IT: What's It Good For?

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Abstract

Demonstrating the business value of information technology (IT) strategies is a major concern for most organizations. Previous research in this area has yielded mixed results, further confounding the issue. Much of the previous literature has focused on the return on investment in hardware and software as the definition of business value. We take a different approach to the IT business value problem by examining whether organizations that deploy IT with differing strategies enjoy better business value efficiencies. This paper describes an eight-year longitudinal study of a homogeneous set of credit unions to determine if different IT deployment strategies (interactive web site, informational web site, or no web site) result in greater credit union efficiency. Data Envelopment Analysis [1, 2] was used to calculate efficiency scores. Our results indicate that credit unions who use the strategy of interactive web sites have greater overall and asset efficiency than credit unions with informational or no web sites. Credit unions with informational web sites have greater asset efficiency than those without web sites, but do not show a difference in overall efficiency. Our analysis shows no statistical difference in personnel and operational cost efficiencies between the three different groups of credit unions. This result contradicts conventional wisdom that a business benefit of IT is cost reduction.

1. Introduction

Demonstrating that Information Technology (IT) provides business value has been a difficult and controversial task. Although spending on IT has increased dramatically, there is surprisingly little evidence that IT's value has been realized [3-5]. A review of the empirical literature suggests that investments in IT through the 1980's have produced negative, or at best neutral, productivity gains [6], although "certain types" of IT investments may increase the value of the firm [7]. In their studies if IT's effects on productivity in large publicly traded firms, and using more current data (late 1980s and early 1990s), Brynjolfsson and Hitt [8-10] show some evidence that investments in information technology hardware and software are associated with increases in the financial market's valuation of the firm, with each dollar invested in IT translating to five to ten dollars of increased overall value. There is also evidence that IT produces productivity and quality gains when introduced to highly manual processes [11-14].

This research takes a different approach to investigating whether IT delivers business value to an organization. We take a strategic approach to the problem, investigating whether similar organizations that leverage technology at different intensities obtain different levels of business value. Our logic behind this approach is that it is not merely investments in hardware and software that result in business value, but the implementation of an IT strategy that uses the *interaction* of people, process, and technology to achieve specific business goals [15].

This research is an industry specific longitudinal analysis of a relatively homogenous set of credit unions over a eight-year time period. All of these credit unions were "low-tech" at the beginning of the study (1994) in that they did not use Internet technology in any way. Rather than use the capital investment in hardware and software as the focus of our study, we categorize how IT is strategically implemented in these credit unions and compare whether credit unions that made greater use of IT by extending automation to the Internet derived more benefits than credit unions that did not. While this methodology does not directly examine the interaction of people, process, and technology within each of the 300 credit unions analyzed, it does capture the result of management strategies that lead to different IT usage strategies.

Data Envelopment Analysis (DEA) [2, 16, 17] is used to evaluate the efficiencies of the set of credit unions. DEA is a non-parametric approach that compares each credit union against the most efficient credit unions in the study. This approach has been used extensively to study the efficiency of financial institutions, and many studies have used DEA in the examination of credit union efficiency (for example, [18-22]).

By comparing credit unions that have IT but are not on the web (low-tech), credit unions with informational web pages (medium-tech), and credit unions that have transactional web pages (high-tech), we demonstrate that credit unions that choose to strategically leverage their IT resources with transactional web pages derived greater overall efficiency and asset efficiency than those that did not. Medium-tech credit unions have higher asset efficiency than low-tech credit unions, but show no difference in overall efficiency. Our results also suggest that there is no difference in total number of personnel and personnel and operating expenses between high, medium, and low-technology credit unions. Even though high-tech credit unions are overall more efficient than medium and low-tech credit unions, they cost more to operate. Additionally, our analysis shows that credit union productivity has gone down approximately nine percent from 1994 to 2001, and that there is no difference in cost per employee between low, medium, and high-tech credit unions.

