand the activities and the production cost from receiving the packages, distributing the packages, and transport the packages to the main hubs in each part of Thailand. The study helped reveal the true cost and all related activities in the process, which further help in figuring out the production cost of each hub. Khuptawatin et al. (2016) also did a very similar research on pineapple logistics which the production cost was discovered and could be used in decreasing the production cost of logistics part.

Almeida and Cunha (2017) studied the integration of ABC in a manufacturing firm as a countermeasure in high competition environment. The study found that cost structure of the product and true production cost of activities and sub activities. Banker et al. (2014) studied the role of manufacturing practices in mediating the impact of ABC on plant performance. Subject of the study are US Manufacturing plants which revealed that world-class manufacturing practices completely mediate the positive impact of ABC on plant performance, and thus advanced manufacturing capabilities represent a critical missing link in understanding the overall impact of activity-based costing. The study of Stapleton et al. (2004), focusing on the firms that adopted ABC, showed that it 1) helped firms across the world to become more effective, 2) provides a clear picture of where resources are being spent, customer value is being created, and money is being made or lost, 3) identifies value-added activities, and 4) eliminates or reduces non-value added activities. This also yielded a very positive result when applying ABC to logistics and delivery industry. The production cost was discovered and could be used to promote firms performance (Baykasoglu and Kaplanoglu, 2008)

### **Concept of Strategic Management Innovation**

In recent years, 'innovation' was picked up and widely used to promote the opportunity in competition among firms. Due to its importance in creating chances and providing opportunity (Distanont and Khongmalai, 2018) in improving products and services and innovative application which could help in gaining advantages (Soloducho-Pelc, 2015). Firms with innovation could be able to sustain throughout the high competition period. Innovation would reflect firms' capabilities in developing new products and services, production abilities, new structurization, and evolving management work based on the innovation and contribute greatly in long-term success (Calantone et al., 2002; Crossan and Apaydin, 2010; Singjai et al., 2018). For strategy, Chandler, Porter, and Mintzberg, are leading strategy theorists in management theory. Sołoducho-Pelc (2015) says that the strategy is the strategy is understood as a specific intention, a plan for achieving the goals, so, if operation of firms with strategy will be manner of achieving the goals or the necessary resources. Moreover, Porter (2000) states that the competition strategy is about creating a uniqueness. Meanwhile Mintzberg (2009) describes the strategy as a pattern in a stream of decisions. It was concluded that strategic management innovation is composed of the analysis of strengths, weaknesses, opportunities, and threats (SWOT analysis). Strategic management consists of the analysis, decisions, and actions an organization undertakes in order to create and sustain competitive advantages (Cinar and Karcioğlu, 2013). Strategic

management innovation is crucial in business model and is a tool to help improve and maintain the competitive advantages (Misakova and Kosicova, 2014) including the role of managerial perception both in organizational decision-making and strategy formulation processes.

This research will explore strategic management innovation in the perception of analytical and decision-making and 3 main roles which could create opportunity and effectiveness in competitive advantages; 1) planning reliability, 2) directing and motivating effectiveness, and 3) quality controlling improvement. Planning reliability is the core to establish objectives and options as a guidance in both short-term and long-term through budget analysis. Budget analysis will be used in quantity planning to set up strategy, and act as a baseline for mandatory tasks. Directing and motivating effectiveness are the responsibilities of managerial positions. They must direct and guide to achieve the stated objectives through effective and great communicative skills. This position also requires great skills in motivating peers to reach the goals, while helping make decisions for the benefits of enterprise. Quality controlling improvement is the role to make sure that the plan is executed properly and smoothly, and going accordingly to the plan, by set up the standard of work and by reporting the actual progress of the work, comparing to the plan, to see the effectiveness and the progress of work, and even possible amendments or improvements of the processes.

