Does Cloud Computing Influence Enterprise Performance?

I-Cheng Chang, National Dong Hwa University, Taiwan*
Chuang-Chun Liu, National Chung Cheng University, Taiwan
Tsai-Ling Wu, National Dong Hwa University, Taiwan

ABSTRACT

The emergence of the cloud computing service has resulted in the entry of many companies into the market, with numerous competitors for cloud computing leading the technological trend. Recent studies have mainly focused on the characteristics of cloud computing, whereas its influence on firm performance has been rarely discussed. Therefore, this study aimed to fill this empirical research gap. This current study examined whether investments in cloud computing can influence firm performance and whether cloud computing influences firm performance. Data were collected using a questionnaire. Structural equation modeling provided evidence supporting the theoretical model. The results of this study revealed that cloud computing investment influences firm learning and growth performance, internal processes, and finances. The theoretical and practical contributions and implications of these findings are described in this paper.

KEYWORDS

Balanced Scorecard, Cloud Computing, Firm Performance, IT Investment

1. INTRODUCTION

After Amazon launched the earliest cloud computing service in 2006, Google introduced the concept of “cloud computing” in that same year. Computing is defined as any computer-related activity involving processing or storage, and cloud refers to data stored through this activity online rather than on the hard disk of a computer (Ouanouki et al., 2014; Bordonaba-Juste et al., 2020). An overview of the scale of the global cloud computing market (including infrastructure as a service [IaaS], platform as a service [PaaS], and software as a service [SaaS]) revealed market value that surpassed US$371.4 billion in 2020, with the expectation that the amount will exceed $832.1 billion by 2025 (Cloud Computing Market, 2020).

One incentive for enterprises introducing cloud computing is that they want to attain the objective of saving other IT-related expenses and improve operational efficiency by relying on cloud computing (Xiao et al., 2020; Sathiyamoorthi et al., 2021). Enterprises should coordinate and communicate with their global counterparts, supply chain partners, and plants (Senyo et al., 2018). Delayed communication and unsuccessful coordination will influence the time of goods deployment in the market. Cloud services for business process management (BPM) and supply chain management (SCM) can reinforce communication and coordination of the global planning system (Giannakis et al., 2019).
Evaluating IT expenditures on future accounting performance is a critical issue in the previous studies (Sambamurthy et al., 2003). IT expenditures and surpluses are associated in many ways: Because IT expenditures are considerable, the profit decreases in the current investment period. However, research and development typically raises increases profit by developing high-margin products, which differs from the method of IT investments for reducing costs to improve corporate efficiency, and in turn increase profit (Melville et al. 2004). A company investing in IT may reduce overall costs through operations and market advantages, thus generating more profit (Henderson et al., 2010) and Tobin’s q (Kumar and Li, 2016). The following reasons show why financial performance is considered a metric for measuring whether information systems can substantially facilitate enterprise practices, namely quantization numbers can be measured objectively. Hence, financial performance can be mutually understood in terms of value and behavior for realizing cohesion to improve competitiveness. Cloud computing is an innovative technology, and further discussion is necessary to determine whether the use of indicators is suitable for measuring the efficiency of cloud computing to measure past IT output, especially the financial indicator.

A frequent criticism concerns accounting performance indicators reflecting only historical information, whereas IT is expected to contribute to future performance (Lim et al., 2011). Market performance indicators reflect a company’s expectations for future performance. Hence, they can be considered as tools for determining the tangible and intangible as well as current and future benefits of IT investments (Lim et al., 2011). In the efficiency market, a company’s market price may reflect the values of all the available information (Kothari, 2001). Said et al. (2003) aimed to determine the influence on corporate performance when including nonfinancial indicators in a work contract, finding that a company’s long-term ROA improves through the combination of financial and nonfinancial indicators. In addition, Weir et al. (2007) found an association between nonfinancial performance indicators and an innovation-oriented strategy, quality-oriented strategy, industrial regulation and company soundness, and other aspects. The measurement system proposed by Kaplan and Norton (1992) is in agreement with the standards; therefore, the balanced scorecard (BSC), when combined with financial and nonfinancial indicators as well as objective and subjective factors, is a suitable tool for measuring the output of information systems. The BSC includes four dimensions, namely finance, customers, the internal process, and learning and growth.

