



# Information technology capability-enabled performance, future performance, and value

Information  
technology  
capability

Chorng-Shyong Ong and Poyen Chen  
*Department of Information Management,  
National Taiwan University, Taipei, Taiwan*

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## Abstract

**Purpose** – The purpose of this paper is to simultaneously determine the impact of information technology capabilities on firm performance, future firm performance, and firm value.

**Design/methodology/approach** – The secondary data for 480 matched-firms are collected from InformationWeek (which provides the IT capabilities ranking) and the Compustat database (which provides financial data).

**Findings** – The results show that IT capabilities positively and significantly influence all three constructs and that the significance level of firm value is higher than that of firm performance and that of future firm performance. That is, IT capabilities are more relevant to firm value, which represents growth opportunities, intangible assets, and innovation, etc.

**Practical implications** – Based on these empirical findings that IT contributes more to the long-term influences than to the short-term influences, firm managers should pay more attention to the strategic positioning that IT provides for firms rather than only enhancing the operational effectiveness.

**Originality/value** – This study proposes a complete set of constructs, which includes firm performance, future firm performance, and firm value, to measure the different effects of information technology capabilities on firms and to discuss the corresponding managerial implications. Therefore, these three constructs can be further clarified and considered simultaneously. This has not been attempted by previous studies.

**Keywords** Information technology capability, Firm performance, Future firm performance, Firm value, Information technology, Company performance

**Paper type** Research paper

## 1. Introduction

In recent years, IT investment has accounted for more than 50 percent of all of the capital investments made by US corporations (Laudon and Laudon, 2012). The link between information technology and firm performance is also of interest to IS researchers and practitioners (Stoel and Muhanna, 2009). However, early studies focus on the influence of information technology on performance, as measured by the accounting-based indicators in the current period. For example, Bharadwaj (2000) examined the relationship between information technology capabilities and firm performance. Subsequently, Santhanam and Hartono (2003) further used the sustainability view of information technology to determine the relationship between information technology capabilities and future firm performance. In addition, Wang and Alam (2007) and Muhanna and Stoel (2010) showed that information technology also has an intangible



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influence and a long-term influence, so they examined the relationship between IT capabilities and firm value, as measured by market-based indicators.

Previous studies have examined the benefit that information technology brings to firms from different viewpoints. However, in studying the impact of IT capabilities, all of these studies only focus on a part of firm performance, future firm performance, and firm value. That is, they usually explore the influence of individual partial constructs. Furthermore, these three dependent variables are not clearly defined. This study demonstrates that there are significant differences between the three constructs (i.e. firm performance, future firm performance, and firm value), and that they each mean different things to firms. In summary, previous studies do not provide a complete structure to illustrate the different ultimate outcomes of the use of IT for firms. For this reason, the impact of information technology capabilities on firm performance, future firm performance, and firm value is simultaneously examined in this study.

Specifically, this study has three objectives. We will first propose a comprehensive model of all the three factors to be considered at the same time for evaluation of a firm's IT capabilities; second, important variables will be clarified and defined clearly; finally, the results of the model validation will be compared with the prior findings in the literature to draw insights and implications for research and practice.

## 2. Literature review

### 2.1 Theory background and the underlying model

Recent research on IT value adopts mostly the resource-based view with the assumption that the variation of performance is due to different IT capabilities (Mata *et al.*, 1995; Powell and Dent-Micallef, 1997; Stratopoulos and Dehning, 2000). Furthermore, Huang *et al.* (2006) demonstrated that IT investment positively influences IT capabilities (which can be classified into IT infrastructure, IT-enabled intangible resources, and human IT resources) which, in turn, positively influence firm performance. Therefore, IT capabilities can be considered to be the mediators between IT investment and performance.

