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Measuring "Return on Learning" & "Return on eLearning"

By

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I. Introduction

The concept of return on investment (ROI) is a critical element of business decision-making. Because of its generic nature, it can be applied to any activity expected to yield a stream of future benefits. In the corporate environment, it is most frequently used in the context of physical investment but, when properly used, it can provide valuable information about the payoff to investment in human capital via training and executive education – what this report will term "return on learning" (ROL).

Application of ROI analysis to corporate training and education is in its infancy, largely because of difficulties in accurately quantifying its benefits. However, results of studies that take a variety of methodological approaches indicate that corporate investment in training provides substantial benefits, with estimated ROL generally ranging between 10 and 200 percent (depending on type of training analyzed, country studied, and methodological approach used).

The concept of ROI can provide valuable information about the payoff to corporate investment in training programs.

These figures provide a rough indication of how much net corporate performance improvement $1.00 of training expenditure will buy. A second critical question is what the payoff is for migrating corporate training programs from classroom or other non-computer-based format to computer-based delivery – what this report will term "return on eLearning" (ROeL). In these cases, additional ROL can be generated from cost savings due to the migration without adversely affecting benefits. ROeL varies widely – some case studies have reported figures in excess of 500 percent. Much of these savings stem from vastly reduced travel costs, as well as the ability to spread instruction costs over a larger number of students.

II. Estimating ROL

Conceptually, ROL is simply the net benefits (in percentage terms) of a given investment in corporate training, which can be formally expressed as the difference between benefits and costs divided by total costs. There are two general empirical estimating approaches. The first, most commonly used in academia and other non-corporate settings, uses firm-level or establishment-level data on inputs and outputs to estimate a production equation using a standard economic growth model. They then calculate the degree to which the "residual" corporate performance not accounted for by capital and labor inputs are correlated with a measure of corporate training. These studies have the advantage of large sample sizes, and their results are thus robust and generalizable. Their disadvantages stem from the same factors. A large sample size generally means that the training variables analyzed are fairly high-level, such as an indicator variable for the existence of a formal corporate

training program or number of workers trained. It is thus impossible to break out the ROL of, for instance, executive development versus technical training. Furthermore, company-specific factors can obscure the true effect of training.

The second approach analyzes the costs and benefits of specific training programs at a single company or small number of companies. This case study framework has the advantage of a deeper analysis of costs and benefits, meaning that there are smaller margins of error around the ROL estimates. In many cases, it is possible to compare the trainees with a control group, which addresses the problems of exogenous unobserved factors that often plague large-sample empirical studies. Furthermore, case studies generally focus on a specific type of training rather than the high-level variables of econometric studies. The disadvantages arise from small sample sizes, which severely limit generalizability of results – though one would expect them to generalize to some extent for similar types of training in similar firms.

II.A. Large-sample econometric studies

Table 1 summarizes the results of six oft-cited studies published in the last ten years that use the large-sample econometric approach. As the right-most column demonstrates, only three used empirical approaches that allowed calculation of a quantitative return to corporate training. Of these, only Bishop had access to the training cost data to calculate a true ROL inclusive of the cost of training. Even with costs explicitly included, the ROL ranges from 11 percent to 38 percent, depending on the model specification. However, this reflects the return to new-hire training and may not be generalizable to other types of training like executive and management development.

Bartel's 1994 study uses a rigorous economic growth model in which corporate performance is measured by value-added per worker, an objective measure that is not self-reported. Thus any data biases on the performance side are eliminated. Unfortunately, the training index studied is very broad – an indicator variable denoting the existence of a formal training program of any type. The study finds a 19 percent increase in productivity growth over three years is attributable to the implementation of formal training programs.

Formal training in U.S. companies raises productivity by 19 percent. Returns in many developing countries are even higher.

Another report of particular note is that of Tan and Baltra (1995) done for the World Bank. It uses an approach nearly identical to Bartel, but apply it to establishment-level data in five developing countries. In four of the five countries studied, the existence of formal training programs was associated with productivity growth in excess of 20 percent, with an impressive 71 percent in Indonesia. Since this paper is not publicly available, it is impossible to know with certainty the factors behind Taiwan's unusually low reported benefit. Their results confirm what many

believe anecdotally – that the payoff to many types of corporate training is higher in developing countries than in the U.S., due to the lower general skill level of their work forces.