2. The Credit Union Industry

Credit unions are cooperative not-for-profit organizations. The goal of a credit union is generally not maximizing shareholders' wealth as in the standard theory of the firm, but rather maximizing its members' benefits [22]. The value of information technology in these organizations is realized as benefits other than profit or stock price. Credit unions generally have one primary IT system within an individual credit union. The services that credit unions can offer members are limited by federal charter [23], therefore they can be easily compared to one another. The vast majority of these services are deposit and loan instruments [19]. In addition, all US credit unions are required by law to report not only financial results, but also management actions and the use of information technology [23]. With a relatively low level of complexity, highly substitutable business processes, and a high degree of visibility in their usage of IT, credit unions are excellent organizations to test the of business value of IT implementation strategies.

The credit union industry has gone through a period of substantial consolidation since 1994, when this study begins. There were 12,201 credit unions in 1994 in the US, and there were 10,107 left in 2001. The primary reasons for the decrease in the number of credit unions is mergers and acquisitions [24]. This has been primarily driven by two factors; competition from a deregulated banking industry and the financial difficulty for small credit unions to purchase needed technology [25]. Credit unions are information intensive and highly dependent on information technology as their primary operational task is to track the flow and storage of (primarily digital) money to and from its members [26].

3. Propositions

Prior studies have posited that the strategic use of IT makes an organization more efficient and provides business value, and that the strategic use of the Internet is one way of gaining these benefits [27-30]. We build on this prior research by testing this claim in the credit union industry. We propose that:

Proposition 1a: Credit unions that have chosen to deploy interactive web sites (high-tech) will be more efficient than those that deploy informational web sites (medium-tech).

Proposition 1b: Credit unions that have chosen to deploy informational web sites (medium-tech) will be more efficient than those that use IT but do not have web sites (low-tech).

The introduction of information technology into an organization may eventually be realized as a change in the organization's bottom line value. However, the time lag between the introduction of information technology and the eventual realization of value may be quite long. "Sociologists and economic historians have long argued (very cogently) that society's ability to fully exploit a new technology lags – often by decades – the introduction of the technology itself" [31, p 8-15]. In addition, the value added by IT is contingent on many moderating organizational variables such as strategy, leadership, attitudes, organizational structure, appropriate task and process reengineering, individual and organizational learning, and managerial style and decision-making [31, p 8-16]. Hence we compare the efficiency of groups of credit unions that have deployed IT with different strategies, rather than simply examining the investment in hardware and software.

4. Research Design and Method

The empirical data analyzed in this study was taken from the credit union database maintained by the National Credit Union Administration (NCUA). The NCUA is an independent federal agency that insures state-chartered credit unions and supervises and insures federal credit unions. The database, obtained under the Freedom of Information Act, contains financial and non-financial data about all credit unions at six-month intervals from June 1994 through June 2001.

The NCUA database contains "official" financial data as well as self-reported data. Three months were spent cleaning and verifying the database to ensure that the data was correct. For example, the CUs' web site URL addresses were verified, self-reported membership numbers were checked for consistency (membership going from 5,100 to 510 to 5,100 in consecutive reports), numbers of employees were checked (going from 55 to 0 to 54 in consecutive reports), and so on.

The NCUA database contains data for 10,107 credit unions (as of December 2001). However, many of these CUs had to be excluded from the study in order to achieve a relatively homogeneous population. This population had to meet three criteria. First, the CU had to be in operation continuously from 1994 through 2001. CUs formed after 1994 or that disappeared from the database before 2001 (through mergers or dissolution) were excluded. Second, the CU had to have 1994 assets between $10 million and $100 million. Generally speaking, smaller CUs tend to be almost entirely manual with very little technology in use and no web presence. Restricting the population to the "mid range" CUs avoids the overwhelming statistical influence that the large CUs would have over the small CUs. Mergers and acquisitions were accounted for in the third criteria. A CU that merged with another would experience an increase in assets, membership, loans, and so on that would obscure the relatively smaller influence that a web presence would have on these same variables. CUs were excluded from the study if they merged or acquired the assets of another CU between 1994 and 2001.