The main advantage of transferring some key programs to the cloud is the flexibility of software and hardware application (Loukis et al., 2019). Such a transfer will lower the maintenance costs of upgrading (Narwane et al., 2019). Through the expandability and high effectiveness of cloud computing services, retailers can effectively collect and analyze different types of data, such as big data, feedback of marketing activities, customer behavior, supply chain, purchasing, sales, and inventory data (Lin and Chen, 2012).

Cloud computing is an innovative IT service; however, empirical research confirming that such technology leads to higher firm performance is lacking (El-Haddadeh, 2020). Although Liu et al. (2020) used the resource-based view and sociotechnical theory to investigate the impact of cloud computing on internal and intercompany performance; with the productivity paradox of IT investments, investments in cloud computing may or may not yield the expected benefits. This empirical study investigated whether investments in cloud computing can improve corporate performance by considering financial and nonfinancial aspects. This paper is organized into the following five sections: Introduction, Literature Review and Hypothesis Development, Research Methodology, Data Analysis and Results, and Discussion and Implications.
2. LITERATURE REVIEW AND HYPOTHESES DEVELOPMENT

2.1 Cloud Computing

Cloud computing has been gradually developed with the Internet and related technologies including past technologies and concepts such as grid computing, parallel computing, virtual technology, and service-oriented architecture (Delavari et al., 2020). Services such as the sharing of computing resources on many computers through networks or the acquisition of a distance host through networks all constitute a form of cloud computing (Senyo et al., 2018; Bouaynaya, 2020). Cloud computing is conceptually similar to a power network, because through certain resources (e.g., software and hardware as well as information) in the architecture of cloud computing, with the network as the medium, and end-users and suppliers may share resources through the original architecture (Cusumano, 2019).

Cloud computing, three service modes were summarized. SaaS enables consumers to operate the supplier’s application program on a cloud infrastructure, and certain restrictions are in place regarding the relative use of the infrastructure (Breznitz et al., 2018). PaaS enables consumers to arrange their independently innovated programs on the cloud infrastructure and provides consumers with a tool for creating application programs (Sultan, 2010). Moreover, certain restrictions are relaxed for infrastructure configuration in cloud computing. IaaS provides consumers with a cloud infrastructure that is akin to a hard disk, the Internet, or basic resources that may be utilized freely by other resource consumers (Asvija et al., 2021).

2.2 Balanced Scorecard

The BSC is a strategy management system that aims to clarify the strategy and convert it into action. This performance system is widely organized for evaluating and managing overall corporate performance. According to Kaplan and Norton (1992), if different dimensions are comprehensively considered in the manner of scoring, an overall and real-time viewpoint could be provided to managers. The four dimensions of the BSC, focusing on strategy and vision, have improved performance investigations and organizational strategy development. The BSC has recently been applied in different fields (Wu and Chang, 2012), and numerous academic studies on the BSC have been related to the issues of information systems. Lee et al. (2013) distributed a questionnaire survey to small and medium-sized enterprises (SMEs) adopting SaaS to measure SaaS from all four dimensions, and the results revealed that these four key dimensions for SaaS success were mutually related and supported the core premise of the BSC. Tsai et al. (2012) used the BSC combined with path analysis to investigate the relationship between system quality and service and success introduction systems provided by an ERP supplier and enterprises in the selection of an ERP system.

2.4 Research Model and Hypotheses

This study examined whether cloud computing investment could help companies organize their learning, continually improve their own ability, improve their performance in customer relationships, and eventually, enhance their financial performance. The research model is illustrated in Figure 1. Cloud computing can help achieve the financial objective of reducing costs for obtaining a low-cost threshold; thus, many enterprises have adopted such technology (Loukis et al., 2019; Chulkov et al., 2021; Rodrigues et al., 2021). Oliveira et al. (2014) reported that the business agility achieved by cloud computing improves enterprises’ responses to perpetually changing market demands. In addition, Tsai and Hung (2014) asserted that cloud computing not only reduces operating costs but also enhances industrial competitiveness. Sultan (2013) indicated that in practice, the capital invested in cloud computing can be recovered after a certain period, and time is required for investments to produce positive economic benefits and investment returns. Therefore, this study presents the following hypothesis:
H1: Cloud computing investment can improve an enterprise’s financial performance.

