ASSESSING THE VALUE OF INFORMATION AND COMMUNICATIONS TECHNOLOGY (ICT) TRAINING

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Assessing the Value of Information and Communications Technology (ICT) Training

> "Clearly, the most widely perceived trend today is the increased need for computer skills training. As information technology becomes an integral part of more jobs, more employees need the skills to use information technology effectively" (1997 National HRD Executive Survey: 1).

A 1997 U.S. national survey of Human Relations Development executives concluded that the most critical need in today's evolving American workplace is additional training for employees in the use of information and communication technologies (ICTs). Indeed, ICTs and end user training in their effective utilization are arguably the two most critical success factors for many contemporary organizations. Why is this the case?

Most organizations assert that people are their most valuable asset. As such, managers expect appropriate investments in human capital, such as programs that insure employees understand how best to use available resources (e.g. other people, technology, and information) should yield high dividends for their companies. A crucial means for achieving such employee expertise is the provision of appropriate training.

A second valuable strategic resource in most organizations is information and the ICT systems used to collect, store, analyze, and manage that information. Most organizations recognize the enormous importance of these assets by allocating substantial resources to them. However, since those systems are only as effective as the people trained to use them, managers face the challenge of appropriate balancing investments in ICT resources and investments in the training of ICT users. The core of this analysis is an

exploration of the costs, benefits, and choices associated with training at the nexus between people and ICTs.

Employee Training Today

Employee training is a structured learning process whose function is to teach employees new or improved knowledge, skills, attributes (KSAs), and behaviors that will enhance job performance. Organizations that desire optimal employee performance must continuously train their employees to acquire the new KSAs required to take advantage of the latest business process innovations.

While the value of employee training is a truism of human resources management, a 1994 survey found that U.S. organizations spent only $2.58 in training per front-line employee per year (Crooks, 1994)! This small amount does not necessarily reflect a belief among organizational leaders that training is not beneficial. In discussing the reasons for such meager training allowances by organizations, Phyllis Eisen, senior manager of the National Association of Manufacturers explains, "Companies have told us it's expensive, it slows us down, and we can't afford it" (Baker, 1993). Yet in an era of complex business processes, sophisticated workplace technologies, and global competition, can companies afford not to train?

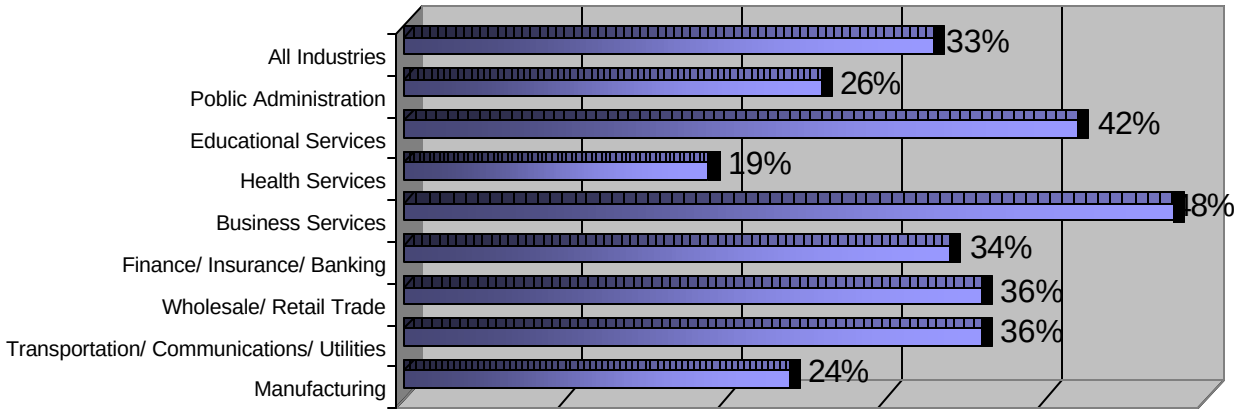
> ***… IN AN ERA OF COMPLEX BUSINESS PROCESSES, SOPHISTICATED WORKPLACE TECHNOLOGIES, AND GLOBAL COMPETITION, CAN COMPANIES AFFORD NOT TO TRAIN?***