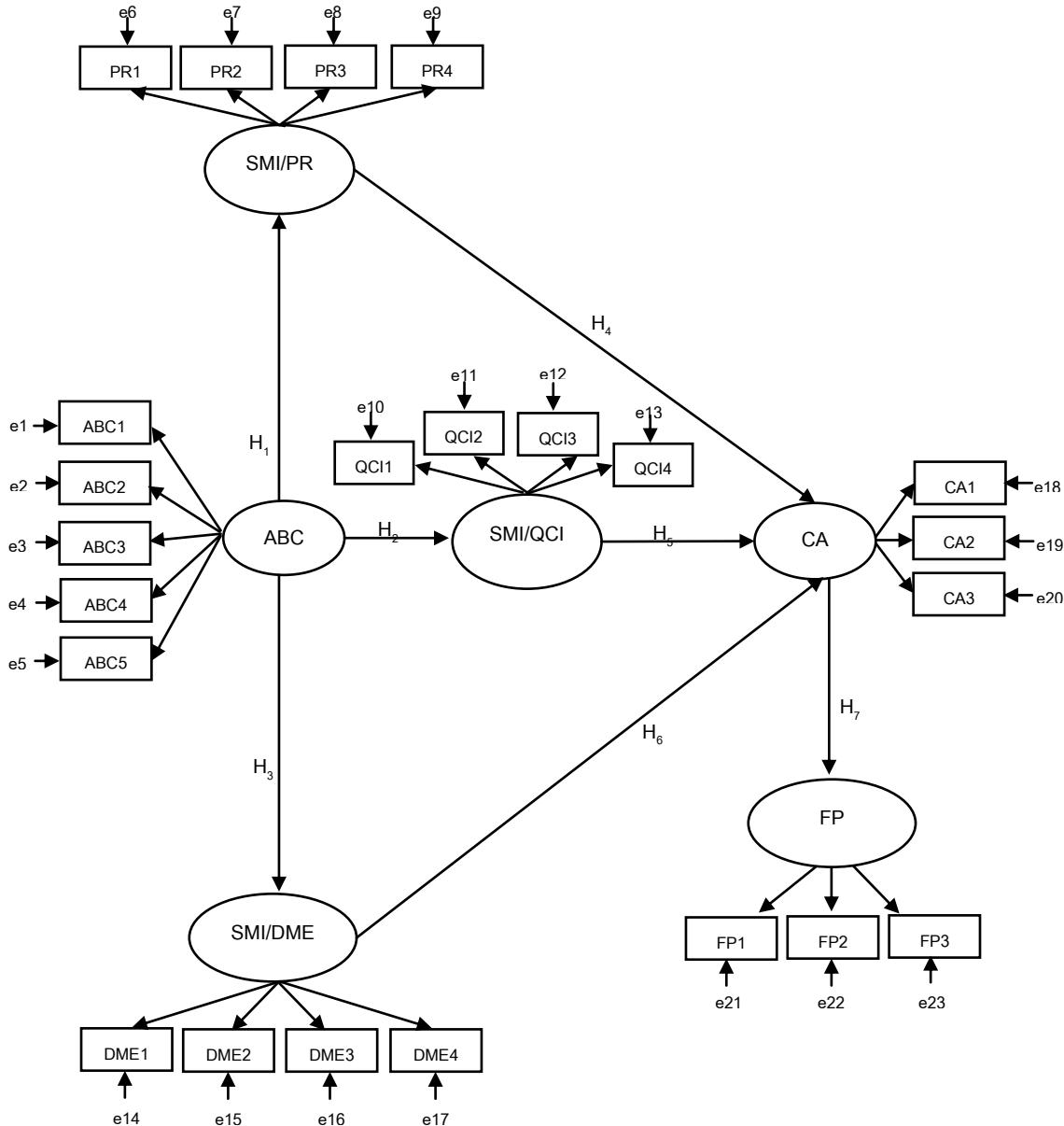


**Figure 1:** Strategic Management Innovation

#### **Concept of Competitive Advantage and Firm Performance**

As innovation became vital in the present as a mean to create competitive advantages, which Porter (1985) mentioned the uniqueness that can be used to compete with competitors. Strategic management innovation could lead firms to achieve perfect management, precise planning, effective directing, and excellent controlling, which maximizes in-firm performance, and increases production of high quality products and services to satisfy customer. The ability to apply this strategy could lead organization to create long-term competition by gathering

knowledge, skills in technology, and experience in creativity and development and introducing new ideas in the form of product innovation, process innovation, or business model innovation (Distanont and Khongmalai, 2018). Moreover, a competitive advantage exists when the firm is able to deliver the same benefits as competitors but at a cost advantage, or deliver benefits that exceed those of competing products (differentiation advantage). Thus, a competitive advantage enables the firm to increase its performance and create superior value for its customers and superior profits for itself (Stonehouse and Snowdon, 2014).