Al-n sour et al. (2014) examined the combined effects of cloud computing benefits (cost and ease of use) and customer relationship management processes (customer acquisition, customer retention, and customer expansion) on organizational performance. Subramanian et al. (2014) described that logistics service providers who are willing to upgrade their cloud computing equipment to enhance the quality, safety, and immediacy of their services can reduce customer complaints and enhance customer satisfaction. Enterprises can take advantage of the agility and scalability of cloud computing to easily adjust workflows and store/analyze data. These operations enable enterprises to adjust and manage the flexibility of their manufacturing processes easily and respond quickly to customer demands, thereby creating more opportunities to collaborate with their customers (MIC, 2015; Cong et al., 2021). Moreover, with video conferencing in cloud computing, customer problems can be identified and resolved in real time by using networks and by engaging with customers. Therefore, this study presents the following hypothesis:
H2: Cloud computing investment can improve an enterprise’s customer performance.

Battleson et al. (2016) proposed a research framework to explain how the cloud computing technologies applied in enterprises facilitate market dynamics and enhance their dynamic capabilities. The findings revealed that cloud computing enhances the operational efficiency and effectiveness of enterprises. Cloud computing systems can autonomously and instantaneously transfer production, inventory, and order data, helping enterprises maintain their inventory levels. Enterprises can also share crucial information with their suppliers through cloud computing systems (MIC, 2015). Peiris et al. (2010) indicated that cloud computing enables users to extend the processing efficiency at any time in accordance with their own needs, allowing different services to be processed on one host simultaneously, thus promoting information-processing efficiency. Therefore, this study presents the following hypothesis:

H3: Cloud computing investment can improve an enterprise’s internal process performance.

Cloud-based storage allows enterprise employees to share, store, and access information and data through e-mail, shared links, and messaging software (Devaki, 2011). Consequently, cloud computing virtually changes a company’s relevant personnel habits in obtaining information. Cloud computing also improves the function of organizational sharing and collaboration. The implementation of a cloud-based intelligent decision-making system improves an enterprise’s supply chain coordination and decision-making performance and enables them to provide more satisfactory services to their customers (Schniederjans and Hales, 2016). Therefore, this study presents the following hypothesis:

H4: Cloud computing investment can improve an enterprise’s learning and growth performance.

In this era of global competition, enterprises must learn how to innovate in order to create a business advantage; thus, the ability to learn and grow is especially critical for enterprises (Lee et al., 2013). Compared with certain IT characteristics, including establishing connections through the use of the Internet, cloud computing is not limited by time and space. Hence, all employees with mobile devices and access can use their company’s database remotely, enabling information and knowledge to process unimpeded (Gupta et al., 2013). Therefore, this study presents the following hypothesis:

H5: Improvements to an enterprise’s learning and growth performance can promote internal process performance in a cloud computing environment.

MIC (2015) indicated that the business intelligence cloud system can help companies collect customer feedback and customer community data from enterprise resource planning (ERP), supply chain management system, and different channels to conduct analysis and further provide timely services for customers’ needs. Therefore, an organization’s response and internal process integration have considerable influence on customers’ satisfaction. Therefore, this study presents the following hypothesis:

H6: Improvements to an enterprise’s internal process performance can promote customer performance in a cloud computing environment.

From the perspective of customer relationship management, the use of information systems can facilitate the maintenance of customer relationships, the final objective of which is to raise customer loyalty and maximize the financial performance produced during customers’ lifecycles (Ryding, 2010). Improvement of management for sales and the inventory system by using cloud computing technology
can help enterprises maintain the appropriate inventory level for meeting customers’ needs and for further deriving more profit (MIC, 2015). Therefore, this study presents the following hypothesis:

H7: Improvements to an enterprise’s customer performance can promote its financial performance in a cloud computing environment.

The manufacturing industry utilizes raw materials to produce new products, whereas the service industry provides services to people, enterprises, or governmental agencies, and the two types of final products lead to distinct factors in affecting the use of the IT system in the production process. Thus, this study makes a distinction for these two industry categories (Hameed et al., 2012). Large and small companies have dissimilar characteristics, with certain differences in various aspects. Hence, factors affecting large companies for the adoption of IT innovations may be inapplicable to small companies. In other words, with a new technological product, the reasons for the adoption of cloud computing by large companies may vary from those of small companies. Therefore, this study presents the following hypothesis:

H8a: The type of industry has a moderating effect on the relation between cloud computing investments and the four dimensions of the balanced scorecard.

H8b: The firm size has a moderating effect on the relation between cloud computing investments and the four dimensions of the balanced scorecard.

