Available online at www.sciencedirect.com
ScienceDirect
Procedia Computer Science 91 (2016) 652 – 661
Procedia Computer Science

Information Technology and Quantitative Management (ITQM 2016)

Impact of IT Investment on Firm Performance Based on Technology IT Architecture

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Abstract

Since many firms have strengthened their core competencies by using information technology, it is important to understand how IT investment contributes to the achievement of business objectives. This study categorizes the IT investments into five technical areas based on a real-life company's architecture such as basic infrastructure, security, wireless, collaboration, and datacenter. An empirical model is built to analyze how IT investment in these categories influences the business growth. We found that wireless technology is the main IT driver of revenue growth. Furthermore, our analysis shows that IT paradox exists in some investment categories because of the time lag before full realization.

Peer-review under responsibility of the Organizing Committee of ITQM 2016

Keywords: IT investment; business performance; technology; revenue growth

1. Introduction

In the age of information technology (IT), with its changing work environment, IT's role has become more important in strengthening firm's competitiveness in their industries. Firms are therefore increasing their IT investments and, due to the continuous economic downturn, management requires IT not only to save costs but also shape business outcomes. Given such pressure, multiple efforts have been made to measure IT investment from a business perspective. We can better understand this IT investment trend by referring to data from the Korea National Statistical Office (2014). The IT industry's contribution to the Korean gross domestic product (GDP) has been continuously rising in recent years, from 28.4% in 2006 to 30.9% in 2013. From 1993 to 2013, enterprises proactively invested in the continuous deployment of information communication broadcasting, increasing IT investment by 64%, from $210 billion to $330 billion (Korea Association of Information and Telecommunication, 2014). Therefore, it is important to measure the relations between IT investment and payoff to determine IT's contribution to business performance.

Firms expect to maintain their business sustainability by maximizing profitability and increase sales revenue by improving their business processes. IT deployment can contribute to these goals by improving employee productivity and collaboration among employees, partners, and customers. By strengthening their IT, companies can better communicate with and provide responsive services to their customers, ultimately positively influencing business. Jason Brougham, enterprise network manager at American Medical Response (AMR) highlights the importance of IT's contribution to business strategy [1]: "You can't just spend on IT for its sake. It really has to be aligned with the business. If IT doesn't solve a specific business problem, then IT is nothing more than a bunch of blinking lights in a really expensive room."

AMR's main business is to provide ambulance services for emergency cases. When Hurricane Ivan hit Birmingham, Alabama, in the United States, where their centralized call center is located, AMR was able to reroute their calls to California, an area unaffected by the hurricane, by utilizing one of their critical IT systems, their IP voice network [1]. IT allowed AMR to maintain its business continuity, a critical aspect. Previous researchers have attempted to find a direct

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Peer-review under responsibility of the Organizing Committee of ITQM 2016
doi:10.1016/j.procs.2016.07.164

relationship between IT investment and business performance, with inconsistent results: Some find IT to have a positive impact on business performance while some find a negative impact. However, no study examines the impact of specific technologies on business performance after investment. Brynjolfsson et al. [2] described how measuring information processing capabilities inside firms requires a more precise view of IT and organizational complementarity, particularly regarding the technologies themselves and the specific systems of practices they support.

Our study aims to analyze how the investment impact of IT on business growth using actual data from a large company's customer sales transactions. Company C is a global IT company that provides end-to-end network solutions (products and services). It has 380 global sites in 165 countries with $49 billion in annual sales revenue. Its market penetration worldwide is 67% in terms of basic infrastructure, 50% in wireless, 46% in collaboration, 34% in data centers, and 31% in security.

2. Literature review

Previous studies concerning IT business value have established a link between firm-level IT investment and tangible returns such as productivity output. Many studies have researched IT payoff, but the results have been inconsistent, some indicating that IT investment positively affects business performance, some highlighting the IT paradox of an immediate negative impact but a lagged positive impact, and others finding no relationship between IT investment and firm performance.

In the literature supporting a positive impact of IT investment, Kelis et al. [3] suggested that IT is vital to intermediate processes such as those that produce intangible output and that its use in innovation and knowledge creation processes is the most critical element to a firm's long-term success. By analyzing yearly data from 1987 to 1997 for a panel of large U.S. manufacturing firms, the authors found that a 10% increase in IT input is associated with a 1.7% increase in innovation output for a given level of innovation-related spending.