Bharadwaj (2000) also demonstrated that firms should combine IT-related resources to create unique IT capabilities, and then to create superior firm performance. The firms with superior IT capabilities that *InformationWeek* selected as the leader group were studied. The matched firms were then chosen as the control group, depending on industry type and firm size and a matching test for the leader group and the control group was performed. It was firmly established that firms with superior IT capabilities to their matched firms, demonstrate superior firm performance (i.e. higher profit ratios and lower cost ratios). In addition, Ravichandran and Lertwongsatien (2005) and Tsai (2004) also conducted similar examinations and obtained positively significant findings.

### 2.2 Information technology and future firm performance

The literature only considers the current firm performance. However, the effect of time is also an important factor in tracing the value of IT (Im *et al.*, 2001). In Kohli and Devaraj's (2003) IT value meta-analysis model, the types of data analysis used in the previous studies were used to distinguish between the cross-sectional analysis and the longitudinal analysis. They also proposed that the benefits from technology investments can be realized over an extended period of time and do not only influence the current period. Further, the effect of lag also shows that there is a time lag between the input of IT and the output of benefits (Devaraj and Kohli, 2000; Kohli and Devaraj, 2003).

Therefore, although most studies focus on the current impact on firms (i.e. cross-sectional analysis), some studies (Devaraj and Kohli, 2000; Santhanam and Hartono, 2003; Chang and Gurbaxani, 2012) trace IT value for a long period (i.e. longitudinal analysis).

Santhanam and Hartono (2003) extended Bharadwaj's (2000) framework in three aspects: the selection of matched samples, more conservative previous financial performance adjustments and the sustainable effect of time lags. Their study shows that the sustainable effect is highly significant. That is, the firms with superior IT capabilities show a performance better than the average performance of the other firms, not only in the current years but also in the following three years. These findings further show that IT capabilities have a sustained influence. They also imply that the contributions that IT brings to a firm cannot be measured only by considering the current firm performance. The future firm performance must also be taken into consideration simultaneously.

### 2.3 Information technology and firm value

In the measurement of IT value, researchers usually use accounting-based measures or financial market-based measures to measure the impact of IT on firms (Bharadwaj *et al.*, 1999; Ravichandran *et al.*, 2009; Tanriverdi, 2006). However, they do not further clarify the implications of these two measures and usually view these measures as the generalized performance. They only use different measurement methods to strengthen the effectiveness of the empirical findings. This study believes that these two types of measures are not only two different measurement methods, but also two different variables. The accounting-based measures (e.g. return of assets (ROA) and return on sales (ROS)) are backward-looking measures that assess the past performance of assets (Tanriverdi, 2006) and are defined as "firm performance" in this study. The financial market-based measures (e.g. Tobin's Q and market to book value ratio) are forward-looking measures (Tanriverdi, 2006) and are defined as "firm value" in this study. Firm performance is calculated according to the historical accounting data and only implicates firms' current and past outcomes. Therefore, it cannot reflect the future outlook and is insensitive to time lags (Bharadwaj *et al.*, 1999). Further, firm performance only represents firms' profitability and productivity (Ravichandran and Lertwongsatien, 2005). Firm value is calculated according to firms' market value and implicates firms' future potential and prospects (Bharadwaj *et al.*, 1999). Firm value also represents firms' intangible value, growth opportunities, and innovation.

In addition, although some studies use an alternative method for the forecasting of future firm performance that takes account of the effect of time lags, the authors believe that there are two main differences between future firm performance and firm value. First, the time point for the assessment is different. Firm value is an assessment of a firm's future in the current period, but future firm performance is the actual situation in the future period. If firm's performance can be traced in the future, the realized benefits of IT can be better established. Second, an intangible value cannot reflect on future firm performance, but reflects on the premium price of the market value. These premiums are difficult to measure only using firm performance. Although future firm performance and firm value may have some overlap or association, they can also be referenced to each other. Further, they indeed represent different effects of IT and can be used in complement with each other to identify the benefits that IT brings.