After filtering the database through these criteria, 6,564 credit unions remained. For purposes of homogeneity, we chose credit unions that had information technology but did not have a web presence in 1994 as our starting sample. Although data about credit union web sites first became available in the 1998 dataset, we verified that our final sample was using some form of information technology and did not have a web presence in 1994. Credit unions were also excluded from the study if they gained their web presence after 1998. For subsequent year analyses, starting in 1998, credit unions were classified as medium-tech if they implemented an informational web strategy between 1994 and 1998, and high-tech if they implemented a transactional web strategy that supports functions such as account transfers, bill and loan payments, merchandise purchases, and electronic cash.

In 1994, smaller credit unions tended to be low-tech due to lack of resources or lack of expertise. Larger credit unions tended to be high-tech. A One-Way ANOVA test of the three groups using 1994 total assets is shown below in Table 1. The size differences produce several statistical problems as the larger credit unions' data could dominate the smaller credit unions' data regardless of their type of technology usage. To ensure that the three groups of credit unions in our sample were equivalent, credit unions were matched based on their 1994 total assets. Essentially, the credit unions were sorted on their 1994 assets, and a low-tech credit union was matched on size with immediately adjacent medium-tech and high-tech credit unions. Thus, based on 1994 assets, this study follows three homogenous groups of credit unions: 100 that remained low-tech throughout the study, 100 that became medium-tech by 1998 and remained so through 2001, and 100 that became high-tech by 1998 and remained so through 2001, as shown in the "Sample" section of Table 1.

Table 1. Test of total 1994 assets

		N	Mean	sig
Population	Low	2,995	7,470,754	0.000
	Medium	490	27,424,839	
	High	727	43,111,476	
Sample	Low	100	26,782,893	0.997
	Medium	100	26,922,261	
	High	100	26,859,135	

5. Results

Data Envelopment Analysis (DEA) was used to examine the efficiency of the 300 credit unions in our study. Charnes, Cooper, and Rhodes [2, 17] developed DEA from earlier work on frontier estimation proposed by Farrell [32], and extended by Banker, Charnes, and Cooper [16]. Briefly, DEA is a non-parametric linear programming technique where a set of best practices defines a production frontier where no other observation (called a "decision-making unit" (DMU)) or combination of observations has as much or more of every output for as little or less of every input [33]. The revealed production frontier is a multi-dimensional convex hull formed by piecewise linear combinations that connect the set of best practices. That is, it is the maximum output empirically obtainable for any DMU in the observed population given its level of inputs [18]. All other DMUs lie within the hull, and their distance from the frontier determines their measure of efficiency. DEA has been adopted (especially in the study of financial institutions, see [33]) to analyze credit union efficiency due to its ability to accommodate multiple inputs and outputs measured in a variety of units and its calculation of a single aggregate measure of efficiency [19].

There is considerable literature on the basic DEA model developed by Charnes, Cooper, and Rhodes (CCR) [2] and so the mathematical formulas and their descriptions will not be repeated here. The CCR DEA model computes the pure technical efficiency of a DMU. However, it assumes a constant scale of production (the Constant Returns to Scale (CRS) assumption) that does not take into account how the scale of production affects efficiency. This is an important consideration in this study as the credit unions in our sample vary in size from $10 million in assets to $100 million in assets. Banker, Charnes, and Cooper [16] developed what is known as the BCC DEA model that uses Varying Returns to Scale (VRS) by adding a constraint to the equations that allows different economies of scale to be taken into account in the efficiency calculations. This study uses BCC input-oriented DEA.

A credit union can increase its efficiency by decreasing the amount of input used while holding its output constant (input-oriented DEA), or by increasing the amount of output produced while holding its input constant (output-oriented DEA). We assume an input-oriented model as information technology is being used to gain efficiency by focusing on reducing the amount of input being used rather than on increasing the amount of output being produced.

Data envelopment analysis was used to compute the technical efficiency on the low, medium, and high-tech credit unions for each of the eight years 1994 to 2001, inclusive. One hundred of each type of credit union were selected (Table 2), and data for each of these credit unions across the eight years was combined into a single data envelopment analysis consisting of 2,400 DMUs. Each credit union is included in the study eight times as separate DMUs, once for each year. This means that the efficiency of a DMU in any year is determined from the most efficient DMUs found in the study regardless of year.

