

Implementation of E-Learning and Corporate Performance – An Empirical Investigation

[doi:10.3991/ijac.v3i1.1022](https://doi.org/10.3991/ijac.v3i1.1022)

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Abstract—Research indicates that successful adoption of information systems (IS) to support business strategy can help the organizations gain superior financial performance. e-Learning can be defined as learning through information and communication technologies and it should include a mechanism for forecasting the actual expected benefits, converted to monetary values, and then comparing the benefits to the projected cost. This study focuses on the relationship between the e-Learning and organizations' financial performance and objective, using secondary financial data draw from the COMPUSTAT. The results indicate these firms significantly reduce cost, increase profitability after adopting e-Learning. The research outcome provides new insights into the productivity paradox associated with e-Learning adopters and helps applications of e-Learning across different organizations.

Index Terms—e-Learning, organization performance, performance evaluation

I. INTRODUCTION

During the global economic expansion of the 1990s, the advent of the Internet, together with the widespread adoption of advanced technologies, helped fuel the implementation of online education and training both in the academic and business worlds. In the knowledge-based economy, people have been identified as the key for success of organizations and businesses. Organizations and businesses need to recruit, retain, and update highly skilled people in such an economy. The present challenge is more than moving learning seamlessly through a enterprise—it is to ensure that the right skills and competencies play in key elements of organization. To thrive in such situation, firms need to provide the skills development and education to workers. Driving each of these developments, combined with the new technological infrastructure, e-Learning has been identified as the enabler for people and organizations to keep up with changes. A diverse range of organizations are appraising and integrating e-Learning in their training and learning strategies, with corporate organizations in the finance and technology sectors setting the trend. However, now many companies have struggled with the real costs, benefits, and return-on-investment of adopting e-Learning. The effects of adopting e-Learning for firms may be associated with improved performance. There are many organizations seeking to understand the economic benefits of their learning initiatives, and to leverage that understanding to improve the efficiencies and effectiveness. Therefore, the evaluation of an e-Learning should include a mechanism for forecasting the actual expected benefits, converted to monetary values, and then compare the benefits to the projected cost.

A. Research Objectives

This study focuses on the relationship between e-Learning and firms' financial performance by using objective, secondary financial data drawn from the COMPUSTAT.

This dissertation is based on two major arguments. First, it argues that e-Learning is linked to organization performance. Second, it asserts that e-Learning plays a central role in the creation and realization of knowledge-based synergies across different units of e-Learning adopter.

II. ADVANTAGES OF E-LEARNING

The advantage of e-Learning could be discussed in four dimensions:

A. Cost savings

When delivered through technology-based solutions, training is less expensive per end user due to scaleable distribution and the elimination of high salaries for trainers and consultants [1]. Further, online training is scaleable because it offers the ability to add instructors and students as needed, with fewer changes and redevelopments [2]. This results in both significant cost reduction and also reduction in lost time and opportunity from having employees away from their responsibilities for extended periods of time. Employee training, fees for conferences, educational seminars, and the costs of hiring consultants can be reduced when companies utilize distance learning and computer based training (CBT) courses. They enable organizations to cross geographic boundaries, cut costs, and share knowledge [3].

B. Employees training

Employees can then access training when it is convenient for them, at home or in the office [1]. e-Learning can improve retention by varying the types of content (images, sounds, videos and text work together), creating interaction that engages the attention (games, quizzes, etc.), providing immediate feedback, encouraging interaction with other e-learners and e-instructors (chat rooms, discussion boards, instant messaging and e-mail all offer effective interaction for e-learners) [4]. Online class can be an acceptable alternative to a traditional lecture based class with regard to exam achievement [5].

C. Organization learning

The ability to store the material can largely contribute to a knowledge database. Maestro-Scherer [6] shows that the use of technology in a group process to increase indi-

vidual participation and group learning. Reducing the turnover rate helps to keep knowledge within the organization - a benefit that is especially important during times of scarce skilled labor [7]. e-Learning has the advantage of being applicable across all areas of workforce training including career development training, new employee orientation, new service or product information, or just updating and upgrading of work knowledge, competencies, and skills [8]. With the help of e-Learning, organizations can look for seamless transitions from live group activities to individual exercises, from self-paced learning activities to synchronous instruction, from activities in smaller groups to activities in a larger learning community [9].