In the early years, McFarlan (1984) proposed that firms must see IT as a strategic resource and think about the strategic position of IT at a firm level. In doing so, new opportunities could be created. Porter and Miller (1985) generalized three effects of IT:

changing the industry structure and the rules of competition, creating competitive advantage by giving companies new ways to outperform their rivals, and spawning a whole new business, often from within a company's existing operations. In recent years, Bharadwaj *et al.* (1999) proposed that IT can create intangible value for firms. Sambamurthy *et al.* (2003) proposed the concepts of agility and digital options, which are also more relevant to intangible value. Mitra (2005) indicated that IT could enable firms' growth. Xue *et al.* (2012) identified the effect of IT on innovation. Kleis *et al.* (2012) linked the relationship between IT and intangible output and proposed that the use of IT in innovation and knowledge creation processes is perhaps the most critical factor in a firm's long-term success. All of these concepts demonstrate the contribution of IT to firms, beyond profitability and productivity (i.e. firm performance). Wang and Alam (2007) and Muhanna and Stoel (2010) also examined the relationship between information technology capabilities and firm value, and their findings are positively significant. Therefore, a reassessment of the value of IT can demonstrate not only how IT can improve performance, but also how IT can create opportunities and produce to more business value (Martinsons and Martinsons, 2002). This also demonstrates that both firm performance and firm value must be simultaneously considered when considering the influences of IT.

### 3. Hypotheses development

The literature review begins with the most basic argument (i.e. IT capabilities influence firm performance). Further, based on the effect of time, current and future firm performance must be differentiated. In doing so, the lag effect and the sustainable effect of information technology can be explained. In addition, depending on measurement methods, the implications of firm performance and firm value are further identified and it is thought that IT capabilities simultaneously affect these two factors. In sum, IT capabilities simultaneously positively affect firm performance, future firm performance, and firm value.

In addition, although previous studies have proposed separate arguments and verification for these constructs, no literature has simultaneously considered these viewpoints and examined them. Most studies have used one of the three constructs. For example, Bharadwaj (2000) only used firm performance; Bharadwaj *et al.* (1999) and Wang and Alam (2007) only used firm value. Some studies use two constructs at the same time. For example, Santhanam and Hartono (2003) used firm performance and future firm performance. Therefore, if these three measures can be used together to identify the value of IT, the value of IT can be better understood. The research hypothesis is proposed as follows.

*Research Hypothesis:* Firms with superior IT capabilities (relative to all the other firms in the same industry) simultaneously have superior (a) *firm performance*, (b) *future firm performance*, and (c) *firm value*.

### 4. Methodology

#### 4.1 Sample source

*InformationWeek* is a major magazine that has surveyed the use of IT in US companies every year, from 1989, and which publishes the 500 IT leading firms every September (Lichtenberg, 1995; Bharadwaj *et al.*, 1999; Bharadwaj, 2000). Further, its IT leader rankings are recognized by many top journals in the IS field, such as *MIS Quarterly*, *Management Science* and *Information & Management*. Bharadwaj (2000) and Santhanam and Hartono's (2003) believed that the firms in the IT leaders' lists are the most "effective and efficient users of information technology" and best represent the

firms with superior IT capabilities. Therefore, this study follows their methodology and uses *InformationWeek* as our sample source.

#### 4.2 Data collection

Although *InformationWeek* has selected the top 500 IT leaders in each of the past 23 years, the selection method and criteria have been adjusted over time. For example, the scale of IT investment has been forsaken in favor of a measure of use and innovation of IT. In the early period, *InformationWeek* only used quantitative indicators to evaluate firms' IT scales. In recent years, *InformationWeek* has combined quantitative with qualitative assessments to rank firms' capabilities in the use and innovation of IT, rather than their IT-related budgets.

Because the consistency of the selection method and the comparison period must be considered, the *InformationWeek* 500 lists from 2004 to 2008 are selected as the IT leader sample sources. In addition, the *InformationWeek* 500 lists are published every September and the list that is published in the current year refers to the previous year's IT leaders. For this reason, the time period must be adjusted. That is, the duration of the current performance and value is from 2003 to 2007, while the duration of the future performance is from 2008 to 2010.

