บทความวิจัย

การบัญชีต้นทุนวงจรชีวิตเป็นวิธีการเชิงกลยุทธ์สำหรับการบรรลุผลการดำเนินงานของกิจการ: หลักฐานจากธุรกิจซอฟต์แวร์ในประเทศไทย

ปพฤกษ์บารมี อุตสาหะวาณิชกิจ[1]

บทคัดย่อ

การวิจัยนี้มีเป้าหมายเพื่อทดสอบความสัมพันธ์ระหว่างการบัญชีต้นทุนวงจรชีวิต ประสิทธิภาพขององค์กร ศักยภาพทางการแข่งขันของธุรกิจ การบรรลุเป้าหมาย และผลการดำเนินงานของกิจการของธุรกิจซอฟแวร์ จำนวน 218 บริษัทในประเทศไทย ระหว่างวันที่ 1 มีนาคม ถึง 31 พฤษภาคม 2559 ผลการวิจัย พบว่า (1) การบัญชีต้นทุนวงจรชีวิต มีผลกระทบเชิงบวกต่อประสิทธิภาพขององค์กรและศักยภาพทางการแข่งขันของธุรกิจ (2) ประสิทธิภาพขององค์กร มีอิทธิผลเชิงบวกต่อการบรรลุเป้าหมาย และ (3) การบรรลุเป้าหมาย มีผลกระทบเชิงบวกต่อผลการดำเนินงานของกิจการ นอกจากนี้ ประสิทธิภาพขององค์กรยังเป็นตัวแปรกลางของความสัมพันธ์ของการวิจัยด้วย โดยกิจการจำเป็นต้องจัดสรรทรัพยากรและศักยภาพที่มีคุณค่าเพื่อสนับสนุนให้เกิดความสำเร็จในการประยุกต์ใช้ระบบการบัญชีต้นทุนวงจรชีวิต

คำสำคัญ: การบัญชีต้นทุนวงจรชีวิต ประสิทธิภาพขององค์กร ศักยภาพทางการแข่งขันของธุรกิจ การบรรลุเป้าหมาย ผลการดำเนินงานของกิจการ

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RESEARCH ARTICLE

Life Cycle Costing as a Strategic Approach for Achieving Firm Performance: Evidence from Software Businesses in Thailand

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Abstract

This study aims at investigating the relationships among life cycle costing, organizational efficiency, business competitiveness, goal achievement, and firm performance of 218 software businesses in Thailand during March 1 to May 31, 2016. The results show that (1) life cycle costing has a positive effect on both organizational efficiency and business competitiveness; (2) organizational efficiency has a positive influence on goal achievement; and (3) goal achievement has a positive Impact on firm performance. Also, organizational efficiency is a mediator of the research relationships. To succeed in implementing life cycle costing system, firms must allocate their valuable resources and capabilities to support the implementation of the system.

Keywords: Life Cycle Costing, Organizational Efficiency, Business Competitiveness, Goal Achievement, Firm Performance

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Introduction

Recently, firms have dealt with changing environments, including uncertain customer needs and expectations, dynamic product innovation and development, complex market requirements and wants, rapid technology growth, rigorous regulation and laws, and intense stakeholder pressure. These environments have forced them to provide best operations, practices and activities through using and utilizing valuable resources and capabilities in order to increase competitive advantage, obtain superior performance, and gain operational success.

In accounting literature, strategic management accounting is an important business tool in enabling firms to achieve survival and sustainability in the competitive markets and environments. It is defined as the provision and analysis of management accounting and information about a business and its competitive environments, including products and services, customers, competitors, markets, and regulations and related issues, for use in developing and monitoring its business strategies, obtaining and increasing competitive advantage, and earning and achieving organizational performance and success (Langfield-Smith, 2008). It becomes a beneficial mechanism of driving firms' business entrepreneurship efficiently and effectively. Firms with strategic management accounting implementation are likely to have excellent organizational efficiency and effectiveness, sustainable competitiveness, and great business outcome. More successful implementation tends to have a significant positive relationship with their performance.