D. *The Positive Impact of e-Learning*

The use of e-learning for enhancing quality and improving accessibility to education and training is generally seen as one of the keystones for building knowledge society. [4]. Vertical markets that have seen the most rapid growth of e-Learning include information technology, financial services, health care, and government. Pressures on financial service companies to continually train their employees have e-Learning suppliers reaping profits. High employee turnover and a general obsession with doing things properly cause the industry to spend more on training than most other fields [10]. Continuing-education requirements for banking and insurance professionals - coupled with a range of federal, state, and industry-based certification programs - have made e-Learning attractive in those areas. Many large investment banks and insurance firms, such as Merrill Lynch and Prudential, have begun augmenting training programs with e-Learning [11].

Health care is another industry in which numerous license- and certification-based continuing-education programs provide fertile ground for e-Learning to take root. More conservative than other industries and heavily regulated, the health-care industry has been slower to integrate e-Learning with classroom training, but health-care providers are beginning to warm to digital learning approaches [10]. Continuing-education requirements for nursing professionals and physicians vary from state to state, and educational programs must win state approval. Continuing education for medical disciplines continues to reside in the domain of degree-granting, accredited academic institutions [9].

e-Learning constitutes a growing share of total IT-related training worldwide, though it does not account for more than a quarter of the total IT training market, which indicates room for significant continued growth [13]. At the same time, leading IT providers have developed lucrative IT training divisions based on certification programs for their technologies. Cisco, Sun, and Microsoft have all been increasingly active in this regard. The expenses facing employers who seek to keep their IT staff current on IT technologies and the inherent demand for training that successful IT certification programs have created have made IT a leader in adoption of e-Learning [11].

As evidence of its value to these market segments mounts, e-Learning will expand into other markets where demand for training is less robust but still vital for organizations' success. These first-generation adopters will revealed a direction for broader adoption of e-Learning among the broader corporate community.

III. RESEARCH FRAMEWORK

With more than fifty million workers to re-train, any discovery leading to decreased expenses is extremely well received, and distance-training programs have already proved their ability to save millions of dollars each year [12]. Many companies in different industries have subsequently discovered more substantial long-term benefits: increased productivity, improved employee retention and recruiting, and a more agile and competitive organization. But the ability to demonstrate a rapid return on investment has been critical for many early adopters as they choose among a variety of IT investment options [13].

Determining the cost of e-Learning is an essential component in deciding whether these new techniques are appropriate for a particular organization. In addition to examining the value added components for learning, one must also consider the cost, and whether these costs are justifiable [2]. In order to actually achieve these goals, companies must revise their perception of training as an unredeemable cost to the company and view expenditures to develop human potential as an investment with unlimited potential returns [14]. Rosenberg [15] points out that corporate investment in information technology, especially corporate intranets, can be leveraged through e-Learning. It can use existing technology and can therefore lower the initial investment per application. Most research is available for the productivity impact on sales, with ample evidence of increased productivity and effectiveness of the sales force [7]. As mentioned above, this study hypothesizes e-Learning adopters would increase profitability than before the adoption.

H1: A firm's profit ratios after adopting the e-Learning should be higher than its profit ratios prior to adopting the e-Learning in subsequent years.

H2: A firm's cost ratios after adopting the e-Learning should be lower than its cost ratios prior to adopting the e-Learning in subsequent years.

The design of electronic performance support (EPS) requires not just an educational thinking but a fundamental rethinking of the relationship between learning and performance. Likewise, much of the roots of performance technology (PT) lie in the education and training field. But like EPS, performance technology thrives when focused on business rather than educational problems [15]. Cost savings result in a positive ROI. This assumes that the output of the learning process remains the same and the earnings or net monetary benefits from both approaches are consistent [16]. Motorola believes that for every dollar they spend on corporate learning, it will translate to US\$30 productivity gains within 3 years. They also believe that 50% of employees' skills will become outdated within 3–5 years [17]. This study hypothesizes e-Learning adopters would increase profitability and reduce cost by creating synergies than non-adopters.

H3: The profit ratios of e-Learning adopters should be higher than those of the non-adopter with equal firm size in the same industry.

H4: The cost ratios of e-Learning adopters should be lower than those of the non-adopter with equal firm size in the same industry.

The research framework can be illustrated as Figure 1.