Two thousand five hundred records (500 records\*5 years) for the selected firms were collected for the five years. However, most firms appear on the leader lists more than once. A total of 1,028 firms are found to have been listed once, after the overlapping data is removed and these are regarded as the possible leader samples. The Compustat finance database was used to collect these firms' financial data. Three hundred and eighteen firms were not included in Compustat database and 244 firms' financial data was not complete. The possible reasons for this may be a merger or acquisition, name change, or the lack of a stock market listing. Finally, 466 firms were selected as the IT leader samples.

The matching procedures of the control groups (i.e. the firms without superior IT capabilities) use Santhanam and Hartono's (2003) selection method. First, all firms that were included in the Compustat database (from 2003 to 2007) were regarded as the possible control samples. Second, the firms that appeared on the leader lists once during this period (i.e. the 1,028 firms that were selected as IT leaders) are removed from the possible samples. In addition, because *InformationWeek* only considers the firms whose revenues exceeded 500 million dollars into their assessment procedure of IT leaders, only the firms whose revenues were over 500 million dollars (i.e. the same criteria) were retained in the possible control samples. Third, the remaining firms were assigned to sub-groups, according to their industry type (firms whose two-SIC code is the same are regarded as being in same industry) and the median of the sub-groups' financial indicators was calculated. Fourth, the leader samples were one-to-one matched to these sub-groups of control samples according to their two-SIC code. The two possible control variables (i.e. firm scale and industry type) are controlled by these protocols. The finally sample size was 466 pairs of leader and control firms.

Table I shows the data collection processes and illustrates the selection steps from the original 2,500 sample firms to the final 466 sample firms. In addition, Table II provides the descriptive statistics of the 466 samples after the matching processes according to the mean and the median values for total assets, revenue, and market value in each year.

#### 4.3 Measures

As mentioned in the literature review, there are two types of measurements for the variables: the accounting-based measures and the marketing-based measures.

These, represent firm performance and firm value, respectively. In terms of firm performance, the ROA and the ROS are used in this study. These were also usually used in previous studies (Dehning and Richardson, 2002; Huang *et al.*, 2006; Liang *et al.*, 2010).

For the measurement of firm value, the concept of comparing firms' market value and book value was used most often (Anderson *et al.*, 2006), and it was also the calculation concepts used by Tobin's Q (Hitt *et al.*, 2002). Therefore, this study uses the market to book ratio to represent firm value. However, two calculation methods at the operational level strengthen the verification. The first is the market stock price to book stock price (abbreviation for MBE). The second is the market value of equity plus liability to book assets (abbreviation for MBA). MBE is used to calculate firm value from the viewpoint of the pure shareholder value (i.e. equity value). MBA is used to add the concept of liability and uses the viewpoint of total assets to calculate firm value.

## 5. Results

### 5.1 Parameter test

Following the matched-samples procedures, each indicator's mean and median are first shown in Table III, for each sample group and year. Overall, either in the mean or in the median, the four indicators for the leader groups are commonly superior to those of the control groups, for each year. Further, the independent parameter tests (Wilcoxon Rank Sum Test) are used to examine the yearly difference between the leader groups and the control groups. This test method avoids the influence of extreme numbers. This method focuses on comparing the relative value of the two groups' ratios rather than the absolute average of the two groups' ratios. The results of the parameter test are shown in Table IV.

**Table I.**  
The distribution  
of Leader Groups

Year	Original samples (information week 500)	Selected samples (in Compustat)	Complete samples (after matched)
2004	500	379	262
2005	500	346	238
2006	500	349	238
2007	500	361	262
2008	500	362	265
Total number of firms (not times)	1,028	710	466