Life cycle costing as a key method of strategic management accounting is a critical determinant of firms' competitive advantage and performance. It refers to a management accounting approach which focuses on the total costs that occur during a product' s life, including estimating costs on a whole life cycle basis and monitoring the cost incurred throughout a product's life cycle (Lindholm and Suomala, 2007). It emphasizes a long-term performance of products by comprehending an interaction of cost items that accumulate among relevant stakeholders during different life cycle stages. These life cycle costs of product comprise all costs attributable to a product from its conception and pre-production state to those that customers incur throughout the life of the product, including the costs of installation, operation, support, maintenance, and disposal (Vlachy, 2014).

In addition, life cycle costing can enable firms to link costs of products that can be associated to the acquisition, operation, support, and disposal of the system (Korpi and Ala-Risku, 2008). It consists of research and development cost, production and construction cost, operation and maintenance support cost, and retirement and disposal cost. In this study, life cycle costing is a main cost-effective strategy that helps firms capture interrelationships and trade-offs between costs and benefits of products in order to deal with customer needs and market requirements in uncertain and changing environments. Thus, life cycle costing becomes a cost management technique and instrument that affect cost effectiveness and revenue enhancement.

The objective of this study is to examine the effects of life cycle costing on firm performance of software businesses in Thailand via mediators of organizational efficiency, business competitiveness and goal achievement. The key research question is how life cycle costing has an effect on firm performance. The specific research questions are: (1) How does life cycle costing relate to organizational efficiency, business competitiveness and goal achievement?, (2) How do both organizational efficiency and business competitiveness affect goal achievement?, (2) How does goal achievement influence firm performance?, and (3) How do both organizational efficiency and business competitiveness mediate the life cycle costing-goal achievement relationships?

Relevant Literature Review and Hypotheses Development

According to resource advantage theory, tangible and intangible entities available to a firm that enable it to produce efficiently and effectively a market offering that has value for some market segment or segments (Hunt and Morgan, 1996). Under resource advantage theory, life cycle costing is an intangible resource that is heterogeneous and different between firms, imperfectly mobile to competitors and difficult to acquire. Successful life cycle costing implementation promotes firms to achieve effective organizational value and gain sustainable competitive advantage. Hence, life cycle costing is regarded as a strategic accounting approach which firms utilize and deploy to create value and

competitive advantage linking to their superior performance as shown in Figure 1.

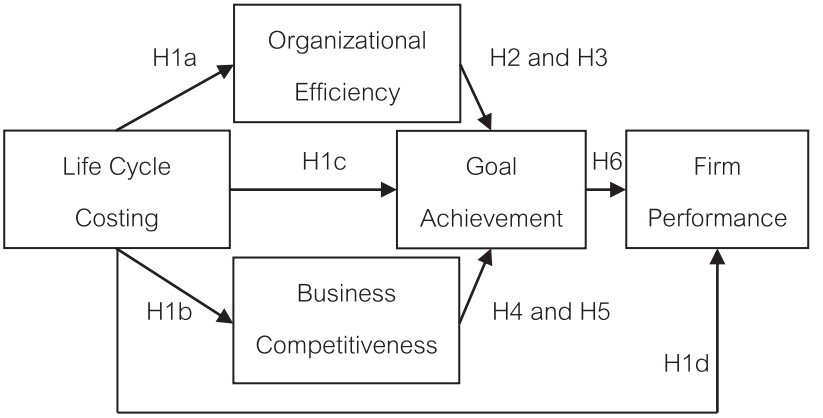


Figure 1

The relationship model between life cycle costing and firm performance

1. Life Cycle Costing

Life cycle costing is important for doing businesses in highly competitive situations and circumstances. It becomes a useful strategic operational tool in helping firms to successfully compete in the volatile markets. Here, life cycle costing is defined as a valuable method in the field of management accounting which focuses on costs that are incurred in all stages of a product' life cycle, including product creation, use and disposal (Waghmode and Sahasrabudhe, 2012). The costs of its life cycle begins with initial identification of needs and requirements and extends through planning, research, design, production, evaluation, operation,

maintenance, support, and its ultimate phase out. Firms with life cycle costing implementation can make a good decision relating to budget planning, cost control and range of other activities that occur over the life time of products. They also pay attention to it by effectively generating revenues, benefits and contributions of products.