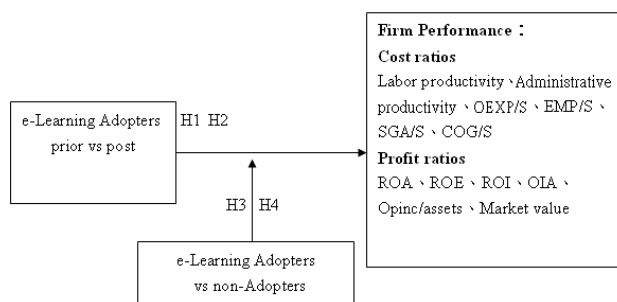


Figure 1. Research framework

A. Dependent Variables - Performance Metrics

There are many research discussions about the profit performance of the IT investment and some are listed in Table I. This study chooses two main dimensions as measures namely: performance included profitability and cost ratio. The research uses six profit-based ratios to measure profit performance:

- Return on Assets(ROA)
- Return on Equity(ROE)
- Return on Investment(ROI)
- Operating income(OIA)
- Opinc/asset
- Market value,

and using six profit-based ratios to measure cost ratio:

- Labor Productivity(LP)
- Administrative Productivity(AP)
- OEXP/S
- EMP/S
- SGA/S
- COG/S.

B. Data Collection

The research uses measures to obtain a comprehensive view of organizations' financial performance. This study created a database consisting of secondary objective measures of financial performance for respondent in the study with data obtained from COMPUSTA which provides annual and quarterly operating and financial data on 156000 publicly traded companies for the last twenty years. The data collections procedure was as follows:

1. This research first searches the Reuters.com (<http://www.reuters.com/>) for key e-Learning vendors that have publicly disclosed firms who acquired their e-Learning applications.
2. This study also searches the Lexis-Nexis (www.lexisnexis.com/) to widen sample size of e-Learning adopters.
3. Because company data was gathered via the COMPUSTAT financial database, the study eliminated the company which can not be found in the COMPUSTAT.
4. This study attempts to examine the three-year effects of implementing e-Learning. As a result, the study exclude the firms who adopted e-Learning after 2001. The sample is built from search results of announcements related to e-Learning during the period from 1999 to 2004.

5. In order to find e-Learning non-adopter, this study search the same SIC (Standard Industrial Classification) codes from COMPUSTAT. Besides, the study compare the financial ratios between e-Learning adopters and non-adopters to confirm two companies match on size, and to ensure that no e-Learning adopters are included in the control sample.
6. This research takes the final step to assure that none of the control firms has a news wire disclosure concerning e-Learning adoption through Lexis-Nexis and Reuters.com.

To examine the possible differential effects of e-Learning adoption, the author collects two samples corresponding to two types of firms according to the above procedures. Finally, 123 e-Learning adopters are selected for our study, including 3M, DELL, COCA-COLA et al. The control samples are 123 e-Learning non-adopter companies which include AVERY DENNISON, CRAY, M&F WORLDWIDE et al. Therefore, this study applies the paired samples t-tests to compare performances ratios before and after e-Learning adoptions.

 TABLE I.
SUMMARY OF PERFORMANCE RATIO

Ratio	Calculation	Study
ROA	Return on Assets is Income Before Extraordinary Items	(Rai et al, 1997) [18]
ROE	Return on Equity is Income Before Extraordinary Items	(Rai et al, 1997) [18]
ROI	Income Before Extraordinary Items - Available for Common, divided by Total Invested Capital, which is the sum of the following items: Total Long-Term Debt; Preferred Stock; Minority Interest; and Total Common Equity.	(Mahmood, M. A., Mann, G. JJ, 1993) [19]
OIA	Operating income is earnings before taxes and depreciation divided by the total assets	(Bharadwaj, 2000) [20]
Opinc/asset	Operating Income divided by asset	(Bharadwaj, 2000) [20]
Market value	Market value is the price at which an asset would transact in open market	(Anderson et al, 2001) [23]
LP	VALUE divided Total employees VALUE = Sales minus Labor Expenses	(Rai et al, 1997) [18]
AP	VALUE divided Selling, General and Administrative Expenses VALUE = Sales minus Labor Expenses	(Rai et al, 1997) [18]
OEXP/S	Operating Expense as a percent of sales	(Bharadwaj, 2000) [20]
EMP/S	Total number of employees divided by net sales for the period.	(Poston and Grab-ski, 2001) [21]
SGA/S	Selling, General & Administrative (SG&A) Expense divided by net sales for the period.	(Poston and Grab-ski, 2001) [21] (Bharadwaj, 2000) [20]
COG/S	Cost of goods sold (COGS) Expenses divided by net sales for the period.	(Poston and Grab-ski, 2001) [21] (Bharadwaj, 2000) [20]