**Table II.**  
Descriptive statistics  
(million \$)

Year	Group	Asset		Revenue		Market Value	
		Mean	Median	Mean	Median	Mean	Median
2003	Leader	41,558.89	6,497.97	13,533.58	4,823.43	19,474.41	5,890.72
	Control	3,443.57	1,908.17	1,575.56	1,317.90	1,921.52	1,781.43
2004	Leader	48,600.95	7,770.38	15,080.50	5,327.35	21,421.58	7,010.11
	Control	3,662.53	1,882.73	1,741.90	1,424.46	2,089.09	2,009.90
2005	Leader	51,087.27	7,737.90	16,408.64	5,990.32	22,028.46	7,819.41
	Control	3,737.68	1,874.05	1,735.45	1,428.29	2,347.06	1,806.35
2006	Leader	57,569.10	8,433.63	18,096.28	6,547.65	24,590.95	8,983.52
	Control	3,493.71	1,830.42	1,864.41	1,475.08	2,469.48	1,966.35
2007	Leader	63,455.65	9,069.55	19,531.57	7,173.43	25,067.78	8,181.41
	Control	3,718.19	1,985.56	2,027.91	1,432.00	2,505.46	2,009.42



Year	Group	ROA		ROS		MBA		MBE	
		Mean (%)	Median (%)	Mean (%)	Median (%)	Mean (%)	Median (%)	Mean (%)	Median (%)
2003	Leader	6.55	3.54	7.63	5.21	187.47	140.71	228.13	231.73
	Control	3.29	3.03	4.97	3.88	142.47	146.62	206.49	209.06
2004	Leader	5.08	4.55	6.94	6.05	186.36	145.63	303.87	238.87
	Control	4.31	4.68	5.88	5.23	145.77	140.90	218.62	206.93
2005	Leader	5.28	4.80	7.01	6.26	187.23	148.93	326.63	229.45
	Control	4.64	4.61	6.32	6.25	151.84	147.68	226.66	217.98
2006	Leader	6.01	5.30	7.97	6.74	187.63	153.06	313.90	243.90
	Control	4.99	4.83	6.68	6.33	154.62	153.38	226.25	221.58
2007	Leader	5.40	5.10	7.10	6.58	178.46	144.59	357.83	224.73
	Control	4.54	5.06	6.06	6.03	144.40	141.13	208.54	209.60
2008	Leader	1.33	3.73	(1.81)	4.53				
	Control	2.64	3.33	3.40	3.90				
2009	Leader	3.29	3.02	3.75	4.09				
	Control	3.21	2.98	4.43	4.18				
2010	Leader	4.75	4.63	5.80	6.68				
	Control	4.46	4.82	6.32	6.72				

**Table III.**  
Mean and median

Year		Indicators			
		Firm performance		Firm value	
		ROA	ROS	MBA	MBE
Current	2003	0.0114 **	0.0034 ***	0.0024 ***	< 0.0001 ***
	2004	0.0458 **	0.0027 ***	0.0013 ***	< 0.0001 ***
	2005	0.0397 **	0.0216 **	0.0310 **	0.0052 ***
	2006	0.0268 **	0.0140 **	0.0328 **	0.0001 ***
	2007	0.0024 ***	0.0017 ***	0.0212 **	0.0001 ***
Future	2008	0.0016 ***	0.0076 ***		
	2009	(0.3804)	(0.4767)		
	2010	0.1975	0.1228		

**Notes:** Significant at: \*10, \*\*5 and \*\*\*1 percent and ( ) represents negative impact; the value indicates the single tail  $p$ -value of the independent parameter test

**Table IV.**  
The results of the  
parameter test

All of the 12 firm performance tests ( $H_a$ ) and all of the 12 firm value tests ( $H_c$ ) are positively significant. Specifically, the significance levels of the 24 tests are all less than 5 percent. This shows that  $H_a$  and  $H_c$  are strongly supported. However, as for all the six future firm performance tests, only the two tests in the first year (2008) are highly significant (1 percent). Therefore,  $H_b$  is partially supported. Otherwise, it may also be inferred that although IT capabilities simultaneously positively affect these three constructs (firm performance, future firm performance, and firm value), the sustained period is short-lived (only one year, according to the empirical findings).