Table 1
Econometric Analyses of the Link Between
Corporate Training and Performance

Author	Data	Type of training	Performance measure	Findings and comments
Bishop (1991)	Employment Opportunity Pilot Projects (2594 employers)	New-hire training	Productivity index (scale of 0 to 100)	• ROL ranged from 11 percent to 38 percent, depending on empirical specification.
Bartel (1994)	Columbia Business School HR survey (155 manufacturing businesses)	All types	Value-added per worker	• Implementation of formal training raised productivity by 19 percent over 3 years. • Absence of training cost data precludes true ROL estimate.
Black and Lynch (1996)	EQW National Employers Survey (617 manufacturing establishments)	All types of off-the-job training	Net sales	• Number of workers trained in prior years had no effect. • In cross-sectional analysis, higher proportion of off-the-job training associated with higher sales. • Results lose robustness in panel analysis • Absence of cost data precludes true ROL calculation.
Huselid (1995)	Self-conducted HR practices survey (968 firms)	"high-performance work practices"	Tobin's Q statistic and rate of return on capital	• Significant positive effect in cross-sectional model. • Much smaller (even insignificant effect) in panel analysis. • Non-monetary expression of training precludes true ROL calculation.
Lam and White (2000)	Self-conducted HR survey (235 manufacturing firms)	Comprehen-sive HR development index	Return on assets, sales growth, and stock price appreciation	• HR orientation is strongly and positively associated with growth in all three performance metrics. • Model structure precludes ROL calculation.
Tan and Batra (1995)	World Bank survey of 5 non-OECD countries	All types	Value-added	Existence of formal company training programs raised productivity as follows: • Taiwan (2.8 percent) • Colombia (26.6) • Malaysia (28.2) • Mexico (44.1) • Indonesia (71.1)

Source: Bartel (2000), Lam and White (2000)

II.B. Case Studies

Table 2 summarizes the results of several studies undertaken by both academics and corporations in the last ten years that use the case study approach. Several case studies that report ROL in excess of 500 percent have been excluded, because they generally suffer from one or more serious methodological flaws (e.g. selection bias, subjective reporting of performance data, ignorance of non-training factors that may drive performance) that render the reported results unreliable. Unfortunately, there are few studies focusing specifically on management development training.

The table provides an interesting window on ROL for different kinds of corporate training. The first two examples (which are the most objective in the sense that they were conducted by outside analysts rather than the company itself) clearly show that investment in higher-level corporate education such as management and communications development yields a much higher payoff than low-level remedial training. The Federal Express example is unique in being the only one to employ a control group, increasing the robustness of reported ROL. The other case studies report ROL in excess of 100 percent, even after netting out training costs.

Management and communications development yields a much higher payoff than low-level remedial training.

Table 2
Case Study Analyses of Return on Learning

Author and/or company	Employee group studied	Type of training	Performance measure	Findings and comments
Bartel (1995) Large manufacturer	Professional employees	Management, communications, and technical skills	Wage growth and performance ratings	• Estimated ROL of 49.7 percent. • Controls for selection bias and employee-specific fixed effects.
Krueger and Rouse (1998) 1 manufacturing and 1 service company	Lower-skill employees	Remedial (reading writing and math improvement)	Wage growth and performance awards	• ROL ranged from zero to 7 percent. • Controls for employee-specific fixed effects.
Federal Express	20 truck and van drivers	Driver safety an related training	10 criteria including accidents, injuries, and errors	• ROL of 24 percent. • Increase in ROL is relative to a control group that did not receive training
Garrett Engine	Maintenance teams	Team building	Dollar value of reduced downtime	• Estimated ROL of 125 percent. • Performance only monitored for 4 weeks. • Small sample limits generalizability.
International Oil	Dispatchers	Customer service	Reduction in pullout and customer complaint costs	• Reported gross ROL of 501 percent (does not net out key cost components). • Estimated net ROL of 200 percent with cost adjustment.
Motorola	All employees	All types	Cost cutting, sales and profit increases	• Claim $30 saved for every dollar of training investment. • Sales per employee doubled in 5 years. • Unclear how performance improvement due to training is separated from that due to other factors.