C. Model Specification

To consider both the performance of an adopting firm subsequent to the adopting e-Learning relative to that same firm’s own performance before adoption, this study uses t-test to examine H1 H2 hypotheses according to the public announcement data of e-Learning adopters. Also, this research used regression analysis to examine the second two hypotheses H3 H4 to check the difference in firm’s performance.

In this regression model, financial ratios are regressed with the pre-adoption financial ratios and a dummy variable representing e-Learning adopters versus non-adopters as follows:

$$\Delta PERF_{iPOST} = f(\Delta PERF_{iPRE}, e - Learning_Adoption) + \varepsilon \quad (1)$$

$\Delta PERF_{iPOST}$ = the difference in performance in the i^{th} pair between the e-Learning adopting company and control company in time t. Each one of the following performance indicators is considered: \square ROA, \square ROE, \square ROI, \square OIA, \square Opinc/asset, \square Market value, \square COG/S, \square SGA/S, \square EMP/S, \square LP, \square AP, and \square OEXP/S. The following time periods were considered: t_{+1} (one year after adoption), t_{+2} , and t_{+3} ;

$\Delta PERF_{iPRE}$ = the difference in the average performance in the i^{th} pair of e-Learning adopting and matched firm for the time period t_{-1} preceding the e-Learning adoption for all ratios.

e-Learning Adoption = a dummy variable, which takes the value of e-Learning Adoption = 1 if the firm was a non-adopter, e-Learning Adoption = 0 if the firm was an adopter, and ε is the error term.

IV. RESEARCH RESULTS

A. Descriptive Statistics

In this section, the author presents the results from the statistical tests used to support the differences between two sets of companies. The two groups of e-Learning adopters and non-adopters were compared using commonly employed measures of firm size such as sales and total assets and the outcome is listed in Table II. The company size of two samples is similar, since the means of t-test did not appear any significant differences between the two groups.

B. Hypothesis 1

This study applies the paired samples t-test to compare firm performance ratio before and after e-Learning adoption and the outcome is listed in Table III. The results of cost ratios indicate that e-Learning adopters are to be associated with significant decrease in the LP, EMP/S, OEXP/S after three consecutive years. The COG/S is significant in the first year and second year of adoption, but SGA/S is not positive significant in the three year. Research results confirm the claims that e-Learning adoptions could improve firm performance in lowering cost ratios.

TABLE II. RESULTS OF STATISTICAL TESTS

	Sample	N	Mean	Std. deviation	T statistic P value
Pre-year					
Total Asset	adopters	98	30805.0328	64353.5157	1.093 .277
	Non-adopters	98	21097.6626	68299.4041	
Sales	adopters	97	11191.9537	14941.8770	1.550 .124
	Non-adopters	97	7427.3238	18545.1896	
First year					
Total Asset	adopters	103	44447.4043	103619.7181	1.348 .181
	Non-adopters	103	27571.0171	88149.6187	
Sales	adopters	103	12999.7970	19465.1940	1.481 .142
	Non-adopters	103	8529.1770	22742.1556	

TABLE III. SUMMARY OF PERFORMANCE RATIO

Financial ratio						
	ROA	ROE	ROI	OIA	Opinc/as set	Market value
1 st year after vs year before	1.39 (.16)	.30 (.76)	1.78 (.07)	2.01 (.04) \square	2.36 (.02) \square	1.75 (.08)
2 nd year after vs year before	2.46 (.016) \square	-.84 (.40)	2.94 (.004) \square	1.32 (.18)	2.21 (.029) \square	2.54 (.013) \square
3 rd year after vs year before	2.40 (.019) \square	.85 (.39)	2.67 (.009) \square	.96 (.33)	1.03 (.30)	-.92 (.36)
Cost ratio						
	LP	COG/ S	EMP/S	SGA/ S	OEXP/S	AP
1 st year after vs year before	-1.84 (.074) \square	-4.48 (.00) \square	2.63 (.010) \square	-.90 (.36)	-2.06 (.042) \square	-1.74 (.09)
2 nd year after vs year before	-2.22 (.034) \square	-1.75 (.083) \square	4.01 (.00) \square	-.83 (.40)	-1.84 (.06) \square	-2.08 (.05)
3 rd year after vs year before	-2.15 (.040) \square	-.03 (.97)	3.26 (.002) \square	-.10 (.91)	-1.85 (.06) \square	-1.95 (.06)