### 5.2 Alternate test

Santhanam and Hartono (2003) proposed that superior prior performance could lead the superior current performance. That is, the current performance can be influenced by the prior performance (i.e. a halo effect). They further used a more conservative method (regression test) to adjust the previous performance. This study follows their

methodology and the results are shown in Table V. Overall, the change in the results is similar to that obtained by Santhanam and Hartono (2003). That is, the impact of IT indeed declines when the prior performance (value) is adjusted. In this case, hypotheses (a) and (c) are partially supported, due to the methodology used, but the indicator of MBE is still strongly supported. However, it is believed that the patterns of these findings are more important and valuable. Indeed, the patterns of the two test methods' findings are similar and they complement each other to confirm the research hypotheses.

## 6. Discussion and conclusion

### 6.1 Discussion of research findings

Using the results of the tests, the significance levels of the different constructs can be further compared, although they are commonly significant. Firm value is the most significant because the significance level of the seven tests is less than 1 percent and the significance level of the three tests is less than 5 percent. The tests for firm performance are second because four of all the ten tests have a significance level of less than 1 percent and that of the other six tests is less than 5 percent. The least significant are the tests for future firm performance because only the two tests in 2008 are significant.

Although IT capabilities indeed have a simultaneous influence on firms in terms of the three constructs, the significance levels of these effects are different. These findings provide an opportunity to compare these three constructs and the authors hope that the insights derived from them will make important contributions to future research. For example, it is found that the significance level of firm value is higher than that of firm performance. This view is similar to Kohli et al.'s (2012) empirical findings. They used both accounting- and market-based measures to examine the influence of IT in the healthcare industry. In addition, firm performance represents a short-term influence and firm value represents a long-term influence (Saeed *et al.*, 2005). Although IT capabilities have simultaneous short- and long-term influences on firms, the long-term influences are more significant than the short-term influences. This shows that managers should pay more attention to the long-term strategic positioning that IT provides for firms, rather than only considering the short-term improvements gained through improvements in operational effectiveness.

Although IT has some sustained effects, these effects are limited. This is a somewhat different finding from those of the early studies. For example, Santhanam and Hartono (2003) used the same sample sources from *InformationWeek* in 1991-1994 and their findings show that the sustained effects are strong supported. It can be inferred that managers should invest in IT continuously, because the sustained influences are curtailed in recent years. If firms do not continuously monitor their IT capabilities, they risk becoming surpassed by their competitors.

### 6.2 Research contributions

First, this study proposes a complete set of constructs: firm performance, future firm performance, and firm value, to summarize the contribution of IT capabilities to firms. Just as Hitt and Brynjolfsson (1996) proposed three different measures for IT value (i.e. productivity, business profitability, and consumer surplus), this study's three measures are more relevant to firms' ultimate outcome. Hitt and Brynjolfsson's (1996) IT value focuses more on the macro-economic perspective and considers the value that the different roles (e.g. firms, consumers, and the entire economy) receive. However, this study's argument focuses more on the individual firm's level and only considers