Source: Bartel (2000), Henkoff (1993), Phillips (1999)

III. Estimating ROeL

It is fairly clear that there is a substantial payoff to firms for engaging in employee training. Furthermore, both econometric analyses and case studies support the notion that training at the professional and executive level appears to have a higher ROL than lower-level training for production workers.

An additional potentially large source of ROL is moving traditional training systems (including classroom settings and text-oriented computer-based training) to Web-based multimedia settings. The transition from classroom to computer-based training is happening throughout large corporations, and, with technology and bandwidth capacity growing, they are focusing on multimedia. As Table 3 shows, large U.S. companies have already embraced technology-mediated presentation and delivery techniques and plan to accelerate this shift in the next several years.

Table 3
Use of Selected Non-classroom Learning Technologies for Employer Training at Large U.S. Corporations, 1998 and 2001 Projections

	Percent of companies using		*Percent of training courses using*	
Presentation techniques	**1998**	**2001**	**1998**	**2001**
Computer-based training of all kinds	53.3	81.2	5.9	14.2
Multimedia	65.1	91.2	14.4	23.9
Teleconferencing	30.0	63.2	1.7	6.4
Virtual reality	2.9	20.9	0.3	2.3
Distribution techniques	**1998**	**2001**	**1998**	**2001**
Intranet	32.2	77.1	4.6	16.2
World Wide Web	19.8	54.4	2.2	8.7
CD-ROM	56.3	87.0	5.9	15.1
Cable or satellite TV	12.5	28.0	0.7	2.5
Local area network	40.2	59.1	9.3	13.5
E-mail	40.6	62.4	8.0	13.2

Source: American Society for Training and Development (2000)

The ROeL of shifting to a computer-mediated environment appear to be very large. Most of the benefits accrue due to vast economies of scale in terms of training delivery. In general, the largest costs of classroom training are the salary of the trainer and travel. Neither one of these displays increasing returns to scale, since each student must travel and each trainer can only train a limited number of students in a given time period.

ROeL appears to be in the triple digits. Most of the benefits result from vast economies of scale in terms of training delivery.

Computer mediation is characterized by large fixed costs (to develop the training material and build the infrastructure for its distribution), and small variable costs (to add another student at the margin). Thus, as the number of students increases, computer mediation becomes a more cost-effective option than classroom training because the fixed costs can be spread over a larger student population while variable costs are for all practical purposes constant. As Table 4 indicates, the payback from transforming classroom training into some kind of computer-based format is generally in the triple digits.

Table 4
Case Studies of Return on eLearning

Company	Computer-based media	Type of training	Cost savings relative to classroom	Comments
Bell Canada (1999)	Web-based asynchronous and synchronous	Technical	ROeL ranged from 283 percent to 697 percent for synchronous and over 3,000 percent for asynchronous.	Synchronous course had no multimedia, hence development cost was much lower than for others.
High-tech company (1997)	CD-ROM	IT	47 percent less, implying ROeL of just over 100 percent.	Bulk of savings came from reduced costs of travel and being absent from office.
Oak Ridge National Lab (1997)	Intranet	Safety and health	ROeL of 845 percent (reflects net benefit of $1.51 million net benefit and $0.178 million cost)	50 percent of saving is from reduced travel costs, remainder is reduced training time and fewer instructor hours. More realistic travel cost estimate yields ROeL of 616 percent.

Source: Whalen and Wright (1999), Schriver and Giles (1999)

While the studies in Table 4 all have ROeL in the triple digits, they all make a key assumption that the benefits of computer-based training programs relative to classroom-based settings are identical. Numerous studies demonstrate that

learning outcomes from distance education are not significantly different from classroom settings, but there is very little literature on how outcomes are affected by the move to distance education *and* computer-based learning.