The results of profits ratios indicate that e-Learning adopters are to be associated with significant increase in the ROA \square ROI after the second year and the third year of adoption. The Opinc/asset is associated with significant increase in the first year and third year of adoption. The OIA is associated with significant increase in the first year of adoption. The Market value is associated with significant increase in the second year of adoption. However, there is no significant increase in the ROE. Rai [18] indi-

cates ROE provides a measure of how effectively a firm uses financial capital. Managers are increasingly examining this measure because it indicates how well the firm is managing resources invested by stakeholders. ROA may be a better indicator of the effectiveness of capital investments than ROE, as the latter combines the effects of capital investments as well as financial leverage employed by the firm. Maybe for value of IT investment, ROE is not an appropriate criterion.

In a nutshell, the adopters significantly reduce costs, increase profitability after adopting e-Learning.

C. Hypothesis 2

As stated previously, the author performed regression to address research hypothesis 3 and 4. Table IV presents the results of regression analyses between e-Learning adopter and non-adopter.

The results are shown in the cost ratio indicates that COG/S and EMP/S is significantly different between e-Learning adopter and non-adopter in all three consecutive years. The result of OEXP/S is significantly different between e-Learning adopter and non-adopter in the third year. Additionally, there is no significantly difference in SGA/S, LP, AP between the e-Learning adopter and non-adopter. The results are shown in the profit ratios indicates that ROI apparently different from non-adopters in all three consecutive years. The result of ROA, ROE is significantly different between e-Learning adopter and non-adopter in the second and third years, but no significantly in the first year.

TABLE IV. SUMMARY OF PERFORMANCE RATIO

T2					
Financial ratio	Pre-Ration	Non-elearning adoption	R Square	Adjuster R Square	
ROA	.948 [61.733] (.000)□□	-.026 [-1.702] (.090)□	.951	.950	
ROE	.300 [2.776] (.006)□□	-.141 [-2.028] (.044)□□	.147	.132	
ROI	.398 [5.679] (.000)□□	-.145 [-2.315] (.022)□□	.191	.180	
OIA	.047 [4.340] (.000)□□	-.012 [-1.106] (.270)	.978	.978	
Market Value	1.268 [4.658] (.000)□□	-.010 [-.175] (.861)	.580	.571	
Opinc/as set	.044 [4.138] (.000)□□	-.014 [-1.271] (.205)	.978	.978	
COG/S	.251 [2.541] (.000)□□	.063 [1.825] (.070)□	.853	.850	
SGA/S	.384 [6.677] (.000)□□	.040 [1.050] (.296)	.798	.793	
EMP/S	-.369 [-.767] (.444)	.058 [1.724] (.086)□	.808	.804	
OEXP/S	-.126 [-.948] (.345)	.017 [-.630] (.530)	.905	.902	
LP	-.128 [-.496] (.623)	-.054 [-.996] (.324)	.873	.865	
AP	-.269 [-.791] (.435)	.002 [.037] (.970)	.880	.868	

T1					
Financial ratio	Pre-Ration	Non-elearning adoption	R Square	Adjuster R Square	
ROA	.255 [3.868] (.000)□□	-.077 [-1.168] (.244)	.074	.065	
ROE	.288 [4.090] (.000)□□	-.156 [-2.213] (.138)	.110	.100	
ROI	.227 [3.394] (.001)□□	-.112 [-1.683] (.094)□	.066	.058	
OIA	.987 [87.07] (.000)□□	-.016 [-1.421] (.157)	.976	.976	
Market Value	.714 [11.975] (.000)□□	-.018 [-.301] (.764)	.515	.508	
Opinc/as set	.987 [89.328] (.000)□□	-.015 [-1.356] (.177)	.976	.976	
COG/S	.910 [25.919] (.000)□□	.065 [1.854] (.066)□	.845	.843	
SGA/S	.857 [19.68] (.000)□□	.042 [-.960] (.339)	.733	.729	
EMP/S	.899 [26.810] (.000)□□	.059 [1.753] (.081)□	.807	.805	
OEXP/S	.952 [36.335] (.000)□□	.018 [-.689] (.492)	.904	.903	
LP	.923 [17.515] (.000)□□	-.049 [-.925] (.360)	.872	.867	
AP	.939 [14.543] (.000)□□	.015 [-.236] (.815)	.878	.869	