Lee [4] analyzed the relationship between office, computing, and accounting machinery and GDP in the United States from 1961 to 2001. And showed that IT investment growth causes economic performance growth in longer periods.

Bharadwaj [5] empirically tested the relationship between a firm's IT capability and performance by comparing the financial performance of firms rated as IT leaders with that of comparable firms. The list of IT leaders was obtained from Information Week and represented a set of firms chosen by a panel of industry experts as the most efficient and effective IT users in the industry. Each of these IT leader firms was matched with another firm of similar size and their financial performances were compared. The results indicated that several average financial performance measures of IT leader firms were significantly better than those of the matched firms. These results supported the argument that firms that develop an effective IT capability are able to achieve superior financial performance compared to those that do not [6].

Using banking industry data, Jun [7] found the relationship between return on equity and the capital budget ratio to be the strongest, implying that the capital budget has the greatest effect in enhancing bank returns. The IT investments of large banks have a stronger positive influence in improving bank returns than those of small banks, as do the IT investments of wholesale banks specializing in corporate loans. According to the author's findings, the real value of strategic alignment is in leveraging a firm's IT investment, at least in small and medium-sized manufacturing firms.

Terry et al. [8] also examined the banking industry and found IT investment to be positively related to firm performance. They also found the alignment of information systems strategy with business strategy to be a critical element of IT management, not as a direct contributor to firm performance but, rather, as a moderator between IT investment and firm performance.

Indjikian and Siegel [9] compared studies on developed and developing countries and found the empirical findings on IT and economic performance to be fairly robust, in the sense that the overwhelming majority of studies showed a positive correlation between a proxy for IT investment and a proxy for economic performance at each level of aggregation (i.e., plant, firm, industry, and country). Furthermore, the authors found evidence suggesting that complementary investments in IT-related labor and organizational factors that provide a supportive work environment for maximizing returns on IT investment also contribute to improvements in productivity.

Kwon [10] found a direct positive relationship between IT investment and five firm performance variables (firm growth, market competiveness, customer relationships, partnerships with providers, operational efficiency), controlling for the role of the chief information officer (CIO), mobile tech adoption, IT support and maintenance, and IT outsourcing. Campbell [11] found that IT investment has an overall significantly positive impact on firm performance over and above the effects of firm size, the relative degree of effective IT use, firm past performance, and industry performance in terms of both profit ratios—return on sales (ROS) and operating income to assets OI/A—and cost ratios—cost of goods sold to sales (COGS/S). The results of time-lagged regression analyses demonstrated that there does appear to be a time lag before IT investments are fully realized in the firm's bottom line. Interestingly, the results also showed different patterns for the time lag effects of IT investment on the three performance measures. Specifically, it took approximately three years after the year of investment to realize the greatest performance benefits in ROS and COGS/S, while it took four years after the year of investment to realize the maximal performance gain in OI/A. It also took as long as two years after the year of investment for the benefits in OI/A to start to manifest, while the effects on ROS and COGS/S appeared as early as the year of the initial IT investment. These findings have useful implications for researchers and managers in better understanding the link between IT and firm performance to make wiser IT investment decisions and for IT management to maximize the business value of their investments.

In a research context that considers only the amount of IT investment and market entry time, the simulation results of Liao el al. [12] showed that greater IT investment indeed contributes to increasing a firm's service quality, customer satisfaction, market share, and profitability within information-intensive service industries. In addition, given similar amounts of IT investment, early entrants will obtain greater competitive advantages and achieve superior market performance compared to followers.

Some studies have researched the impact of IT from a time lag perspective, since IT does not pay off immediately due to the paradox of overspending on the IT resource.

Jung's [13] empirical study based on online brokerage firm data found that high-capability firms invest more in IT systems than in capability advantages and thus achieve better financial performance by providing better-quality service.

Huang et al. [14] provided an important message to enterprises: If firms want to use IT investment to improve their performance, their IT-enabled intangible assets must be improved first and, if the firm wants to improve its IT-enabled intangible assets, it should enhance its human IT capability with a background in resource-based view (RBV) theory. Until a firm's IT capability is ready, IT investment will not impact the firm's performance.

Kauffman et al. [15] stated that a firm's senior managers will benefit from deferring technologically investment decisions based on appropriate expectations, since information is revealed over time about future trends regarding technology standards and market conditions, as well as the volatility of investment costs and benefits. When the investment decision horizon is more flexible, the firm is more likely to defer its technological investment decisions for longer to maximize the potential of a higher payoff. With higher risk and volatility levels associated with future benefits from technology adoption, the firm will be able to achieve a higher return on investment but the likelihood of a large loss will be greater. When benefit flows revert to equilibrium more quickly, the investment will achieve higher returns.