Clearly, computer-based learning as it currently exists is better suited for some training applications than others. Interestingly, all of the examples from Table 4 pertain to technical training, in which the tasks to be learned are well defined. This allows fairly easy tailoring of responses to potential questions, reducing the importance of on-the-fly interactivity.

Computer-based intelligent tutoring systems are bringing real-time interactivity to executive education, further increasing the value of eLearning.

Executive education, management development, and other open-ended kinds of training where student input has the potential to alter the direction or focus of a specific training module raises issues of how unanticipated questions or ideas can be handled in a computer-based environment. In many contexts, real-time interaction and development of ideas are an important part of the educational experience. With today's technology, this requires human interaction for even the most rudimentary questions.

In the very near future, however, information technology may be able to provide some of this on-the-fly feedback functionality. So-called "intelligent tutoring systems" – advanced instructional software with certain features such as generativity, mixed-initiative dialogue, interactivity, model-based instruction, and self-improvement – are in development, with successful pilots operating at US West and in the Department of Defense. Because of the ability to address a much broader array of questions in real time, ITS programs have improved student performance by 34 percent over traditional CBT techniques.

IV. Conclusion

Return on learning (ROL) is a critical element of planning corporate training and educational priorities, and is thus garnering more interest among large companies. A growing literature on the subject indicates that these returns are very large, whether measured with respect to sales, productivity, or other broad metrics. Interestingly, the benefits seem to increase in magnitude as the sophistication of the training level increases. As part of a comprehensive HR development strategy, training is a key determinant of retention, which allows companies to reap the full benefit of their training investments.

Even larger benefits, likely in the triple digits in terms, stem from the return on eLearning (ROeL) – migrating existing corporate education and training programs to

a Web-based or other computer-mediated environment. For some kinds of training for which real-time interactivity is important, the curricula must be carefully planned (perhaps incorporating advanced intelligent tutoring systems) so student outcomes do not deteriorate relative to classroom settings.

V. References

American Society for Training and Development (2000), *ASTD 2000 State of the Industry Report* (Alexandria, VA: American Society for Training and Development).

Bartel, Ann P. (2000), "Measuring the Employer's Return on Investments in Training: Evidence from the Literature," *Journal of Industrial Relations* 39:3 (July), pp. 502-523.

---------- (1995), "Training, Wage Growth, and Job Performance: Evidence from a Company Database," *Journal of Labor Economics* 13 (July), pp. 401-425.

---------- (1994), "Productivity Gains from the Implementation of Employee Training Programs," *Journal of Industrial Relations* 33:4 (November), pp. 411-425.

Bishop, John H. (1991), "On-the-Job Training of New Hires," in D. Stern and J.M.M. Ritzen (eds.) *Market Failure in Training?* (New York: Springer-Verlag) pp. 61-98.

Black, Sandra and Lisa Lynch (1996), "Human Capital Investments and Productivity," *American Economic Review* 86 (May), pp. 263-267.

Huselid, Mark (1995), "The impact of Human Resource Management Practices on Turnover, Productivity, and Corporate Financial Performance," *Academy of Management Journal* 38 (June), pp. 636-672.

Krueger, Alan and Cecelia Rouse (1998), "The Impact of Workplace Education on Earnings, Turnover, and Job Performance," *Journal of Labor Economics* 16 (January) pp. 61-94.

Henkoff, Ronald (1993), "Companies that Train Best," *Fortune* March 22.

Lam, Long W. and Louis P. White (2000), "Human Resource Orientation and Corporate Performance," *Human Resource Development Quarterly* 9:4 (Winter), pp. 351-364.

Phillips, Jack J. (1996), "Was it the Training?" *Training and Development* (July), American Society for Training and Development.

Schriver, Rob and Steve Giles (1999), "Real ROI Numbers," *Training and Development* (August), American Society for Training and Development.

Tan, Hong W. and Geeta Batra (1995), "Enterprise Training in Developing Countries: Incidence, Productivity Effects, and Policy Implications," World Bank unpublished mimeo.

Whalen, Tammy and David Wright (1999), "Methodology for Cost-Benefit Analysis of Web-based Tele-learning: Case Study of the Bell Online Institute," *American Journal of Distance Education* 13:1, pp. 24-44.