In this study, life cycle costing is a main cost-effective strategy of firms by capturing interrelationships and trade-offs between costs and benefits of products and it enables to efficiently meet customer needs and market requirements and excellently deal with uncertain and changing environments. Within the system of life cycle costing, firms must consider a life cycle of products into four steps of products, including (1) identification of an opportunity, (2) development, testing and promotion, (3) introduction, growth, maturation, and decline, and (4) withdrawal. They can declare an evaluation of alternative strategies, an identification of relevant economic criteria, a definition of significant costs, and an assessment of organizational risks (Cole and Sterner, 2000).

Life cycle costing can build long-term benefits of its implementation through creating standards and formal guidelines of business operations, practices and activities as to promote firms' efficiency and competitiveness, achieve their goals, targets and objectives and gain performance, success, survival, and sustainability in the complex competitive environments. Therefore, life cycle costing seems to have a positive relationship with organizational efficiency, business competitiveness,

goal achievement, and firm performance. Hence, it is positively related to them. Therefore, the research hypothesis is as follows:

H1: Life cycle costing is positively related to (a) organizational efficiency, (b) business competitiveness, (c) goal achievement, and (d) firm performance.

2. Organizational Efficiency

Organizational efficiency is the first consequence of successful life cycle costing implementation. It refers to a conversion ratio encompasses multiple inputs to outputs (Wang, Hunag and Shou, 2015). It is the extent to which firms investing minimal resources generate maximal profit and sales. Firms with organizational efficiency tend to achieve much revenue from operational activities and utilize minimum capitals, resources and capabilities. More different gaps between revenues and resources reflect firms' much efficiency in doing business operations, practices and activities. Thus, organizational efficiency is likely to support firms to meet goal achievement. It helps respond customer needs, fulfill market requirements and build management satisfaction.

Additionally, organizational efficiency is defined as the amount of output obtained from a given input (Davis and Pett, 2002). It is the internal functioning of an organization and is considered as a ratio of inputs to outputs. Great organizational efficiency encourages firms to have superior goal achievement. Then, life cycle costing has a significant effect on organizational efficiency while organizational efficiency has an important

influence on goal achievement. The relationships between organizational efficiency and goal achievement are hypothesized to be positive. In addition, organizational efficiency is likely to play a critical role in mediating the research relationships. It is hypothesized to be a mediator of the life cycle costing-goal achievement relationships. Therefore, the research hypotheses are as follows:

H2: Organizational efficiency is positively related to goal achievement.

H3: Organizational efficiency mediates the life cycle costing-goal achievement relationships.

3. Business Competitiveness

Life cycle costing is a valuable management accounting approach as mentioned earlier and it is a key determinant of firms' business competitiveness in the fluctuate competitive environments. In this study, business competitiveness is an important factor contributing to their goal achievement. Firms with business competitiveness can increase and obtain goal achievement in the current and future aspects. Additionally, business competitiveness is defined as the degree to which firms better perform in a marketplace compared to their major competitors (Jiang *et al*., 2016). It presents an ability of firms to adapt firms' productions and operations to demand effectively, efficiently and excellently so as to achieve their goals and objectives. It plays a significant role in determining firms' outcomes, such as goal achievement, success, growth survival, and sustainability. More business competitiveness mean larger benefits and

contributions from customers and markets compared to competitors' operations. Then, firms can meet goal achievement from providing business competitiveness.

Interestingly, business competitiveness enables firms to make a business difficult to be replaced by competitors and can help them maintain and meet their goal achievement (Chuang and Huang, 2015). Firms can utilize their business competitiveness in order to meet goal achievement and generate best success. Thus, business competitiveness has an important effect on goal achievement. It is likely to have a positive relationship with goal achievement. Likewise, business competitiveness tends to help link life cycle costing to goal achievement. It is a possible mediator of the life cycle costing-goal achievement relationships. Therefore, the research hypotheses are as follows:

H4: Business competitiveness is positively related to goal achievement.

H5: Business competitiveness mediates the life cycle costing-goal achievement relationships.

4. Goal Achievement

Goal achievement is a key outcome of life cycle costing, organizational efficiency and business competitiveness. It is defined as utility with overall results of business operations, practices and activities, including executive satisfaction, stakeholder relationship, strategic presence, and organizational learning (Durmusoglu et al., 2012). It affects increased market share, profit margin, sales growth, and numbers of

existing and new customers. These achievements reflect non-financial measurement of business outcomes. Accordingly, goal achievement is likely to have a positive relationship with firm performance. Better goal achievement can enable firms to gain and maintain greater performance in the competitive markets and environments. Firms with more goal achievement can have their superior performance within these markets and environments. In addition, goal achievement means the objectives and targets of doing businesses that are met by using firms' valuable resources, capabilities and competencies. Effective goal achievement is positively related to their operational and organizational performances. Therefore, the research hypothesis is as follows:

H6: Goal achievement is positively related to firm performance.