In addition, some researchers [16, 17] have found no impact of IT investment on firm performance.

As mentioned, the debate on the impact of IT on business performance is ongoing. Surprisingly, in a time of economic recession and regardless of controversial issues, IT investment has been increasing (Korea National Statistical Office, 2014). One could ask whether IT investment should be measured as one element, that is, as a whole, or as multiple components broken down into several investments by category. In this study, we analyze investments by category to measure their influence on business performance in time.

Table 1. Studies on IT investment

Relationship between IT and firm performance	Theory	Research	Findings
Positive	Matched sample comparison RBV theory	[5]	This study used 5 years of sample data (IT spending and sales revenue) and found that superior IT capability improves firms' business performance though their IT investment.
Positive	Empirical studies on the impact of information and communications technology on economic performance	[9]	IT investment will pay off when it is accompanied by complementary investment in IT-related labor and organizational factors.
Positive	Causal mechanism (Granger causality)	[4]	IT investment growth causes economic performance growth in longer periods.
Positive	Production approach Variance approach	[10]	This study found a direct positive relationship between IT investment and five firm performance variables (firm growth, market competiveness, customer relationships, partnerships with providers, operational efficiency) and that the CIO's role has a positive

			moderating impact on business while IT outsourcing has a negative impact.
Positive	Business analysis or financial (statement) analysis	[7]	The IT investments of large banks have a stronger positive influence than those of small banks.
Positive	Strategic alignment	[8]	IT investment with business strategic alignment can increase sales revenues and profits.
Positive	Real option theory Time lag effect of IT investment on firm performance	[11]	IT investment was found to have a positive impact on firm performance based on firm size, the relative degree of effective IT use, firm past performance, and industry performance in terms of both profit ratios and cost ratios There is also a time lag before IT investments are fully realized in the company's bottom line.
Positive	Knowledge production function framework	[18]	IT is vital to intermediate processes such as those that produce intangible output and the use of IT in innovation and knowledge creation processes is the most critical to a firm's long-term success.
Positive	Socio-technical approach	[19]	IT investment has positive results by saving costs in some cases.
Positive	System dynamics process	[12]	The amount of IT investment and market entry time influence firm performance.
Positive	Econometric model	[20]	Firms with the highest IT investment and capability have 45–76% greater market value than firms of the lowest IT investment and capability.
IT Paradox	IT productivity paradox	[21]	There is paradox regarding IT investment and it takes a time for the benefits of, for example, an enterprise resource planning system to emerge. IT investment influences firm performance through an intermediate variable, IT capability.
IT Paradox	RBV theory	[22]	The study demonstrated the productivity paradox of IT investment.
IT Paradox	RBV theory	[13]	IT investment is not enough to improve performance but better service quality induces higher financial performance.
IT Paradox	RBV theory	[23]	IT investment can impact negatively business performance unless the firm is leading the industry.
IT Paradox	Real option Longstaff–Schwartz method	[15]	IT investment does not have an immediate impact on firm performance; it takes a certain time to pay off.
No Impact		[16]	IT investment does not impact firm performance.
No Impact	Financial performance evaluation model	[17]	There is no relationship between e-business activities and firm performance.

3. Sample Context

3.1. Extraction of analytical data from field data

The sample data were extracted randomly from Company C's customer purchase data from 2011–2014. We analyzed data on 5,010 transactions from 360 firms, sorted by purchase information (architecture, purchase amount, purchase year) and recreated for analysis.

Table 2. Field data sample summary

Industry	# of Firms	# of Employees				Purchase from Company C (1M Won)				Firm Sales Revenue (1M Won)			
		Mean.	Max.	Min.	Std. Dev.	Mean.	Max.	Min.	Std. Dev.	Mean.	Max.	Min.	Std. Dev.
Finance	59	2,455	21,768	40	4,383	5,483	84,581	45	14,117	2,405,177	15,735,275	8,488	3,770,391
MFG	158	2,127	37,097	21	5,139	3,244	147,018	1	13,449	1,888,696	53,863,975	1,611	5,359,714
Retail	37	2,130	25,688	65	5,137	2,060	56,015	10	9,022	2,579,627	31,588,325	16,202	6,464,771
Service	106	1,199	20,000	34	2,868	4,153	146,426	1	18,164	962,554	31,866,800	1,775	3,523,481

Company C defines its architectures by the customer's intended product use, with the classifications listed in Table 3. We use growth as growth of the firm's year-on-year sales revenue, in percentage, as the variable. To do so, we match 360 companies, obtaining sales revenue information from the Data Analysis, Retrieval and Transfer System (DART) of Korea's Financial Supervisory Service. We then calculate the revenue growth year on year since purchasing specific architectures (Table 3) and finally construct a sales revenue growth rate variable.

