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Abstract

In spite of the impact of Information Technology (IT), researchers have little demonstrated a consistent relationship among IT investment, productivity, and performance. To investigate this relationship, the field of small independent banks is selected and studied in terms of banks' productivity and their profitability. Both financial information and survey on small banks in Nebraska and Missouri are used to analyze whether there is a positive relationship between the amount of banks' IT investment and their performance.

Introduction

The virtue of small independent banks over the big ones has been geographical convenience and friendly environment. Since small community banks have been doing business mainly in small towns, they provide better services that are needed in those communities only than outsiders. Many studies (Clemons & Knez, 1988; Sager, 1988; 1989) have been consistently asserting that even smaller players can often acquire the necessary technology through cooperative arrangements or by outsourcing. Small bankers realize the central role of IT in banking so that over 90% of those responding to a recent survey said how they deploy IT is an important part of their future success (Luhby 1997).

Using right technology is important issue for every bank, and it is even critical to small banks that are competing with big ones. By choosing and implementing a right IT, small banks become stronger and survivable. Unfortunately, small banks are short of resources, they have little margin for misjudgment. Great hesitation comes from the fear of failure. Most small banks cannot afford even one failure. It makes more difficult for small banks to decide IT investment.

Now, it is the time for small banks to look into themselves in order to find a way to confront big banks. It is very important to observe "are those small, independent banks making profits from their IT investments?" Based on the 119 survey results from the independent banks in the two states, Nebraska and Missouri, this research shows the relationship between IT spending and performance and discusses the future direction of IT in small banks.

Theoretical Background

IT and its effective use in organizations have received much attention from both practitioners and researchers. It has posed a fundamental question, "Can a huge investment of IT always ensure the great return of any kind of performance?" The banking industry, in particular, is highly sensitive to the critical role of IT in its own survival and success, as powerful forces such as interstate commerce, on-line banking, global competition, and mergers and acquisitions continue to revolutionize the industry (Gupta & Collins 1997).

In spite of the huge impact of IT, researchers still have hardly demonstrated a consistent relationship among IT investment, productivity, and performance. O'Sullivan (1998), for example, found that researchers were unable to draw an indisputable link between technology expenditures and increased profitability, in which they defined as improved returns on assets (ROA) and returns on equity (ROE). This has been known as IT-Paradox. IT Paradox is now well-known anti-IT theory because the return of IT investment has not identified and realized so far.

In this study, small independent banks are investigated on the basis of IT investment, productivity, and performance. In fact, several previous studies (e.g., Floyd and Wooldridge, 1990) attempted to identify the relationship between IT and financial performance like ROA and ROE. There are three reasons that we chose the domain of small independent banks for this research. First, most large companies already implemented IT. However, many regional independent banks in the Midwest area still do not have IT infrastructure such as ATM and the Internet. This fact provides us with a great opportunity that we can compare the two types of banks: Banks with IT and Banks without IT. Second, IT investment in small independent banks is critical because they do not have extra budget for project failure such as IT implementation. Due to a small budget, small banks, as compared to big ones, are very careful about their IT investment. Finally, regional banking area is now being threatened by the Internet technology that allows rural customers to access big banks regardless of their location and time zone. Practically, managers in small banks are very interested in how the small banks will be able to survive in the new millennium.

Hypotheses

In this study, the boundary of IT is ATMs and the Internet. We believe that these two technologies are not only the most important weapon in competing with other big or small banks but also the largest parts of small banks' IT investment. Two types of banks, banks with IT and banks without IT, are analyzed as shown in Figure 1 and 2. In figure 1, customers have to walk into a bank without IT to do their transactions. This is the only access to this type of banks because these banks do not have IT infrastructure such as ATM and Internet banking.

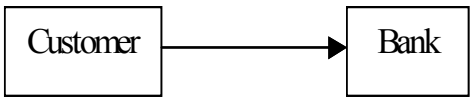

Figure 1. Banks Without IT

However, in Figure 2, customers can also access banks with IT like ATM or the Internet as well as walk-in. A great number of customers are satisfied with various ways of access and advanced services from banks, but IT infrastructure brought heavy investment and careful maintenance.

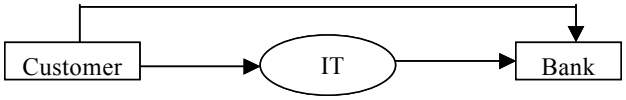

Figure 2. Customers with IT

A study of small independent banks in the states of Nebraska and Missouri is designed to test whether IT gives banks more productivity (deposits and loans) and better performance (ROA and ROE). Specifically, the performance is a key concern for the future IT investment and can compete with larger banks who have very organized and structured IT infrastructure. The hypothetical relationships of the dependent variables (deposits, loans, ROE, and ROA) and independent variables (the number of ATMs, the Internet banking, and the dollar amount of IT investment) were developed.

H1: Banks that invested in IT have the same amount of deposits and loans as those that did not.
H2: Banks that invested in IT have the same level of ROA and ROE as those that did not.