3. RESEARCH METHODOLOGY

3.1 Measurement

The empirical data used for this study were obtained by mailing questionnaires. After the completion of the first draft, two experts were invited for a questionnaire pretest. The questionnaire was measured using a 7-point Likert scale, with the scale ranging from 1 (strongly disagree) to 7 (strongly agree). The questionnaires from previous studies that were used for reference are listed in Table 1.

Table 1. Construct source

<table>
<thead>
<tr>
<th>Construct</th>
<th>Sub-construct</th>
<th>Source</th>
</tr>
</thead>
<tbody>
<tr>
<td>Financial performance</td>
<td>Cost</td>
<td>Wu and Chang (2012)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Cohen and Olsen (2015)</td>
</tr>
<tr>
<td></td>
<td>Profitability</td>
<td>Wu and Kuo (2012)</td>
</tr>
<tr>
<td></td>
<td>Competitive advantage</td>
<td>Wu and Kuo (2012)</td>
</tr>
<tr>
<td>Customer performance</td>
<td>Market response</td>
<td>Wu and Chang (2012)</td>
</tr>
<tr>
<td></td>
<td>Satisfaction</td>
<td>Wu and Hu (2012)</td>
</tr>
<tr>
<td>Internal process performance</td>
<td>Management efficiency</td>
<td>Devaraj et al. (2007)</td>
</tr>
<tr>
<td></td>
<td>Process efficiency</td>
<td>Wu and Chen (2006)</td>
</tr>
<tr>
<td>Learning and Growth</td>
<td>IS function</td>
<td>Wu and Hu (2012)</td>
</tr>
<tr>
<td>performance</td>
<td>Decision making</td>
<td>Rondeau et al. (2006)</td>
</tr>
<tr>
<td></td>
<td>IS structure</td>
<td>Wu and Hu (2012)</td>
</tr>
</tbody>
</table>
3.2 Common Method Variance Analysis

We adopted several methods to reduce the impact of common method variance. First, the questionnaire respondents were anonymous to appease their concerns; second, this study used the relationship matrix for examination by referencing the method from Bagozzi et al. (1991), and the degree of correlation of any two dimensions was lower than 0.9. In addition, by referencing Lindell and Whitney (2001), we used the marker variable to determine the presence of common method variance, and the results revealed that the square of the maximum of the pairwise correlation coefficient between the marker variable and the dimension was lower than 1%, from which it can be inferred that common method variance in this study was negligible.

3.3 Data Collection

This study collected quantitative data using a questionnaire; the survey was conducted among 1,520 listed and over-the-counter (OTC) companies in Taiwan. A questionnaire was mailed to each company. Consequently, 130 valid questionnaires were obtained after excluding 20 questionnaires with incomplete answers, yielding a response rate of 8.55%. Table 2 provides the sample descriptive statistics.

4. DATA ANALYSIS AND RESULTS

4.1 Reliability and Validity Analysis

Construct validity is a measure of whether a questionnaire can be used to identify theoretical concepts or qualities, and includes the subconstructs convergent validity and discriminant validity. For demonstrating reliability, the most commonly used method is the Cronbach α coefficient, and we found that all the other variation coefficients were higher than 0.9 (as shown in Table 3). Therefore, we found that the questionnaire in this study was reliable. The lowest value of item loading was higher than 0.7. Composite reliability and the average variance extracted (AVE) were respectively higher than 0.9. The square root value of AVE was used in this study to measure discriminant validity; this value must typically be higher than the correlation coefficient of the other dimensions. In Table 3, the correlation coefficients were all lower than the square root value of AVE, showing that the remaining dimensions also had discriminant validity (Fornell and Larcker, 1981).

4.2 Hypothesis Testing

SmartPLS was used in this study to test the research hypotheses, the results of which are shown in Figure 2. As shown in Figure 2, the R² value for cloud computing investments toward the financial performance dimension was 0.605, and the path coefficient was significantly positive at 0.229 (p < 0.05). Cloud computing investments can promote a company’s financial performance; therefore, H1 is supported.
Table 2. Sample descriptive statistics