Table 3. Company C architecture description

Architecture	Description
Basic Infrastructure	IT provides basic and essential basic infrastructure to physically connect network devices.
Wireless	IT enables employees to access information systems anywhere at any time with their own devices and productively collaborate with customers and partners.
Collaboration	Employees can use IT to conduct virtual business communications in real time and effectively.
Security	IT protects the information system from external cyber risks and resolves security problems.
Datacenter	IT provides agile computing services, including big data.

3.2. Dependent variable

The dependent variable $growth_i$ is measured by the sales difference of (Company C's customer) firm *i* between year t - 1 and year *t*:

$$Growth_{it} = Sales_{it} - Sales_{i(t-1)}$$

Table 4. Major variables in the extracted data

	Variables	Description	Remark
Information on Firm's Purchase from Company C	*Account ID*	Unique ID for firm purchase from Company C	
	Basic Infrastructure$_{(t-n)}$	Basic infrastructure purchase amount (in Korean won) in year *t - n*	*n = 0, 1, 2, 3*
	Wireless$_{(t-n)}$	Wireless LAN purchase amount (in Korean won) in year *t - n*	*n* = 0, 1, 2, 3
	Collaboration $_{(t-n)}$	Collaboration purchase amount (in Korean won) in year *t - n*	*n* = 0, 1, 2, 3
	Security$_{(t-n)}$	Security purchase amount (in Korean won) in year *t - n*	*n* = 0, 1, 2, 3
	Datacenter$_{(t-n)}$	Data center purchase amount (in Korean won) in year *t*	*n* = 0, 1, 2, 3
Sales Revenue Data from DART	Growth$_{it}$	Revenue growth in year *t*	
	Employee$_{it}$	Firm's number of employees in year *t*	
	Capital$_{it}$	Firm *i*'s amount of capital (in Korean won) in year *t*	
	NumType$_{i}$	Number of types of architecture firm *i* purchased	Maximum = 5
	Age$_{i}$	Firm *i*'s age (year since foundation)	
	Industry$_{i}$	The firm's industry	Finance, manufacturing, service, retail

3.3. Independent variables

To define independent variables that influence business performance (sales revenue growth), we use a firm's purchases from Company C, sorted by architecture (Table 3). The independent variables consist of a firm's architecture purchase amount from Company C in each year, where $Basic\ Infrastructure_{ik}$, for example, is firm *i*'s basic infrastructure IT investment in year *k*, and so forth, with k ∈ [0, 3]. Because the firm's growth is measured in year *t*, the year *t - n* indicates the architecture was purchased *n* years before the period growth was measured. Since our data consist of purchase information from 2011–2014, *n* ranges from zero to three. Additionally, $industry_t$ is a dummy variable that identifies firm *i*'s industry in year *t*—whether manufacturing, service, finance, or retail—and we add the number of employees ($Employee_{it}$) as a control variable.

3.4. Control variables

We control for firm-specific characteristics that could impact a firm's revenue growth. First, we use industry dummy variables ($Industry_i$) to control for the firm's industry. Then, we add the number of employees of firm i in year t ($Employee_{it}$), the amount of capital of firm i in year t ($Capital_{it}$), the age of firm i in year t (the year since the firm was founded), and the number of architecture purchased by firm *i* from 2011 to 2014($NumType_i$).