Research Method

1. Sample and Data Collection

In this study, all 512 software businesses in Thailand from Department of Business Development, Ministry of Commerce were selected as samples of the study. Software businesses in Thailand are the appropriate samples because these businesses have dealt with highly competitive markets and environments. Then, management effectiveness of costs of each activity in a product's life, including (1) identification of an opportunity, (2) development, testing and promotion, (3) introduction, growth, maturation, and decline, and (4) withdrawal is important. A questionnaire survey is the research tool (Leekpai et al., 2014). The data collection was conducted in Thailand during March 1 to May 31, 2016.

The mail questionnaire surveys were sent to these software businesses in Thailand by using accounting executives, such as accounting directors or accounting managers, as the key informants because of their responsibilities, functions and duties relating to accounting practices and issues.

In a mailing process, 17 surveys were undeliverable because some listed firms had moved to unknown locations. Deducting the undeliverable mailing, from which 233 responses were received. Of the surveys completed and returned, there are 218 usable questionnaires that are empirically utilized to measure validation of the research tool and to analyze data for the research results. The effective response rate was approximately 42.58% which is considered acceptable for the response rate for a mail survey because it is greater than 20% (Aaker, Kumar and Day, 2001).

This study used a comparison of the first and the second wave data, such as firm age, firm size and firm capital as recommended by Armstrong and Overton (1977) to evaluate the non-response-bias. In this regard, neither procedure explicitly showed significant differences because there were no statistically significant differences between first and second groups at a 95% confidence level as firm age ($t = 0.123$, $p > 0.05$), firm size ($t = 0.131$, $p > 0.05$) and firm capital ($t = 0.104$, $p > 0.05$).

2. Measures of the Research Variables

All constructs were measured using a 5-point Likert scale (1 = strongly disagree to 5 = strongly agree). In this study, a questionnaire survey is adapted from previous studies. Life cycle costing refers to a valuable method which focuses on costs that are incurred in all stages of a product' life cycle, including product creation, use and disposal (Waghmode and Sahasrabudhe, 2012). Six-item scale was developed to assess how firms manage their costs of products or services' life cycles, including budget planning, cost control and range of other activities that occur over the life time of products.

Organizational efficiency refers to a conversion ratio encompasses multiple inputs to outputs (Wang, Hunag and Shou, 2015). Four-item scale was introduced to evaluate how firms invest minimal resources, capabilities, competencies, and capitals generate maximal outputs and outcomes. Also, business competitiveness refers to the degree to which firms better perform in a marketplace compared to their major competitors (Jiang *et al.*, 2016). Four-item scale was established to measure how firms utilize their productions and operations to demand effectively, efficiently and excellently so as to compete in the markets better.

Likewise, goal achievement refers to the utility with overall results of business operations, practices and activities, including executive satisfaction, stakeholder relationship, strategic presence, and organizational learning (Durmusoglu et al., 2012). Four-item scale was

initialed to gauge how firms meet their operational and organizational goals, objectives, targets, and policies. Lastly, firm performance refers to an outcome of firms' doing business within the competitive markets and environments. Four-item scale was introduced to assess how firms gain increased market share, profit margin, sales growth, and numbers of existing and new customers.

3. Research Instrument Tests

This study implements factor analysis, item-total correlation and Cronbach alpha to verify a quality of the research tool. Factor analysis was utilized to measure the underlying relationships of a large number of items and to determine whether they can be reduced to a smaller set of factors. All factor loadings as values of 0.70-0.89 are greater than the 0.40 cut-off and are statistically significant (Nunnally and Bernstein, 1994). In the scale validity, item-total correlation as values of 0.67-0.90 is greater than 0.30 (Churchill, 1979). Similarly, the reliability of the measurements was assessed by Cronbach alpha coefficients. In the scale reliability, Cronbach alpha coefficients as values of 0.72-0.90 are greater than 0.70 (Nunnally and Bernstein, 1994). Accordingly, the scales of all measures appear to produce internally consistent results and these measures are deemed appropriate for further analysis as shown in Table 1.