<table>
<thead>
<tr>
<th>Item</th>
<th>Category</th>
<th>Frequency</th>
<th>Percent</th>
</tr>
</thead>
<tbody>
<tr>
<td>Industry</td>
<td>Manufacturing industry</td>
<td>97</td>
<td>74.62%</td>
</tr>
<tr>
<td></td>
<td>Service industry</td>
<td>24</td>
<td>18.46%</td>
</tr>
<tr>
<td></td>
<td>Others</td>
<td>9</td>
<td>6.92%</td>
</tr>
<tr>
<td>Company’s Establishment Date</td>
<td>Less than 5 years</td>
<td>1</td>
<td>0.77%</td>
</tr>
<tr>
<td></td>
<td>6~10 years</td>
<td>3</td>
<td>2.31%</td>
</tr>
<tr>
<td></td>
<td>More than 10 years</td>
<td>126</td>
<td>96.92%</td>
</tr>
<tr>
<td>Number of Employees</td>
<td>1~100 people</td>
<td>20</td>
<td>15.38%</td>
</tr>
<tr>
<td></td>
<td>101~500 people</td>
<td>58</td>
<td>44.62%</td>
</tr>
<tr>
<td></td>
<td>More than 500 people</td>
<td>17</td>
<td>40.00%</td>
</tr>
<tr>
<td>Gender</td>
<td>Male</td>
<td>102</td>
<td>78.46%</td>
</tr>
<tr>
<td></td>
<td>Female</td>
<td>28</td>
<td>21.54%</td>
</tr>
<tr>
<td>Education Degree</td>
<td>Senior high school</td>
<td>2</td>
<td>1.54%</td>
</tr>
<tr>
<td></td>
<td>college</td>
<td>16</td>
<td>12.31%</td>
</tr>
<tr>
<td></td>
<td>University</td>
<td>63</td>
<td>48.46%</td>
</tr>
<tr>
<td></td>
<td>Graduate school or above</td>
<td>48</td>
<td>36.92%</td>
</tr>
<tr>
<td></td>
<td>Not answered</td>
<td>1</td>
<td>0.77%</td>
</tr>
<tr>
<td>Position</td>
<td>General Manager</td>
<td>3</td>
<td>2.31%</td>
</tr>
<tr>
<td></td>
<td>Supervisor of Information Department</td>
<td>74</td>
<td>56.92%</td>
</tr>
<tr>
<td></td>
<td>Financial supervisor</td>
<td>13</td>
<td>10.00%</td>
</tr>
<tr>
<td></td>
<td>Business supervisor</td>
<td>5</td>
<td>3.85%</td>
</tr>
<tr>
<td></td>
<td>Others</td>
<td>35</td>
<td>26.92%</td>
</tr>
<tr>
<td>Experience of Acting as Supervisor</td>
<td>1~5 years</td>
<td>36</td>
<td>27.69%</td>
</tr>
<tr>
<td></td>
<td>6~10 years</td>
<td>25</td>
<td>19.23%</td>
</tr>
<tr>
<td></td>
<td>More than 10 years</td>
<td>58</td>
<td>44.62%</td>
</tr>
<tr>
<td></td>
<td>Not answered</td>
<td>11</td>
<td>8.46%</td>
</tr>
</tbody>
</table>
In Figure 2, the \( R^2 \) value of cloud computing for customer performance was 0.758, the path coefficient was positive at 0.074, and the \( t \) value was 1.164; the findings did not reach statistical significance. Hence, H2 was not supported. The \( R^2 \) value of cloud computing for internal process performance was 0.627, and the path coefficient was significantly positive at 0.209 (\( p < 0.01 \)). Therefore, H3 was supported. The path coefficient of cloud computing investments toward learning and growth performance was 0.509 (\( p < 0.01 \)). Cloud computing investments are known to be able to increase capabilities for learning and growth; therefore, H4 was supported. The path coefficient between learning and growth performance and internal process performance was 0.665 (\( p < 0.01 \)). Learning and growth performance can be inferred to promote the internal process in a cloud computing environment. Consequently, H5 was supported. Regarding H6, the path coefficient between internal process performance and customer performance was positive at 0.828 (\( p < 0.01 \)), implying that the promotion of internal processes can improve customer performance. Thus, H6 was supported. The path coefficient between customer performance and financial performance was 0.615 (\( p < 0.01 \)), implying that the promotion of customer performance improves financial performance. H7 was supported. Figure 2 presents the result of the moderating variables, which was nonsignificant; therefore, H8a and H8b were not supported. Our analysis of cloud computing characteristics highlights the importance of determining why firm size and industry do not have moderating effects on the relation between cloud computing investment and the four dimensions of the BSC. One reason is that cloud computing technology has gradually become a service model demanded by numerous industries. Furthermore, because all the companies sampled in the current study were listed companies, those companies’ understanding and application of cloud computing technology were similar.