3.5 Research model

Prior research has used diverse methods to analyze the impact of IT investment on firm performance. The RBV is one of the main methods wherein reputation is an intangible asset composed of complementary and reinforcing relationships whose synergies create causal ambiguities that have positive performance implications [24]. Ultimately, in future research following this study, an RBV methodology should be used for analysis, including for the multi-dimensional components of influencers; however, this study uses panel regression analysis to clarify the lagged effect of IT investment on firm performance measured by sales revenue growth. To better understand our analysis mechanism, the concept of our model's time-lagged effect is described as follows.

$$Growth_{it} = \alpha + \sum_{k=2011}^{t} \sum_{j=0}^{j=4} \beta_{jk} \text{Investment in IT}_{ijk} + \beta_5 \text{Industry}_{it} + \beta_6 \text{Employee}_{it} + \beta_7 \text{Capital}_{it} + \beta_8 \text{Age}_{it} + \beta_9 \text{TypeNum}_{it} + \varepsilon_{it}$$

where

IT_j = basic infrastructure for $j = 0$
IT_j = wireless for $j = 1$
IT_j = collaboration for $j = 2$
IT_j = security for $j = 3$
IT_j = data center for $j = 4$

Growth is measured by

Firm *i*'s growth in $Year_t$ = Sales revenue in $Year_{it}$ - Sales revenue in $Year_{i(t-1)}$

for t = 2011, 2012, 2013, 2014

We use four control variables, for the industry, the number of employees, the firm's age, and the firm's amount of capital in year *t*. IT investment is defined as the amount of money the firm used to purchase IT architecture in year *t* and organizational performance is defined as the firm's sales growth in year *t*. Company C defines architectures by their purpose of use. IT investment is broken down into five categories (architectures) based on Company C's definition of product usage (Table 3).

4. Analysis results

The sample data were restructured as panel metrics to analyze revenue growth by time lags. Since our data are in panel form, we first consider fixed and random effects in a generalized least squares (GLS) panel regression model. To determine the most appropriate regression model between the two, we then conduct a Hausman test. The results of the Hausman test do not reject the null hypothesis (Prob > χ^2 = 0.3773), so we use the GLS regression model. Finally, to examine the reliability of our GLS estimation, we conduct a Breusch–Pagan Lagrangian multiplier test. The test does not reject the null hypothesis (Prob > χ^2 = 0.99) either, so we finally choose ordinary least squares (OLS) regression analysis to estimate the value of a dependent variable by establishing relationships between the variables.

Table 5 shows the results of our empirical analysis. Columns (i) to (iv) show the results of the influence of each architecture on the firm's sales revenue growth after zero to three years, with 95% confidence with respect to the significance of each independent variable.

Table 5. OLS regressions of the impact of IT investment on sales growth after zero to three years

	$Growth_{it}$ (*t*-Stats) (i)	$Growth_{it}$ (*t*-Stats) (ii)	$Growth_{it}$ (*t*-Stats) (iii)	$Growth_{it}$ (*t*-Stats) (iv)
Basic $Infrastructure_{ik}$	0.3352441 (0.06)	3.775416 (0.70)	0.1795522 (0.03)	-4.024975 (-0.44)
$Wireless_{ik}$	303.7667** (2.09)	511.4753*** (4.31)	-69.76601 (-0.60)	1015.766*** (7.57)
$Collaboration_{ik}$	-39.74932*** (-3.15)	-20.47326* (-11.69)	-19.68761 (-1.59)	-1.326131 (-0.07)
$Datacenter_{ik}$	0.2570886 (0.40)	-1.335638 (-0.14)	120.4254** (1.97)	-18.36796 (-0.17)
$Security_{ik}$	87.56436 (0.51)	60.87356 (0.24)	90.13972 (0.35)	-245.8293 (-0.48)
$employee_{it}$	0.0967282 (-0.10)	-5818624 (-0.99)	-1.30e + 07 (0.35)	-1.34e + 07 (-0.48)
$profit_{it}$	0.0967282 (7.12)	0.0881842 (6.45)	0.0911735 (6.29)	0.0120649 (0.62)

$TypeNum_{it}$	5.77e + 09 (0.32)	297e + 09 (0.17)	6.69e + 08 (0.04)	2.44e + 10 (0.98)
age_{it}	5.72e + 08 (0.29)	5.66e + 07 (0.29)	3.89e + 07 (-0.68)	1.19e + 08 (0.44)
Constant	-7.17e + 10 (-0.87)	-6.73e + 10 (-0.82)	-5.83e + 10 (-0.68)	2.27e + 11 (1.99)
Observation	1080	1080	720	360
R^2 (%)	7.64	8.16	6.21	20.01

Note: The dependent variable is growth. The *t*-statistics are listed in parentheses; columns (i) to (iv) indicate the result of the model with lagged terms of zero to three years.