Year	ROA				Performance				ROS							
	Adj-R <sup>2</sup>	Coeff.	p-value	Dummy	Adj-R <sup>2</sup>	Coeff.	p-value	Dummy	Adj-R <sup>2</sup>	Coeff.	p-value	Dummy	Adj-R <sup>2</sup>	Coeff.	p-value	Dummy
Current	2003	0.012	0.351	0.0006***	0.033	0.1632	0.0088***	0.017	0.220	0.017	0.0660*	0.301	0.017	0.0660*	0.010	0.0530*
	2004	0.010	(0.010)	0.0229**	0.008	0.0088***	0.0088***	0.006	0.017	0.0088***	0.0088***	0.0088***	0.006	0.017	0.0088***	0.0088***
	2005	0.415	0.788	<0.0001***	0.000	0.8985***	0.8985***	0.400	0.641	0.641	<0.0001***	0.000	0.400	<0.0001***	0.000	0.9839**
	2006	0.178	0.412	<0.0001***	0.007	0.0269**	0.0269**	0.182	0.414	0.414	<0.0001***	0.010	0.182	<0.0001***	0.010	0.0360**
Future	2007	0.237	0.521	<0.0001***	0.003	0.3420***	0.3420***	0.175	0.482	0.482	<0.0001***	0.004	0.175	<0.0001***	0.004	0.4410
	2008	0.220	0.803	<0.0001***	(0.020)	0.0010***	0.0010***	0.017	0.580	0.580	<0.0001***	(0.058)	0.017	<0.0001***	(0.058)	0.0390**
	2009	0.107	0.194	<0.0001***	0.003	0.3879	0.3879	0.026	0.051	0.051	<0.0001***	(0.004)	0.026	<0.0001***	(0.004)	0.6363
	2010	0.112	0.306	<0.0001***	0.003	0.4365	0.4365	0.004	0.139	0.139	0.0126	(0.004)	0.004	0.0126	(0.004)	0.7749
	MBA				MBE											
		Adj-R <sup>2</sup>	Coeff. <th>p-value</th> <th>Dummy</th> <td></td> <td>Adj-R<sup>2</sup></td> <td>Coeff. <th>p-value</th> <th>Dummy</th> <td></td> <td>Adj-R<sup>2</sup></td> <td>Coeff. <th>p-value</th> <th>Dummy</th> </td></td>	p-value	Dummy		Adj-R <sup>2</sup>	Coeff. <th>p-value</th> <th>Dummy</th> <td></td> <td>Adj-R<sup>2</sup></td> <td>Coeff. <th>p-value</th> <th>Dummy</th> </td>	p-value	Dummy		Adj-R <sup>2</sup>	Coeff. <th>p-value</th> <th>Dummy</th>	p-value	Dummy	
	2003	0.821	1.029	<0.0001***	(0.022)	0.4149	0.004	0.136	0.0238	0.097	0.8858***	0.004	0.136	0.0238	0.8858***	
	2004	0.824	0.833	<0.0001***	0.031	0.1962	0.067	(0.092)	<0.0001***	0.872	0.0005***	0.067	(0.092)	<0.0001***	0.872	0.0005***
	2005	0.852	0.930	<0.0001***	(0.024)	0.2819	0.041	0.288	<0.0001***	0.754	0.0492**	0.041	0.288	<0.0001***	0.754	0.0492**
2006	0.817	0.858	<0.0001***	0.027	0.2525	0.002	0.005	0.8913	0.871	0.0611*	0.002	0.005	0.8913	0.871	0.0611*	
2007	0.754	0.834	<0.0001***	0.065	0.0127**	0.101	0.160	<0.0001***	1.353	<0.0001***	0.101	0.160	<0.0001***	1.353	<0.0001***	

Notes: Significance at: \*10, \*\*5 and \*\*\*1 percent levels; (performance<sub>t</sub> or value<sub>t</sub>) = fperformance<sub>(t-1)</sub> or value<sub>(t-1)</sub>, dummy: leader firm = 1, control firm = 0

Table V.  
The Results of the Alternate Regression Test

which ultimate outcomes (i.e. financial-related indicators) a firm will realize from IT. This is the main research contribution and it complements the previous arguments.

Second, the literature review illustrates the implications (or driving factors) of these three constructs. For example, the current firm performance represents the impact of productivity and profitability. The future firm performance represents the lag effect and sustained effect of IT inputs. Beyond the scope of firm performance, the impact of intangible value, growth opportunities, and innovation is represented by the indicators of firm value.

### 6.3 Practical implications

In terms of the management practice in regard to IT value, Ragowsky *et al.* (2000) proposed that the two questions “What benefits should organizations expect from IS?” and “What variables predict or explain these benefits?” – must be answered by managers. The preliminary answers are given in this study, including the use of these three variables (firm performance, future firm performance, and firm value) to explain the benefits of IT, as these three variables represent the potential benefits. Huang *et al.* (2006) noted that a reasonable and objective evaluation method is important for managers and managers can use this study’s method to assess and manage their IT capabilities. They can also further confirm the accuracy and effectiveness of these IT inputs.