**Figure 2:** Theoretical Framework

The mentioned idea could be linked to the theoretical framework based on resource-based view of the firm theory (RBV Theory). This theory contributes greatly to the area of competitive advantages and firm performance. Barney et al. (2011) describes that RBV involves firms' capabilities and resources that could create potential in competitive advantages. The characteristics of RBV include unique, harmonious, precious, valuable, irreplacable, and irreplaceable of skills and resources of firms to produce such advantages. The resources with

unity could be prominently helpful in providing advantages for firms in a long-term. These create a competitive advantage difficult to replicate. As such, this research views ABC as a valuable skill of firms in calculating production cost, as it could provide a beneficial insight of the true production cost of products. With this knowledge, firms would use strategic management innovation to gain competitive advantages and excellent firm performance in a long run.

## Research Methodology

### Population and research samples

The population of this research came from 4,969 firms and organization in 53 industrial estates across Thailand ([www.iet.go.th](http://www.iet.go.th), 2018). For each variable, 10-20 samples were assigned as it was calculated by Statistical Package Software SPSS-AMOS and abided by rule of thumb (Hair et al., 2010), thus the total samples of this research must be more than 460 firms. The researchers deployed questionnaires to the whole population, and 2,064 of them were returned, for 41.54 percent of total, which is in an acceptable range.

### Research Instrument and Validation

The instrument of this research is questionnaire. The instrument is developed by analyzing and defining variables from literature review process to create 5-point Likert scales. The questionnaires were validated by 3 experts within the field of management accounting and activity-based cost allocation for contents, language, and objectives to calculate index of congruency (IOC). The questionnaires were revised based on experts advice and then tested on non-samples of 30 people to find item-total correlation which is more than 0.4 (Kline, 2010). Based on the score, the items were picked to analyze for reliability of questionnaires. The Cronbach's Alpha coefficient is between 0.79-0.84, which is higher than 0.7, signifying that every elements has high reliability (Hair et al., 2010; Kline, 2010). The composite reliability is ranging between 0.75-0.82, higher than 0.7, showing that observed variables could test latent variable of structure equation model and is in a good level. Average Variance Extracted is higher than 0.4, indicating that variance of error is lower than variance of observed variables. It could be concluded that the validity of this structure equation model is in a good level as showing in table 1.