*** $p < 0.01$; ** $p < 0.05$; * $p < 0.1$

Based on the firm's architecture purchase data, we find that wireless architecture purchases influence business growth positively in the year of purchase and in the first and third years after purchase. We also find that collaboration purchases negatively impact business growth in the year of purchase and in the first year, while data center purchases positively impact business growth in the second year, using the firm's capital amount, number of employees, number of architectures invested, firm's age, and industry as control variables. Additionally, the influence of wireless purchases on sales growth increases with time, with 303 in the year of purchase, 511 in the second year, and 1015.76 in the third year.

5. Discussion

This study uses actual sales data from Company C to determine the areas of IT investment that impact a firm's business performance. Upon starting this research, it was assumed that all architecture investments would positively impact sales growth. However, we found that wireless architecture influences business growth directly in years 0, 1, and 3 after investment. With wireless technology, employees of firms can access Internet anywhere and anyplace. In addition, there is an increasing trend toward employee-owned devices within businesses in this Internet age. Smartphones are the most common example and employees also take their own tablets and laptops to work. Employees bringing their own devices is part of the larger trend of IT consumerization, in which consumer software and hardware are being adopted within the enterprise. For example, employees can access a company's customer relationship management system with their smartphone when they are out of the office. They can conduct a conference call with remote workers, sharing presentation files, with their devices. With wireless technology, retail stores can attract customers, promoting their products when customers are near their stores. Doctors can use their tablets to input patients' medical records remotely. Gartner (2016) forecasted 12 global IT trends in 2016 at the beginning of the year. Four of the trends are closely related to wireless technology: 'the device mesh', 'ambient user experience', 'information of everything', and 'the Internet of things'. Correspondingly, our analysis concludes that the deployment of a wireless architecture is essential. We show that wireless contributes significantly to business growth, where the ability to connect to the Internet anywhere, at any time, with one's own device is the main trigger in growing a firm's business, increasing productivity, sales opportunities, and employee satisfaction.

Investment in collaboration has a negative impact on growth for two years, while data center investments produce growth after two years. These results motivated us to consider the IT paradox, changing our direction of study. Considering that firms aim to use collaboration investments to save costs through virtual engagement, replacing face-to-face engagements, employee familiarity and their efficient use of the architecture will take time, as implied by the negative effect of such investments on business growth in the year of purchase and the year after. Further research is needed to determine whether this is an IT paradox during the ramp-up stages. The positive effects of data center investments after two years indicates that data centers require two years for internal applications deployment and stabilization. The migration cycle of computing products (such as servers) is becoming shorter due to heavy data processing, so this dimension no longer influences business performance.

No significant sales decrease or increase was incurred after investments in the remainder of the architectures (basic infrastructure, security). The basic infrastructure and security work as hygiene factors of firm rather than influence to business growth directly.

The theoretical contributions of our study are firstly, it is the first to examine the relationship between business performance and investment in terms of specific IT network architectures. Multiple studies have measured overall IT expenditures and business performance but none has done so with such detailed data. Second, using actual field data, our study empirically determines the relationship between business performance and investment. Third, by drilling down to specific technologies, we find that both an IT paradox and an IT payoff could exist together.

One of the study's practical implications is that investment in wireless influences business performance in multiple years. Many firms increase their IT investment to contribute to business performance and must therefore decide on their IT investment priorities. This study reveals that wireless technology is important in growing their business. The other implication is related with IT paradox. In case of collaboration investment, firms should find a way how they can shorten ramp up time to utilize collaboration architecture to contribute to firm's performance.

Our study has some limitations. First, the IT investment data are from a single company, Company C, so we cannot know what other IT investments(from Company C's competitor) are being made by corresponding firms. Second, the data include only four years of purchase information, which could limit the results for the relationship between other architectures and business growth. We recommend deeper analysis of this IT paradox in the future, with more data and an examination of the reasons and factors in IT investment that lead to business growth. Third, in RBV theory, to measure IT payoff, we need to consider other areas that involve improving business impact. Therefore, another recommendation for future study is the use of more firm records, including variables related to other organizational resources, business processes, business process performance, and partner resources.

6. Conclusion

Considering ongoing increases in IT investment, it is important to know what makes IT investment pay off. The IT itself does not matter; it is more about how the IT is utilized to create business outcomes. This study analyzes the relationship between IT investment and business growth directly based on real data. The conclusion is that IT paradox and IT pay-off can exist together. IT investment in wireless technology significantly contributes to business growth in multiple years. Datacenter technology investment impacts business growth after 2 years while collaboration is found IT paradox in 2 years.

Firms need to set priority considering what IT investment will bring business outcome when they invest and also need to find a way how they can drive business outcome faster overcoming IT paradox.

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