Credit unions had the capability of automated operation, web presence, and interactive web sites in 1994. Although Internet technology for credit unions existed in 1994, very few credit unions took advantage of it. If a separate efficiency analysis was performed for each year the results would be misleading as each credit unions' efficiency would be compared to the most efficient, yet non technological, credit union. Over time as web technology became more embedded in the medium and high-tech credit unions, the efficiency frontier would be "pushed out" such that a 100% efficient credit union in 1994 would actually be much less efficient than a 100% efficient credit union in 2001. Since the technology used by credit unions in 2001 did exist in 1994, we assume that no technological frontier shift took place. A composite DEA is appropriate.

There has been some discussion about the best method to test the hypothesis that one set of DMUs are more efficient than another set of DMUs. The traditional approach in the DEA literature has been to use Welch's mean test or the Mann-Whitney test. More recently, Banker's DEA test statistics [34] have been shown to outperform the traditional tests [35, 36]. Three statistical tests were performed for each hypothesis in this paper: Banker's test for exponential distribution, Banker's test for half-normal distribution, and the Mann-Whitney test. The value reported is the most conservative of the three. The null hypotheses are rejected at the 5% level of significance.

5.1 Overall Credit Union Efficiency

The credit union uses its assets, its employee compensation expense, and its office operations expense to produce the benefits. Assets include cash, investments, land and building, fixed assets, and "other assets." For our purposes, outstanding loans are not considered assets. While outstanding loans are generally considered assets of a financial institution, for our purposes they are an output generated by the credit union and are considered separately. The expenses used in this study were total employee compensation and benefits (salaries, reimbursement to sponsor when credit union employees are on the sponsor's payroll, benefits, pension plan costs, and employer's taxes) and office operations expenses (expenses related to the operation of an office including communications, stationery and supplies, liability insurance, furniture rental and/or maintenance, depreciation, bank charges, in-house EDP cost, and so on). We argue that assets used as an input variable will reveal whether information is being used more productively by the credit union to produce member services (loans and deposits). The rationale for using employee and office expenses as input variables is more direct, as it is generally believed that reduced costs in these areas are a business benefit of IT.

The output variables used in this study to test whether credit unions are delivering business value to their members are total dollar value of deposits and loans. These variables were chosen based on prior research on the productivity and efficiency of credit unions. However, regarding which particular input and output variables to use in the data envelopment analysis, "the literature encompasses a wide range of specifications which may have as much to do with data availability as with matters of principle" [22, p. 11]. In this study, we assume that a credit union attempts to maximize the services and benefits to its members. Following Worthington [19], these benefits are measured as the dollar amount of loans and deposits generated by its members. These outputs are used as indicators of the overall service to members provided by the credit union. We used various input variables to test credit union efficiency, and form testable hypotheses based on these variables and generated from the propositions described above.

The combined analysis of assets and expenses tests the overall efficiency of the credit union. Thus, our first hypotheses are:

Hypothesis 1a: A high-tech credit union will be more efficient overall than a medium-tech credit union.

Hypothesis 1b: A medium-tech organization will be more efficient overall than a low-tech credit union.

Data Envelopment Analysis was run on the combined set of 2,400 DMUs with three inputs and two outputs as described above. The results are shown in Table 2 and in Figure 1. The hypothesis tests were performed on the low and medium-tech credit unions, medium and high-tech credit unions, and on the low and high-tech credit unions. This test examines whether the data supports the null hypothesis that the efficiency scores are from the same distribution.

Table 2. Mean low, medium, and high-tech efficiencies.