T3					
Financial ratio	Pre-Ration	Non-elearning adoption	R Square	Adjuster R Square	
ROA	-.911 [-3.291] (.001)□□	-.027 [-2.975] (.070)□	.953	.952	
ROE	-.067 [-.733] (.464)	-.137 [-1.970] (.050)□	.149	.130	
ROI	.286 [4.042] (.000)□	-.182 [-2.012] (.003)□□	.250	.236	
OIA	-.075 [-2.453] (.015)□□	-.009 [-.877] (.381)	.979	.978	
Market Value	-.734 [-2.578] (.011)□□	.003 [-.048] (.961)	.599	.587	
Opinc/as set	-.060 [-2.002] (.047)□□	-.013 [-1.184] (.238)	.979	.978	
COG/S	.214 [1.894] (.061)□	.060 [1.755] (.082)□	.857	.853	
SGA/S	-.723 [-3.919] (.000)□□	.026 [-.715] (.476)	.818	.813	
EMP/S	-.761 [-1.139] (.256)	.057 [1.682] (.094)□	.809	.805	
OEXP/S	-1.600 [-7.567] (.000)□□	.038 [1.689] (.094)□	.932	.930	
LP	-2.114 [-6.779] (.000)□□	-.001 [-.015] (.988)	.936	.931	
AP	-2.120 [-5.784] (.000)□□	.048 [1.053] (.302)	.950	.940	

V. CONCLUSION

In this paper, the author has investigated the impact of e-Learning on organizations' performance. This better understanding of financial and performance impacts should help to improve the sustainability of e-Learning adoption. According to the statistical results of this study, there are significant decrease in the LP□EMP/S□OEXP/S after three consecutive years. In the profit ratios, the results show the significant increase in the ROA□ROI after adoptions. Further, the research found in cost ratios that includes COG/S□EMP/S has significant different between non-adopter. The result of OEXP/S is significantly different between e-Learning adopter and non-adopter in the third year. This result shows an indirect relationship between IS and the reduction of production costs. The effects of reduced OEXP costs are not obvious different than non-adopter in the first and second year. The employees need time to adjust themselves to their own utilization [22]. On the other sides, Table IV shows that e-Learning did not decrease the Labor productivity□ Administrative productivity compared to non-adopter. Rai [18] point out that if the objective of proposed investments is to improve business performance, the justification should be closely tied to the organizations business planning processes and aligned with both short-term and long-term strategies. The results of Labor Productivity□ Administrative Productivity did not significant may be aligns with more factors like firm strategy.

The result of ROA□ROE is significantly different between e-Learning adopter and non-adopter in the second and third years, but no significantly in the first year. Rai [18] indicate that improvements in business performance require accumulated competencies and periods of learning and adjustment arising from cumulative IT investment. Long-term investment in e-Learning assets may be required to improve such business performance ratios as ROA ROE.

Based on the above discussion, the results indicate that the better profitability and productivity in performance accrued to adopters of e-Learning. Moreover, these results reveal that e-Learning adopters have better performance before adoption in terms of LP□EMP/S□OEXP/S □ROA and ROI that determine the cost reduction, improve profitability of firms.

This study is limited by the data collecting which collected from Ruter.com and Lexis-Nexis. In some cases, some e-Learning adopter did not listed on this study. Other limitation concern that financial measures data we obtained from COMPUSTATE, so some financial measures can not get from COMPUSTAT.

For future studies, in-depth research is needed to study important factors that many influence the relationship of e-Learning and financial returns while controlling for other exogenous. Costs include direct costs, such as payments to vendors, as well as indirect costs, such as the value of time. Financial benefits can be in the form of cost savings, or increases in productivity or revenue. For future studies can discuss relationship between indirect costs and e-Learning investment.

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Submitted July 16, 2009. Published as resubmitted by the authors February 2nd, 2010.