To verify the research relationships, structural equation modeling (SEM) is conducted to empirically investigate the hypotheses of the relationships among life cycle costing, organizational efficiency, business

competitiveness, goal achievement, and firm performance. The results of this study are presented in the next section.

Table 1

Results of measure validation

Items	Factor Loadings	Item-total correlation	Cronbach Alpha
Life cycle costing (LCC)	0.73-0.84	0.71-0.80	0.87
Organizational efficiency (OEF)	0.70-0.81	0.67-0.78	0.81
Business Competitiveness (BCP)	0.79-0.82	0.79-0.80	0.72
Goal Achievement (GAC)	0.87-0.89	0.87-0.89	0.90
Firm performance (FPF)	0.78-0.86	0.79-0.87	0.86

Results and Discussion

In Table 2, the descriptive statistics and correlation matrix for all variables are presented. The range of mean scores for all constructs is 3.90-4.23. In summary, the mean score of life cycle costing is high, which is 4.23 while a standard deviation value of life cycle costing is equal to 0.51. Additionally, operational efficiency, business competitiveness, goal achievement, and firm performance are main outcomes of life cycle costing. The mean scores of these outcomes are 4.03, 3.99, 3.90, and 4.01 respectively while their standard deviation values are 0.59-0.66. They present the high levels of life cycle costing' s consequences from software businesses in Thailand.

In this study, multicollinearity might occur when inter-correlation in each predict variable is more than 0.80, which is a high relationship (Hair et al., 2010). The correlations ranging from 0.27 to 0.77 at the $p < 0.05$ level, which means that the possible relationships of the variables in the conceptual model could be tested. In addition, variance inflation factors (VIFs) were used to provide information on the extent to which non-orthogonality among independent variables inflates standard errors. The VIFs range from 1.56 to 3.47, well below the cut-off value of 10 as recommended by Neter, Wasserman and Kutner (1985), means that the independent variables are not correlated with each other. Thus, there are no substantial multicollinearity problems encountered in this study.

Table 2

Descriptive statistics and correlation matrix

Variables	LCC	OEF	CP	GAC	FPF
Mean	4.23	4.03	3.99	3.90	4.01
SD	0.51	0.61	0.59	0.63	0.66
LCC					
OEF	0.27**				
BCP	0.42***	0.66***			
GAC	0.42***	0.77***	0.60***		
FPF	0.39***	0.75***	0.55***	0.76***	

**p<.05, ***p<.01

Table 3

Results of path coefficients and hypotheses testing

Hypotheses	Relationships	Coefficients	t-value	Results
H1a	LCC → OEF	0.43***	2.69	Supported
H1b	LCC → BCP	0.47***	3.01	Supported
H1c	LCC → GAC	0.18	1.45	Not supported
H1d	LCC → FPF	0.01	0.15	Not supported
H2	OEF → GAC	0.87***	6.57	Supported
H3	LCC → OEF	0.43***	2.69	Supported
	OEF → GAC	0.87***	6.57	
H4	BCP → GAC	0.08	0.56	Not supported
H5	LCC → BCP	0.47***	3.01	Not supported
	BCP → GAC	0.08	0.56	
H6	GAC → FPF	0.76***	6.52	Supported

***p<.01

Table 3 presents the results of path coefficients and hypotheses testing of the research relationships. According to Herda and Lavelle's study (2012), four indices are used to assess the goodness of fit of the models, including the goodness of fit index (GFI), the comparative fit index (CFI), the incremental fit index (IFI), and the root mean square error of approximation (RMSEA). Firstly, CFI values always lie between 0 and 1, with values over 0.90 indicating a relatively good fit (Bentler, 1990). Secondly, GFI value is an index that ranges from 0 to 1, with value over 0.90 indicating a relatively good fit (Byrne, 1998). Thirdly, IFI values exceeding 0.90 indicate a relatively good fit (Kline, 1998). Lastly, a

RMSEA value of less than 0.05 indicates a close fit and less than 0.08 suggests a marginal fit (Bollen and Long, 1993). This study shows that the initial test of the measurement model resulted in a good fit to the data (CFI = 0.93; GFI = 0.91; IFI = 0.92; RMSEA = 0.04).