### 5. DISCUSSION AND IMPLICATIONS

This study found that cloud computing influenced performance in three dimensions: finance, internal process, and learning and growth. Several approaches are available for improving financial performance, and organizations typically reduce costs and increase revenue to secure substantial financial benefits. The successful establishment of cloud computing can encourage enterprises to focus on core businesses for large enterprises, which has also reduced substantial overheads (Garrison et al., 2015). With regard to learning and growth performance, cloud computing is popular among users because of its storage functions, and it can be quickly expanded according to the demand compared with other information systems. In the Information Age, mobile devices are popular, and

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**Table 3. Reliability and validity analysis**

<table>
<thead>
<tr>
<th>No.</th>
<th>Construct</th>
<th>No. of items</th>
<th>Item Loading</th>
<th>Composite Reliability</th>
<th>Alpha</th>
<th>AVE</th>
<th>1</th>
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<th>3</th>
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<th>6</th>
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<th>9</th>
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<td>1</td>
<td>Cloud Computing Investment</td>
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<td>0.93-0.97</td>
<td>0.94</td>
<td>0.94</td>
<td>0.89</td>
<td>0.95</td>
<td></td>
<td></td>
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<td></td>
<td></td>
</tr>
<tr>
<td>2</td>
<td>Cost</td>
<td>5</td>
<td>0.72-0.90</td>
<td>0.90</td>
<td>0.90</td>
<td>0.71</td>
<td>0.54</td>
<td>0.84</td>
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<td></td>
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</tr>
<tr>
<td>3</td>
<td>Profitability</td>
<td>4</td>
<td>0.86-0.93</td>
<td>0.93</td>
<td>0.93</td>
<td>0.83</td>
<td>0.51</td>
<td>0.87</td>
<td>0.91</td>
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<tr>
<td>4</td>
<td>Competitive Advantage</td>
<td>2</td>
<td>0.95-0.96</td>
<td>0.91</td>
<td>0.91</td>
<td>0.92</td>
<td>0.50</td>
<td>0.78</td>
<td>0.87</td>
<td>0.96</td>
<td></td>
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<td></td>
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<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>5</td>
<td>Market Response</td>
<td>3</td>
<td>0.88-0.94</td>
<td>0.90</td>
<td>0.90</td>
<td>0.83</td>
<td>0.54</td>
<td>0.68</td>
<td>0.68</td>
<td>0.66</td>
<td>0.91</td>
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<tr>
<td>6</td>
<td>Satisfaction</td>
<td>3</td>
<td>0.95-0.97</td>
<td>0.96</td>
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<td>0.92</td>
<td>0.48</td>
<td>0.65</td>
<td>0.67</td>
<td>0.64</td>
<td>0.86</td>
<td>0.96</td>
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<td>7</td>
<td>Management Efficiency</td>
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<td>0.82-0.92</td>
<td>0.93</td>
<td>0.93</td>
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<td>0.73</td>
<td>0.74</td>
<td>0.76</td>
<td>0.83</td>
<td>0.76</td>
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<tr>
<td>8</td>
<td>Process Efficiency</td>
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<td>0.92-0.93</td>
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<td>0.92</td>
<td>0.86</td>
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<td>0.62</td>
<td>0.55</td>
<td>0.49</td>
<td>0.82</td>
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<td>0.93</td>
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<tr>
<td>9</td>
<td>IS Function</td>
<td>4</td>
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<td>0.94</td>
<td>0.85</td>
<td>0.51</td>
<td>0.66</td>
<td>0.58</td>
<td>0.54</td>
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<td>0.62</td>
<td>0.61</td>
<td>0.92</td>
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<td>Decision Making</td>
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<td>0.88-0.90</td>
<td>0.91</td>
<td>0.91</td>
<td>0.79</td>
<td>0.47</td>
<td>0.68</td>
<td>0.60</td>
<td>0.57</td>
<td>0.70</td>
<td>0.64</td>
<td>0.72</td>
<td>0.71</td>
<td>0.81</td>
<td>0.89</td>
<td></td>
</tr>
<tr>
<td>11</td>
<td>IS Structure</td>
<td>3</td>
<td>0.91-0.93</td>
<td>0.90</td>
<td>0.90</td>
<td>0.83</td>
<td>0.42</td>
<td>0.66</td>
<td>0.61</td>
<td>0.54</td>
<td>0.71</td>
<td>0.67</td>
<td>0.69</td>
<td>0.73</td>
<td>0.72</td>
<td>0.86</td>
<td>0.91</td>
</tr>
</tbody>
</table>