	1994	1995	1996	1997	1998	1999	2000	2001
low	67.7%	66.7%	67.5%	67.8%	68.7%	68.3%	68.7%	71.1%
medium	68.3%	67.6%	67.7%	68.3%	69.3%	69.9%	70.6%	72.5%
high	69.4%	67.8%	68.6%	69.5%	71.1%	73.1%	74.4%	77.4%
sig L / M	0.810	0.707	0.943	0.771	0.869	0.486	0.484	0.669
sig M / H	0.461	0.765	0.594	0.333	0.167	0.033	0.015	0.004
sig L / H	0.341	0.403	0.533	0.234	0.152	0.006	0.001	0.001

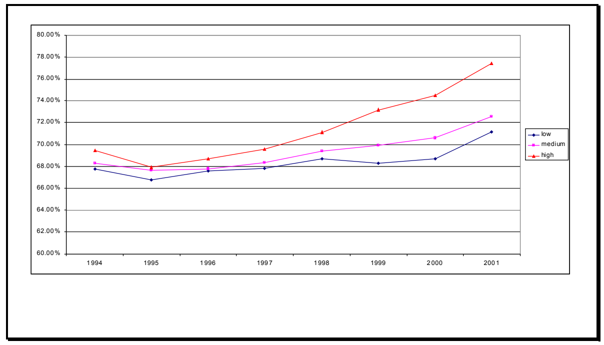

Figure 1. Mean low, medium, and high-tech efficiencies.

Information technology in the form of web sites was introduced to our medium and high-tech credit union samples some time between 1994 and 1998. The initial difference in 1994 for credit union efficiency is not significant for any of the three efficiency measurements. However, by 1999 there is a significant difference (L/H p = 0.0066, M/H p=0.0337), and the gap in efficiency keeps widening through 2001. Comparing low-tech credit unions to medium-tech credit unions, the difference in efficiency never becomes significant.

Based on these results, the null Hypothesis 1a can be rejected, a high-tech organization is more efficient than a medium-tech organization (and by extension, a low-tech organization), but null Hypothesis 1b cannot be rejected, and there is no indication that a medium-tech organization is more efficient than a low-tech organization.

It is interesting to note the time lag between the application of information technology and its effect on the organization's efficiency. Simple web sites were added to our initial sample of credit unions making them medium-tech sometime between 1994 and 1998. Significant efficiency gains from this implementation were never realized. Adding more technology to create a high-tech credit union did not realize any efficiency gains until 1999, at least one year after implementation. This lag is present even though credit unions are information intensive organizations with very little attenuation between the information technology and the organization's bottom line.

5.2 Asset Efficiency

The next two sections disaggregate the efficiency scores due to the use of assets from the efficiency scores due to expenses. Information technology is said to leverage an organization's assets, so the hypotheses to be tested are:

Hypothesis 2a: A high-tech credit union will be more asset efficient than a medium-tech credit union.

Hypothesis 2b**:** A medium-tech credit union will be more asset efficient than a low-tech credit union.

BCC input-oriented Data Envelopment Analysis was performed using one input and two outputs. The single input is the credit union assets that include cash, investments, and fixed assets. The two outputs are the same as in the previous section: the dollar amounts of loans and deposits. The hypothesis test was performed as before on the High and medium-tech, the medium and low-tech, and the high and low-tech efficiency scores. The results are shown below in Table 3 and Figure 2.

Table 3. Mean low, medium, and high-tech efficiencies.

	1994	1995	1996	1997	1998	1999	2000	2001
low	38.2%	38.7%	39.6%	40.8%	42.6%	44.3%	44.4%	49.0%
medium	38.7%	39.8%	41.4%	43.5%	46.2%	48.2%	50.4%	55.0%
high	38.8%	40.4%	42.5%	44.6%	47.7%	50.5%	55.2%	59.9%
sig L / M	0.606	0.362	0.180	0.051	0.017	0.019	0.002	0.009
sig M / H	0.821	0.490	0.333	0.411	0.373	0.182	0.023	0.026
sig L / H	0.542	0.090	0.020	0.004	0.000	0.000	0.000	0.000

The results are similar to, but more pronounced than, the results for credit union efficiency. The difference between the low-tech and high-tech credit union effectiveness becomes significant ($p = 0.0203$) in 1996, between the low and medium-tech credit unions in 1998 ($p = 0.0173$), and between the medium and high-tech credit unions in 2000 ($p = 0.0234$). Both null Hypotheses 2a and 2b that there is no difference in effectiveness based on technology can be rejected.