In this study, life cycle costing directly affects both organizational efficiency (b = 0.43, $p < 0.01$) and business competitiveness (b = 0.47, $p < 0.01$). In existing literature, life cycle costing enables firms to successfully manage costs that are incurred in all stages of a product' life cycle, including product creation, use and disposal (Waghmode and Sahasrabudhe, 2012). Effective life cycle costing implementation can help them provide budget planning, cost control and range of other activities that occur over the life time of products. They tend to maintain, obtain and gain best business outcomes, including organizational efficiency and business competitiveness through the utilization of excellent life cycle costing implementation. Thus, life cycle costing has a significant positive relationship with organizational efficiency and business competitiveness.

Surprisingly, life cycle costing does not affect goal achievement (b = 0.18, $p < 0.15$) and firm performance (b = 0.01, $p < 0.89$). It may not directly relate to these independent variables because the life cycle costing-goal achievement relationships and the life cycle costing-firm performance relationships need to have valuable mediators that help link life cycle costing to both goal achievement and firm performance. Firms can implement life cycle costing system as a key strategic tool of doing businesses so as to provide organizational efficiency and increase

business competitiveness. Likewise, they can provide both organizational efficiency and increase business competitiveness for meeting goal achievement and obtaining their superior performance. Also, both goal achievement and firm performance seem to be consequences of firms' operational efficiency. According to Hypotheses 1a, 2, 3, and 6, operational efficiency explicitly mediates the life cycle costing-goal achievement relationships while operational efficiency and goal achievement are also the mediators of the life cycle costing-firm performance relationships. *Therefore, Hypotheses 1a-1b are supported, but Hypotheses 1c-1d are not.*

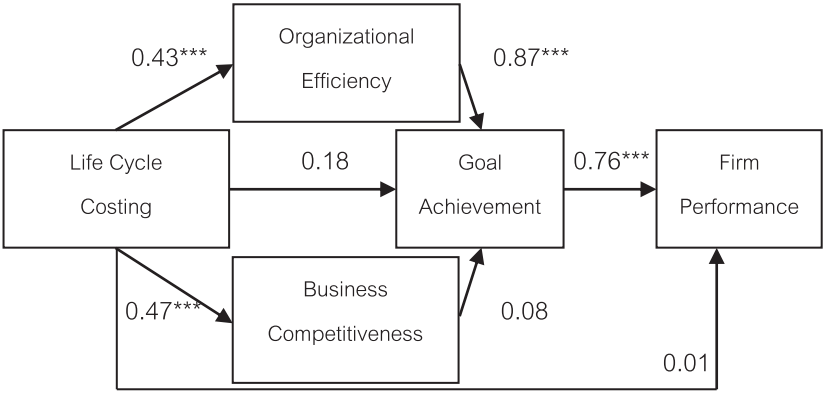
Organizational efficiency plays an important role in determining and explaining goal achievement (b = 0.87, $p < 0.01$). It presents firms' competencies and capabilities in investing minimal resources generate maximal outputs and outcomes. Better organizational efficiency can lead to greater conversion ratio encompasses multiple inputs to outputs (Wang, Hunag and Shou, 2015). It helps firms respond customer needs, fulfill market requirements and build management satisfaction effectively, efficiently and excellently. Firms with organizational efficiency can achieve their goals, objectives and targets successfully. They are likely to effectively meet goal achievement in rigorously competitive markets and environments. Thus, organizational efficiency has an important positive association with goal achievement. *Therefore, Hypothesis 2 is supported.* Goal achievement is positively related to firm performance (b = 0.76, $p < 0.01$). It is the utility of firms with overall results of business operations,

practices and activities, including executive satisfaction, stakeholder relationship, strategic presence, and organizational learning (Durmusoglu *et al*., 2012). Effective goal achievement affects firms' business outcome through increased market share, profit margin, sales growth, and numbers of existing and new customers. Accordingly, they can gain, obtain and maintain superior performance with great goal achievement. Thus, goal achievement has a critical positive influence on firm performance. *Therefore, Hypothesis 6 is supported.*