When managers make investment decisions, they can apply this study’s ideas to expand their horizons and assess the benefits that IT brings. For example, using only the current performance to measure the effectiveness of IT investment may cause a new investment initiative to be overlooked. This is not conducive to a firm’s future development. It is also necessary to balance or coordinate a firm’s IT portfolios to ensure the benefits of these three constructs.

### 6.4 Limitations and future research

The data types mean that only the binary data for IT capabilities and the ultimate accounting-based and market-based outcomes for a firm can be collected. This study fails to deal with these variables more rigorously because of the lack of a more meticulous measurement method for IT capabilities. In addition, due to the same limitation, this study uses only the parameter test (or the alternate regression model) to compare the leader groups and the control groups in the statistical test. However, the firms’ scale and industry type (the two most important factors) and their prior performance or value (in the alternate regression model) are controlled. The median ratios of industries are used, and the comparison is elongated to avoid possible biases. Other variables may explain the superior performance (value). However, this study focuses on the three IT-enabled influences. If better samples and data are available in the future, these influences can be examined more rigorously.

Second, because *InformationWeek* only considers firms with revenues exceeding 500 million dollars, the empirical findings do not reflect the situation for small firms. This issue should also be noted as a limitation, although these small firms could use IS much more productively.

Finally, this study’s hypotheses only focus on whether or not IT capabilities affect these three ultimate outcomes. The weight of these relationships is not further compared and explored. Moreover, there may be relationships between these ultimate outcomes. These issues can be further examined, because managers want to know the trace of IT-enabled ultimate outcomes. However, a correlation table (Table VI) is provided, which shows that there are indeed some differences between these constructs.

	Current performance			Leader Future performance			Value			Current performance			Control Future performance			Value		
	ROA	ROS	ROA	ROA	ROS	ROA	MBA	MBE	ROA	ROS	ROA	ROS	ROA	ROS	ROA	ROS	MBA	MBE
<i>Leader</i>																		
Current performance	ROA	1.00																
	ROS	0.82	1.00															
Future performance	ROA	0.21	0.20	1.00														
	ROS	0.10	0.11	0.50	1.00													
Value	MBA	0.34	0.29	0.50	0.20	1.00												
	MBE	0.16	0.15	0.31	0.08	0.44	1.00											
<i>Control</i>																		
Current performance	ROA	0.14	-0.07	0.12	0.09	0.24	0.09	1.00										
	ROS	-0.05	0.30	-0.07	-0.06	-0.18	-0.09	-0.20	1.00									
Future performance	ROA	0.12	-0.01	0.25	0.15	0.24	0.13	0.57	-0.15	1.00								
	ROS	0.00	0.22	0.09	0.06	-0.04	-0.04	-0.03	0.70	0.45	1.00							
Value	MBA	0.15	0.01	0.18	0.13	0.39	0.15	0.74	-0.19	0.66	0.15	1.00						
	MBE	0.11	0.08	0.18	0.13	0.33	0.16	0.50	-0.01	0.57	0.30	0.87	1.00					

Table VI. Correlation table

Overall, this study proposes three IT-enabled ultimate outcomes that completely identify the contributions of IT. However, many issues must still be clarified and studied in the future, including the issues that are noted in the preceding sections, e.g. the difference between the short-term and the long-term impact and the sustained impact of IT, etc.

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#### Further reading

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#### About the authors

Chorng-Shyong Ong is a Professor of Information Management at National Taiwan University (NTU), Taiwan. He holds a Master's degree in management science and policy studies from TSUKUBA University in Japan. He received his PhD in business administration from NTU. His research interests include IS service quality, web-based services, electronic commerce and strategic management of e-business. He has published papers in *Decision Support Systems*, *Technovation*, *Information & Management*, *Computers in Human Behavior*, *Government Information Quarterly*, and other journals.

Poyen Chen is a PhD student of Information Management at National Taiwan University (NTU). He has served as a senior consultant at PricewaterhouseCoopers (PwC) Taiwan. He received his MBA in information management from National Taiwan University. His current research interests include IT performance, strategic management, e-business, and knowledge management. Poyen Chen is the corresponding author and can be contacted at: poyen.taiwan@gmail.com

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