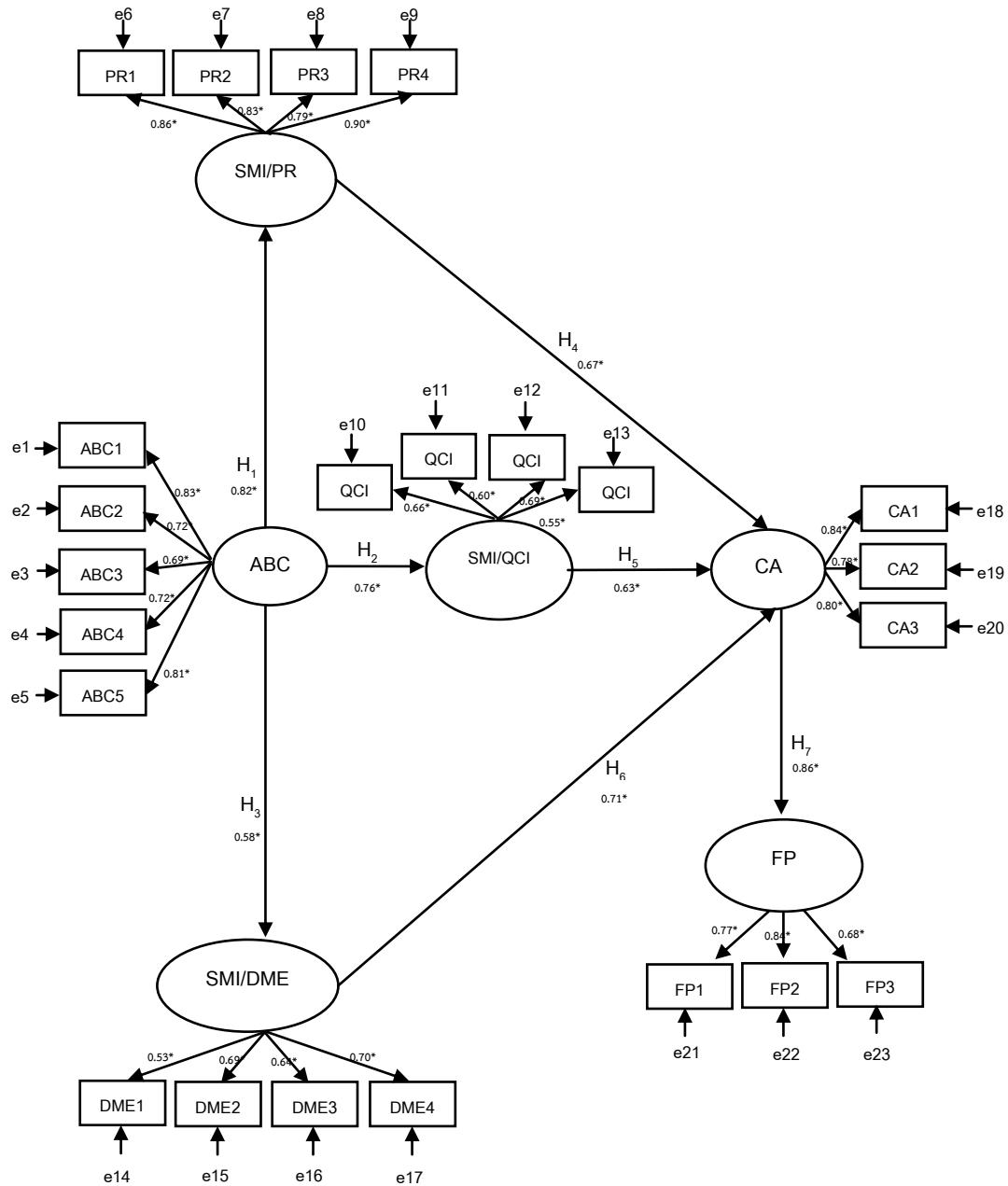
**Table 1** Content Validity and Construct Validity

Variables	Question Items	Item-total Correlation	Alpha Coefficient	Composite Reliability	Average Variance Extracted
Activity-Based Costing	10	0.65 - 0.70	0.84	0.82	0.50
Strategic Management	8	0.64 - 0.68	0.82	0.82	0.52
Innovation: Decision for Planning Reliability					
Strategic Management	9	0.59 - 0.67	0.80	0.80	0.54
Innovation: Quality					
Controlling					
Improvement					
Strategic Management	8	0.66 - 0.70	0.82	0.81	0.45
Innovation: Directing and Motivating					
Effectiveness					
Competitive Advantage	6	0.69 - 0.74	0.79	0.80	0.48
Firm Performance	6	0.70 - 0.75	0.80	0.75	0.51

## Data Analysis

The data is analyzed and explained by using descriptive statistics, mean, standard deviation, frequency, and percentage; and Structural Equation Modeling: SEM software to test hypothesis.

## Result



**Figure 3:** Result of Structural Equation Model Testing

( $\chi^2/df = 1.96$ , p-value of Chi-square = 0.197, GFI = 0.95, AGFI = 0.97, CFI = 0.99, and RMSEA = 0.03)

The goodness of fit of empirical data and model factor analysis appears to be in an excellent level. The statistic criterion indicators of model fit include Chi-square/df = 1.96, p-value of Chi-square = 0.197, GFI (Goodness of fit index) = 0.95, AGFI (Adjusted goodness of fit index)

= 0.97, CFI (Comparative fit index) = 0.99, and RMSEA (Root mean square error of approximate)

= 0.03. All of them are in a positive level, indicating a high level of model fit.