In contrast, business competitiveness has no effects on goal achievement ($b = 0.08$, $p < 0.58$). According to the existing literature, business competitiveness is the degree to which firms better perform in a marketplace, compared to their major competitors (Jiang *et al*., 2016). It makes a business difficult to be replaced by competitors and can help them maintain and meet their goal achievement. It reflects how firms adapt their productions and operations to demand so as to achieve their goals and objectives. Firms with business competitiveness can create goal achievement. However, business competitiveness may directly affect their performance. It seems to positively affect to financial measurements of firm performance through market share, profit margin, sales growth, and numbers of existing and new customers. In contrast, it may not relate to non-financial measurements of goal achievements via operational and organizational goals, objectives, targets, and policies. Then, the relationships between business competitiveness and goal achievement do not occur. Thus, the direct effects of business competitiveness on firm

performance and the mediating effects of goal achievement on the business competitiveness-firm performance relationships may need to be investigated for future research. *Therefore, Hypothesis 4 is not supported.*

Interestingly, life cycle costing is positively related to both organizational efficiency and business competitiveness while only organizational efficiency is positively linked to goal achievement, but business competitiveness is not. In addition, life cycle costing has no direct effect on goal achievement. According to Baron and Kenny (1986)'s study, organizational efficiency significantly mediates the life cycle costing-goal achievement relationships. *Therefore, Hypothesis 3 is supported, but Hypothesis 5 is not supported.* The research results are shown in Figure 2.



***p<.01; CFI = 0.93; GFI = 0.91; IFI = 0.92; RMSEA = 0.04

Figure 2

The results of the life cycle costing-firm performance relationships

Contributions and Directions for Future Research

1. Theoretical Contribution and Directions for Future Research

This study definitely confirms that life cycle costing is an intangible resource and capability that enables firms to obtain organizational efficiency and increase business competitiveness according to resource advantage theory. Similarly, organizational efficiency encourages them to have goal achievement; and goal achievement enhances them to gain their performance. However, some research relationships are not confirmed. To verify and expand the research results, future research must review more literatures linking to the life cycle costing-goal achievement relationships, the life cycle costing-firm performance relationships and the business competitiveness-firm performance relationships and reconceptualize the research model of these relationships. In addition, future may need to investigate the mediating roles of organizational efficiency and business competitiveness in determining the life cycle costing-goal achievement relationships. To prove the generalizability of the research results, future research may need to collect data from large population, different industries or different countries.

2. Managerial Contribution

This research also gives the contribution of management to executives and firms. Executives of firms can utilize life cycle costing system as a key strategic tool in doing business operations, activities and practices so as to create organizational efficiency, effectiveness and

excellence. In addition, it can build sustainable competitive advantage, obtain goal achievement, have superior performance, and gain success, growth, survival, and sustainability in highly volatile competitive markets and environments. To successfully implement life cycle costing system in an organization, the executives must make this system as becoming the valuable, important and necessary instrument of doing businesses and allocate their appropriate resources, capabilities, competencies, and capitals to promote the implementation of the system. Likewise, they must provide their management vision, policy and strategy for supporting life cycle costing's activities and related issues.

Conclusion

In recent years, life cycle costing has become a strategic competitive tool in doing businesses within uncertain environments. Hence, this study attempts to investigate the roles of life cycle costing in driving business outcomes. The objective of this study is to examine the effects of life cycle costing on organizational efficiency, business competitiveness, goal achievement, and firm performance of software businesses in Thailand. In this study, 218 software businesses in Thailand are the samples of the study.

The results reveal that life cycle costing has a significant impact on both organizational efficiency and business competitiveness; organizational efficiency has an important effect on goal achievement; and goal achievement has a critical influence on firm performance.

Surprisingly, life cycle costing is not related to goal achievement and firm performance while business competitiveness has no roles in determining firm performance. Accordingly, executives of firms can utilize life cycle costing system as a key strategic tool so as to build sustainable competitive advantage, obtain goal achievement and achieve superior performance through best resource supports of firms for implementing this system.

However, future research must recheck and reconceptualize the life cycle costing-goal achievement relationships, the life cycle costing-firm performance relationships and the business competitiveness-goal achievement relationships. In addition, future research may need to investigate the mediating effects of organizational efficiency and business competitiveness of the research relationships. To verify and expand the benefits and contributions of the current study, other statistics, including regression analysis and partial least squared should be conducted in future research by comparing to the research results of structural equation model method; and data collection from large populations or different countries should be provided for proving the generalizability of the study.

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