Data

Two sets of data from different sources are collected and analyzed in this study. First, a survey questionnaire with a cover letter was sent out to 135 small banks in Nebraska, and 125 small banks in the State of Missouri. It is very important to note that this research limits itself in rural areas by excluding two biggest cities for each state: Omaha and Lincoln in Nebraska, as well as St. Louis and Kansas City in Missouri. Survey was conducted to only one bank per each community in order to cover more communities and reduce the bias of special performance in a certain community.

To increase the rate of questionnaire return, we use two different addresses: one in Missouri the other one in Nebraska. For example, respondents in Missouri sent the filled surveys back to a state university of Missouri. Although 63 from Missouri and 69 from Nebraska were obtained, 14 from Missouri and 2 from Nebraska were discarded because they did not have enough information regarding IT investment.

Financial data about the banks who responded the survey were downloaded from the website of Federal Finance Institution Examination Council (http://www.ffiec.gov/), which is a government agency to prescribe uniform principles, standards, and report forms for the federal examination of financial institutions by the Board of Governors of the Federal Reserve System (FRB) and other four federal organizations. To this governmental agency, all member financial organizations like banks have obligations to report their financial status like balance sheet and income statement.

Total assets, total deposits, equity, net income, total loan, service charges, and number of employees in the above sites have been found and used for further analysis with the data from survey. Financial data obtained from five fiscal quarters (9/30/99, 6/30/99, 3/31/99, 12/31/98, 9/30/98) are analyzed to eliminate the bias that might happen for a bank having an extremely high performance at a certain season. Each category data such as total assets and total deposits have been added throughout five quarters and divided by five to obtain average numbers.

Analysis of Data

Analysis Method

Both financial data and survey results of small banks are analyzed by the Pearson product moment coefficient of correlation to find out that there is a relationship between IT investment and performance of small banks. The correlation is a direction, either positive or negative, and it is useful tool to find out a relationship. However, there is a major concern about only using correlation in a research because it doesn't reveal any explanation or prediction. To find and explain the relationship between IT spending and performance of small banks in Nebraska and Missouri, this study provides t-test based on hypotheses.

As mentioned earlier, two different data sources are analyzed in this study. To analyze data, two different measurements are used, Pearson product moment coefficient of correlation and t-test as mentioned above. The triangulation of different sources and different methods will increase internal validity and reliability (Merriam 1988).

Results

Of the 116 surveyed banks from two states, 19 Nebraska and 10 Missouri banks indicated that they did not invest in IT. This indicates 20 percent of those independent banks in each state have reportedly not invested in any kind of IT. And also there was only one bank in Nebraska that was providing the Internet banking to their customers.

Table 1 is the result from Pearson Correlation. In case of independent banks in both Nebraska and Missouri, IT paradox seems to be apparent. By looking at the numbers at the two columns of ROA and ROE for Missouri and the two rows of those for Nebraska, we realize that there is no correlation between performance (ROA and ROE) and other variables like Deposit and number of ATMs. Further, the result shows that there is little or no relationship between IT investment and either ROA or ROE while there is some relationship between IT and deposit as well as loan.

Table 1. A Result of Pearson Correlation of Banks in Nebraska and Missouri

	ROA	ROE	Deposit	Loan	Service Charge	Employee	# of ATMs	$ of IT
ROA		.180	.018	.093	.029	.011	-.086	-.048
ROE	.865		-.052	-.022	-.032	-.069	-.098	.224
Deposit	-.024	.056		.858	.973	.979	.911	.666
Loan	-.024	.081	.971		.815	.908	.904	.702
Serv.Char.	.096	.199	.381	.350		.961	.880	.714
Employee	-.085	-.009	.528	.507	.736		.937	.692
# of ATMs	-.049	.125	.140	.282	-.043	-.080		.518
$ of IT	-.069	.138	.768	.788	.487	.462	.444	

Nebraska

Missouri

This research uses the independent sample t-test to look into the IT impact on banks' performance. Table 2 is the summary of t-test. If a significance level (2-tailed) is less than α value (0.05), the null hypothesis will also be rejected.

Table 2. T-Test Results

		N	Mean	Std. Deviation	Std. Error of a Mean	T-Test for Equality of Means	Sig. (2-tailed)
Total Asset	Without IT	29	16,370.52	7952.33	1735.34	-3.160	.003
	With IT	87	50,518.80	72330.74	10664.59		
Deposit	Without IT	29	14001.38	6585.0816	1436.9826	-3.062	.004
	With IT	87	43236.33	64026.4994	9440.1923		
Equity	Without IT	29	1863.14	1063.7616	232.1318	-3.599	.001
	With IT	87	4857.93	5419.8753	799.1170		
Net Income	Without IT	29	130.57	111.6757	24.3696	-3.159	.003
	With IT	87	380.48	510.4047	75.2551		
Total Loan	Without IT	29	593.33	306.1187	66.8006	-3.990	.000
	With IT	87	1657.78	1751.5194	258.2475		
Service Charge	Without IT	29	32.90	17.2044	3.7543	-3.054	.004
	With IT	87	97.15	140.4018	20.7011		
# of Employees	Without IT	29	6.00	2.0248	.4419	-3.114	.003
	With IT	87	20.32	31.0627	4.5799		
ROA	Without IT	29	6.95E-03	2.86E-03	6.23E-04	-1.018	.315
	With IT	87	7.72E-03	2.88E-03	4.24E-04		
ROE	Without IT	29	.113	3.29E-02	7.18E-03	-.612	.543
	With IT	87	.123	.103618	1.53E-02		

H1: Banks that invested in IT have the same amount of deposits and loans as those that did not.