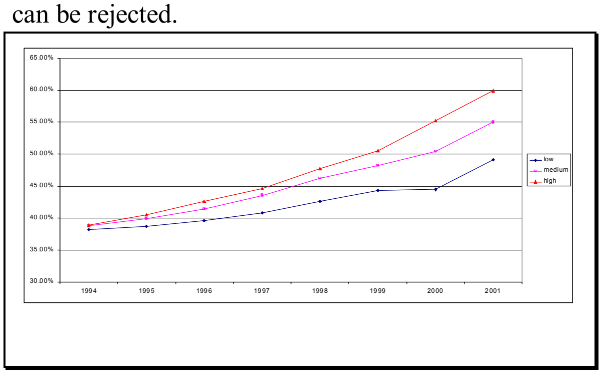

Figure 2. Mean low, medium, and high-tech efficiency.

5.3 Employee Efficiency

This part of the study examines employee efficiency; how well an organization uses its employees. Information technology should make each employee more productive: serving more customers, doing more work per unit time, and so on. This leads to the third set of hypotheses to be tested:

Hypothesis 3a: A high-tech credit union's personnel will be more efficient than medium-tech credit union personnel.

Hypothesis 3b: A medium-tech credit union's personnel will be more efficient than low-tech credit union personnel.

To test these hypotheses the total number of employees in the credit union was used as input and the dollar amount of loans outstanding and the dollar amount of deposits were used as outputs. Credit unions are somewhat unusual as they typically have many part-time employees, and the smaller credit unions are often staffed with volunteers. Eliminating those small credit unions with assets less than $2 million reduces the risk of unpaid volunteers entering the study groups. The NCUA calculates a part-time employee as 0.5 of a full-time employee and tracks these numbers separately. We use the formula (full time + (0.5 × part-time)) to calculate the number of employees.

There is no difference in productivity for employees between low-tech, medium-tech, and high-tech credit unions across the entire period from 1994 through 2001. Productivity for the medium-tech and the high-tech credit unions in 2001 was slightly higher, approximately one percent, but the difference is not statistically significant (L/H $p = 0.7113$, M/L $p = 0.7314$). The results are shown below in Table 4 and in Figure 3. As a result we cannot reject the null Hypotheses 3a and 3b that there is no difference in employee productivity.

Table 4. Mean productivity.

	1994	1995	1996	1997	1998	1999	2000	2001
low	35.4%	35.0%	35.5%	35.2%	35.3%	35.8%	35.7%	37.4%
medium	36.5%	36.3%	35.3%	36.0%	36.4%	36.7%	37.9%	38.6%
high	37.2%	36.1%	36.0%	36.2%	36.3%	37.0%	37.8%	38.5%
sig L / M	0.777	0.862	0.528	0.790	0.841	0.770	0.849	0.731
sig M / H	0.224	0.396	0.317	0.307	0.467	0.265	0.294	0.481
sig L / H	0.262	0.480	0.835	0.498	0.598	0.493	0.467	0.711

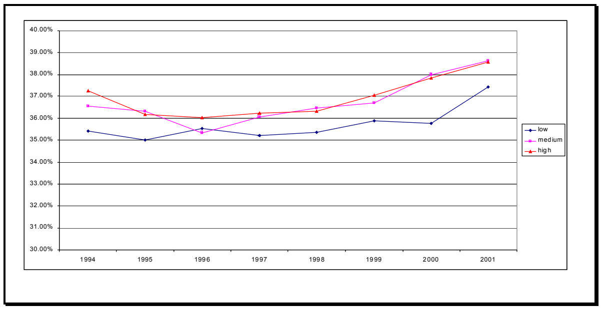

Figure 3. Employee productivity.

5.4 Employee and Operating Efficiency

Another aspect of efficiency is the use of expenses in producing output. The expenses used as inputs in this portion of the study were the same as the previous efficiency analysis: total employee compensation and benefits, and office operations expenses. The outputs were again the dollar amount of loans outstanding and the dollar amount of deposits. We hypothesize that:

Hypothesis 4a: A high-tech credit union's personnel and operating expenses will be more efficient than those of a medium-tech credit union.