*Note: Diagonal is the value of the square root of Average Variable Extracted (AVE).*
it is highly convenient to remotely retrieve information online (Gupta et al., 2013). Because a group can store considerable information, databases can support organizational knowledge innovation processes when required, which is closely related to organizational learning and growth. However, the customer performance had no significant correlation with cloud computing investments in this study. We inferred that companies consider cloud computing to have less of an impact on the customer dimension after adoption compared with other dimensions. Khodakarami and Chan (2014) divided information systems into three categories: operational, analytical, and collaborative. The benefits of these three types of performance were created by customer knowledge. Consequently, an analytical system can predict a customer’s behavior and preferences, and an operational system is helpful for integrating product information and collecting customer feedback. Most of extant cloud services in this present study were classified into the operational type. This might be the reason why cloud

Figure 2. Empirical evidence
computing investment did not significantly affect customer dimension. A causal relationship exists among the four BSC performance dimensions for cloud investments (Kaplan and Norton, 2001). Cloud computing can assist companies in organizational learning and can help them continually improve their capabilities, enhancing their performance in customer relationships and finally leading to an increase in financial performance (Grabski et al., 2011).

5.1 Theoretical and Practical Contributions

For potential users of cloud computing, the usage lessons of companies that have invested in cloud computing were provided in this study. The analytical results implied that cloud computing had an influence on the dimensions of finance, internal process, as well as learning and growth. The four BSC dimensions had a causal relationship in the cloud computing environment that was found to be significant, which can provide positive implications for enterprises that are considering the adoption of cloud computing. MIC (2015) revealed that “Security” ranked first among all the reasons for not adopting cloud computing. If the government wishes to promote the cloud industry in the future, it can refer to the results of this study to regulate the relevant cloud industry or coordinate with industries to sign unified security agreements for increasing the stability of the cloud market.

Most studies have focused on the different characteristics of cloud computing adoption compared with past studies on information technology, and few researchers have discussed the correlation between cloud investment and an enterprise’s performance. This is one of the first studies to explore the influence of cloud computing investments on firm performance. This study provides an incremental theoretical contribution to cloud computing research. Hoque (2014) indicated that the BSC had many research themes in the past, including organizational effectiveness. In addition to exploring the management implications between the BSC and organizations and IT, this study found that the innovative IT theme—cloud computing investments—can improve an enterprise’s performance in facilitating the achievement of its financial goals. This result supports the BSC can also be applied to the cloud computing field.

By using the modern advanced infrastructure of the network and through the flexible use of the cloud service program without the concern of information security, enterprises can use public cloud services or develop private cloud services to decrease maintenance and the information investment budget. In addition, the creation and development of a new manufacturing process present a new opportunity for enterprises to use cloud computing. Based on the flexibility and expandability of cloud computing, companies can easily modify business process and analyze big data. Cloud computing allows companies to more easily regulate the flexibility of the operation process and rapidly respond to customers’ needs. With the reduction of IT cost, companies can invest more time and resources in research and development.

5.2 Limitations and Future Research

In this study, we discovered that firm attributes did not significantly moderate the relationship between cloud computing investment and the BSC’s four dimensions of performance. Future studies can explore other types of moderators, such as organizational leader traits and environmental characteristics, as well as the antecedents of cloud computing investment. In addition, we employed cross-sectional data. Future research should collect longitudinal data because results are more robust when derived from long-term observations.
REFERENCES


I-Cheng Chang is currently an Associate Professor and chairperson at Department of Accounting at the National Dong Hwa University. He received his PhD degrees in accounting and information technology from National Chung Cheng University. His research direction is focusing on enterprise resource planning, information technology governance and computer auditing. He has published research papers in some journals such as Information Systems Journal, Decision Support systems, Information & Management, Information Systems Management, Information Systems Frontier and Communications of the Association for Information Systems.


Tsai-Ling Wu is a Master’s student at Department of Accounting at the National Dong Hwa University.