Figure 3 demonstrates the analysis of relativity of among latent variables with standard coefficient and latent variables with observed variables with factor loading of every variable with statistics significance ( $p < 0.01$ ). The relationship between each variable also being shown. As ABC has positive influence to strategic management innovation in all 3 aspects; decision for planning reliability, quality controlling improvement, and directing and motivating effectiveness ( $\beta = 0.82, p < 0.01$ ;  $\beta = 0.76, p < 0.05$ ;  $\beta = 0.58, p < 0.05$ , respectively), accepting hypothesis H1-H3. In testing hypothesis 4 to 6 about strategic management innovation in 3 areas towards competitive advantages, it was revealed that strategic management innovation has positive influence to competitive advantages ( $\beta = 0.67, p < 0.01$ ;  $\beta = 0.63, p < 0.01$ ;  $\beta = 0.71, p < 0.05$ , respectively), accepting hypothesis 4 to 6, and also accepting hypothesis 7 in positive influence of competitive advantages towards firm performance ( $\beta = 0.86, p < 0.01$ ).

## Conclusion and Discussion

Measures of goodness of fit of model in theory shows that model has a good fit with empirical data, confirming positive influence activity-based costing upon strategic management innovation in decision for planning reliability, quality controlling improvement, and directing and motivating effectiveness. This finding is based on the perspective of cost allocation of production cost from ABC to reflect the true cost of products. This information could be used in budgeting, strategizing business model, making decision, and reducing production cost, as Kingphadung and Woottichaiwat (2017) has found out by using ABC in allocating expenses of production in each activity with great precision. Srichan (2015) also studied an importing business and applied ABC to help in budgeting. Therefore, it is clear that activity-based costing is the great asset in calculating the true production cost which is valuable in a business model, especially in the period of high competition. To survive through the crisis, the organization must reduce all of the unnecessary expenses to create competitive advantages, as Almeida and Cunha (2017) suggested by studying a manufacturing business and came up with the cost structure of the final product and activity rate of all activities and sub activities. Bunker et al. (2014) explored the role of manufacturing practices in mediating the impact of activity-based costing on plant performance which the result showed that world-class manufacturing practices completely mediate the positive impact of ABC on plant performance, and thus advanced manufacturing capabilities represent a critical missing link in understanding the overall impact of activity-based costing. The logistics and delivery services also gain insight by using ABC to figure out the true cost of production and use that knowledge to improve firm performance (Baykasoglu and Kaplanoglu, 2008)

As this research studied the impact of strategic management innovation towards competitive advantages and firm performance, the result shows that all 3 aspects of strategic management innovation influence positively to competitive advantages and firm performance which is the new perspective in the area of activity-based costing. The previous researches were focusing on finding the true production cost of activity rate, so this research aimed to expand the knowledge and study the impact of that relationship to signify the importance of ABC in creating competitive advantages and firm performance

through strategic management innovation. Resource-based view of the firm theory explained that firms' capabilities and resources are the factors that could create competitive advantages. Thus, the firms using ABC could be considered as having great asset in production cost calculation capabilities, as this method could reflect the very true cost of production process based on activities and demanded tasks, and by using that information, applying strategic management innovation, creating competitive advantages and improving firm performance.

## Recommendation

### The Usage of Researching Results

The results of this research came from the applied knowledge of cost allocation of activity-based costing in strategic management innovation which highlight the importance of production cost and the possibility of lowering production cost and increasing products to increase competitive advantages and firm performance. This knowledge could be applied to various firms in the area of manufacturing, sales, or services, and leading up to 3 dimensions of strategic management innovation which are the key roles to the success of firms.

### Recommendation for Future Research

1. What is the differences or similarities of results if the population is from service industry?
2. What is the relationship of structural equation model in creating competitive advantages during the period of cost fluctuation of resources?

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