Hypothesis 4b: A medium-tech credit union's personnel and operating expenses will be more efficient than those of a low-tech credit union.

The results of the analysis are shown below in Table 5 and in Figure 4. There is no statistically significant difference in efficiency between the three kinds of credit unions across the period from 1994 through 2001; therefore the null hypotheses are not rejected. However, it is interesting to note the significant drop in productivity of approximately nine percent throughout the period from 1994 to 2001.

Table 5. Mean expense efficiency.

	1994	1995	1996	1997	1998	1999	2000	2001
low	52.1%	49.8%	48.5%	47.3%	46.0%	44.4%	43.5%	43.1%
medium	53.6%	51.2%	49.3%	47.7%	46.0%	45.0%	44.1%	42.8%
high	55.3%	51.7%	49.2%	47.3%	45.3%	44.3%	43.0%	42.0%
sig L / M	0.530	0.570	0.852	0.885	0.881	0.858	0.918	0.630
sig M / H	0.477	0.802	0.898	0.914	0.875	0.941	0.780	0.837
sig L / H	0.155	0.327	0.695	0.724	0.963	0.835	0.862	0.750

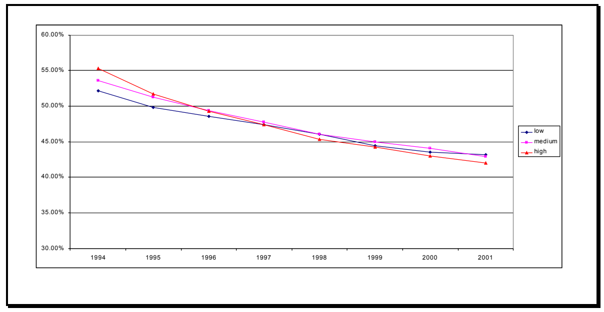

Figure 4. Expense efficiency

A closer look at the employee compensation and office operations expenses shows a dramatic increase in actual expenses throughout the period, and a significant difference between expenses of the high, medium, and low-tech credit unions shown below in Table 6 and in Figure 5. One-way ANOVA was used to test the significance of the differences. The DEA and ANOVA analysis indicate that expenses for credit unions are rising faster than the output resulting in an overall drop in productivity. Expenses for the high-tech credit unions are higher than expenses for the low-tech credit unions, but this difference is eliminated by the concurrent faster rise in output for the high-tech credit unions compared to the low-tech credit unions. The result is a consistent no-difference in productivity.

Table 6. ANOVA of mean expenses (in thousands)

	1994	1995	1996	1997	1998	1999	2000	2001
low	543	580	615	655	687	733	763	799
medium	542	597	651	699	754	809	864	933
high	541	606	678	747	844	927	1,010	1,103
sig	0.999	0.831	0.450	0.252	0.044	0.021	0.005	0.001

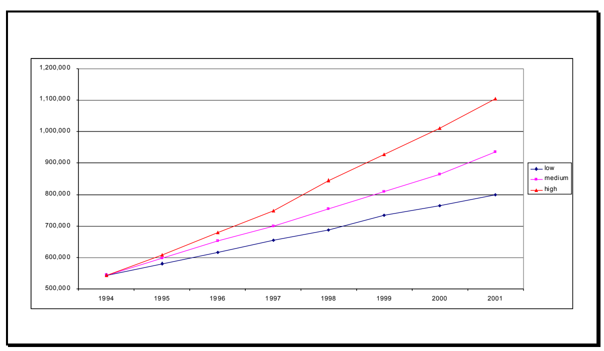

Figure 5. Employee compensation and operating expenses

It is often believed that employees in high-tech organizations are paid more than employees in low-tech organizations. This assumption was tested, and the results are shown in Table 7 and in Figure 6. The results indicate a steady increase in the total compensation per employee for all kinds of credit unions throughout the period, but no difference between low, medium, and high-tech credit unions.

Table 7. ANOVA of mean employee compensation per employee ($, in thousands).