Because the t-values for both deposits and loans are lower than the significance level (.05), the first null hypothesis is rejected. This rejection means that the mean difference of between two groups is not likely to obtain a random bank that has the mean difference under the 95% confidence level. We can arrive at the conclusion that the banks that invested in IT have significantly more deposits and loans than those banks that did not. This implies that productivity (deposits and loans) does depend on the IT investment. However, because the IT investment might not be the only reason that affected the difference, we should be cautious about the other factors like marketing. Consequently, even though the result does not tell us what the specific reason is, the data provide sufficient evidence to indicate a difference in productivity between banks with IT and those without IT.

H2: Banks that invested in IT have the same levels of ROA and ROE as those that did not.

However, we failed to reject the second hypothesis. Banks that invested in IT do not have a significantly higher ROA and ROE than those banks that did not invest in IT. This result delivers an important message that IT investment has little influence on the performance while it has much influence on the productivity.

Implications

IT investment itself will not deliver or promise better performance on any kind. To grip the appropriate technology for the banks and to apply it into right place can make positive changes in the performance of banks. IT investment does not necessarily provide a high return but may result in costs that contribute to a loss in competitive capability (Loveman, 1991; Strassman, 1985) as well as to little or no productivity gains and business performance improvements (Loveman, 1991; Weill, 1992). By testing hypotheses, this study has confirmed the IT paradox once again. Further analyses are discussed to ensure the findings.

First, we compared the banks with IT with those without IT. Simply comparing the volume of deposit and loan can be biased due to the size of banks. In order to avoid this bias, this research uses an easy calculation. Instead of using plain deposit and loan volume, deposit and loan are divided by asset. It will provide a ratio explaining that IT can attract more deposit and loan based on asset volume. For example, this research defines the productivity of deposit as the number computed by dividing deposits by total assets; similarly, the productivity of loan is the number dividing loan by total assets. Table 3 is the result of these calculations.

Table 3. Result of Productivity Related to IT Investment

	Productivity of Deposit	**Productivity of Loan**
With IT investment	0.8508	0.0361
Without IT investment	0.8597	0.0371

Surprisingly, there is almost no difference between two groups of banks even though it has been assumed that the banks with IT investment should have more deposit and loan than those banks without IT. This result is not consistent with the finding obtained by testing the first hypothesis that if banks spend more money on IT, the bank can expect more deposit and loan. Table 3, however, points out that even though the banks do not spend money on IT, the banks can attract deposit and loan as much as banks who do invest in IT.

Second, Table 4 illustrates the number of employees in the banks who invested in IT and who did not. The banks with IT investment have more employees than those who did not. It can be understood by two completely different ways. Firstly, the relatively larger banks can invest in IT, so they naturally have more people than small banks do. Secondly, banks that invest in IT have more employees to operate and maintain IT.

Table 4. IT Investment and Number of Employees

	With IT investment	Without IT investment
Average Number of Employees	19.5	6.2

Apparently, there are more employees working in the banks that invest in IT. It still remains some of the performance questions. The most important question is laid on the performance per Capita.

Table 5. IT Investment and Performance per Capita

	Asset per Capita	Deposit per Capita	Equity per Capita	Net Income per Capita
With IT investment	24860.6	2128.10	239.18	18.70
Without IT invest	2774.77	2369.84	316.81	22.38

Table 5 shows a result of productivity per capita. The banks who did not invest in IT had better performance in every category. The employees in banks that did not invest in IT actually did better business than those in banks that did invest in IT. Due to the service charge on using IT that banks offer, it might give a different ratio of net income per Capita. Even net income per capita is preferable to those banks that did not invest in IT. This implies that IT is not helping the performance of human resources. The IT paradox has been confirmed once again.

Conclusions

The findings from this study tell us that banks without IT do business better than those with IT. However, it is questioned how long those small banks go without IT. In near future, the big banks will be jumping into the small communities by offering the service via ATM or the Internet. Almost every small bank will face new competition due to the advancement of information technology. Small banks will have to invest their pocket money into IT to survive in the competition. Because IT spending of small banks has not been contributed to their performance so far, finding ways to the right and most effective IT and to use it for their performance is very important to researchers.

Unfortunately, it is impossible to analyze the impact of on-line (or the Internet) banking in this study because of the lack of this type of IT implementation in small independent banks. Since both e-commerce and e-business are becoming a common theme of new millennium, it would be very interesting to investigate the impacts of the Internet in small rural banks. We have a very strong belief that small independent banks will never be able to avoid the trend of electronic globalization in modern society. Sooner or later, we will be seeing how those small rural banks compete with their big counterparts in the cyber space.

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