	1994	1995	1996	1997	1998	1999	2000	2001
low	30,842	31,629	32,833	33,551	34,352	36,182	37,576	39,123
med	30,193	31,411	31,659	33,457	34,818	35,836	37,779	39,224
high	30,772	31,129	32,275	33,681	35,095	36,447	37,966	39,498
sig	0.7850	0.8770	0.4791	0.9779	0.7961	0.8588	0.9505	0.9409

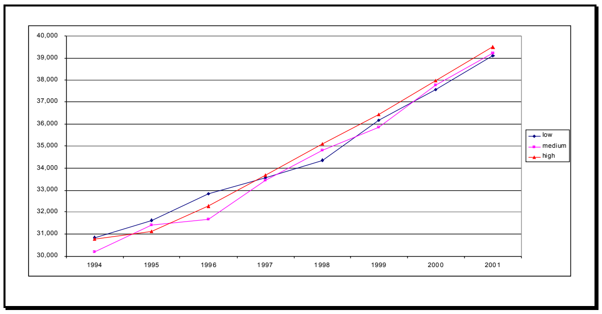

Figure 6. Mean employee compensation per employee.

6. Discussion

Previous research [37, 38] has failed to detect any positive productivity returns for information technology specifically in the banking industry, and we know of no studies that demonstrate that using Internet technology in either banks or credits unions has a positive impact on efficiency. We present evidence that high-tech credit unions that strategically deploy interactive web technology are overall more efficient than medium and low-tech credit unions. In addition, these credit unions make more efficient use of assets. Although there is no significant difference between the overall efficiency of medium-tech credit unions that have informational web sites and low-tech credit unions that have no web site, the medium-tech credit unions do use their assets more efficiently.

Our analysis shows no difference in the expense efficiency or in the efficiency measured by number of employees between any of the groups of credit unions. In fact, our data shows a drop in credit union expense efficiency of approximately nine percent between 1994 and 2001, with all credit unions in our sample showing the same downward trend, regardless of strategic technology deployment. These results suggest that the promise that IT lowers costs may be a fallacy, at least in the credit union industry. However, the findings that overall efficiency and asset efficiency are greater when IT is more intensely strategically deployed (interactive versus informational versus no Internet site), indicates that there are business value benefits to strategic IT use in credit unions. These benefits take the form of services to members and better information that leads to better use of assets. It appears that these benefits outweigh the lack of benefit on the expense side, since the DEA that included both assets and expenses resulted in better efficiencies for the high-tech credit union group.

Simply put, our data shows that it costs more to run a credit union in our high-tech sample. However, those credit unions, by strategically implementing interactive web sites, have been able to better leverage their asset efficiency to a point where their overall efficiency is greater than that of the credit unions that do not have interactive web sites. This is also true for asset but not overall efficiency in medium-tech credit unions.

These results imply that a strategy of investing in a combination of technology, people, or other operational costs that results in credit unions being able to serve their members with interactive web sites is worth pursuing. The payback for this strategy is that members will utilize more services of the credit union in the form of greater dollar amounts of deposits and loans. The data envelopment analysis shows that an interactive web strategy can achieve this goal. The other two major IT benefits were lower personnel and operating costs and better and faster information. The DEA shows no difference in the efficiency of personnel and operating costs based on technology strategy, and in fact show higher actual costs associated with an interactive web services strategy. However, these costs appear to be outweighed by the information value of the interactive web strategy, in that overall credit union efficiency is better than that of credit unions with informational or no web presence. The results strongly suggest that strategic IT business cases should not be made on the basis of cost reductions or an increase in efficiency.

This is one of the first studies that empirically demonstrates that interactive Internet strategies result in business value to the organizations that deploy them. Great care was taken to study a homogeneous set of credit unions to get the most accurate model possible. There are, however, several limitations to this study. The credit unions in this sample were between ten and one hundred million dollars in asset size. It is possible that larger credit unions could use economies of scale to gain expense efficiencies. The goal of credit unions is not profit; therefore the generalizability of these findings to for-profit entities is limited. Although a similar methodology could be used to study other types of organizations, different output variable such as net income might be more appropriate. We do, however, recommend that researchers embarking on such studies determine what the stakeholders of their sample believe are the business benefits of IT, and use this information when choosing variables to analyze.

7. References

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