ICT Training Today

Most companies acknowledge the importance of training specific to the use of ICTs. Recent nationwide studies have indicated that an increasing share of all training provided by

American employers focuses explicitly on building ICT skills. The share of total training courses devoted to ICT training has increased steadily in recent years. By 1998, ICT training represented fully one-third of all training, an increase of 25% over 1996 (Training, October 1998: 64). The size of the company does not seem to influence the extent of ICT training, although there are notable differences across industrial sectors in the proportion of formal training devoted to ICT skills. Table 1 (Training, October 1998: 64) summarizes these differences.

Table 1
Percent of All Formal Training Devoted to ICT Skills by Industry - 1998



Positive Impacts of Training

Numerous studies demonstrate the positive impacts of general training. Former Secretary of Labor Robert Reich reports that job training should yield a 20% return on investment, based on the training studies conducted by the Bureau of Commerce Research

in 1989 (Baker, 1993). In one such study, Bell Labs recouped three times the cost of its training program in the first year. After two years, the savings doubled to six times the cost of training. During the 1980's, three other Motorola studies documented a thirty-fold return on the cost of the training investment (Baker, 1993). A comparative study by the American Society for Training & Development found that companies that invest more funding in training are more profitable than those that invest less (Bassi and McMurrer, 1998). Other studies (discussed later) conclude that training leads to an increase in performance through increases in employee competency, self-efficacy, self-esteem, and job satisfaction. James Barksdale of Federal Express summarizes the importance of training: "If you train your people well enough, you can just get out of the way and let them do the job" (Crooks 1994).

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Providing Effective Training

Although training has been shown to result in high returns on investment, studies indicate that organizations must thoughtfully plan the training process in order to obtain such results. More specifically, research from psychology concludes that the beneficial effects of training can be increased by applying the following learning principles (De Cenzo, 1996):

- Motivate the learner.
- Provide feedback.
- Reinforce the learned behavior to increase the likelihood that it will be repeated.
- Increase the learner's performance through practice.
- Train the learner in KSAs that are transferable to the job.

Consequently, a sound training program will incorporate these principles, in both the manner in which training occurs and the ways in which the organization rewards positive behavior after the training. The benefits of training will be greatest when the program is consistent with the values reinforced by the organizational climate.

Training Methods and Modes

The modes of employee training have evolved in response to rising corporate investment in ICT hardware and applications, the emergence of new ICTs, and the continued advances in technologies of training. Many new training options are now available. A *Training Magazine* (October 1997) survey of 803 organizations found a multiplicity of training modes in use:

TABLE 2: PERCENT OF ORGANIZATIONS USING SPECIFIC TRAINING MODES

	% Using
Instructional Classroom Programs	94
Workbooks/Manuals	77
Videotapes	74
Public Seminars/Workshops	71
Overhead/Opaque Transparencies	64
Business Books	57
Role-Playing	52
Audiocassettes	44
Noncomputerized Self-Study Programs	44
Self-Assessment/Self-Testing Instruments	43
Case Studies	38
Computer-Based Training (CBT) via CD-ROM	36
Slides	29
CBT via Disks	28
Noncomputer-Based Games or Simulations	28
CBT via Proprietary Network/Intranet	24
Videoconferencing	19
Teleconferencing	17
Computer-Based Games or Simulations	15
Outdoor Experiential Programs	11
CBT via Internet/WWW	10
Videodiscs	6

CBT via Commercial Online Services	3
Virtual Reality Programs	3
Desktop Videoconferencing	3

Classroom-style training is still the most widely used mode and there is considerable reliance on self-training with written materials. Many training programs now enhance the traditional, instructor-led training experience, combining it with other training modes on the list. The use of multimedia and computer-based training is increasing, at least in part because it is perceived to be an inexpensive means to transmit educational information to a large population, especially when that population is geographically dispersed. However, the cost effectiveness of many of the modes of training, including technology-intensive methods, has yet to be empirically established.

Despite the fact that "good" training has some common characteristics, not all training modes are equally effective for all organizations or all ICT systems. Choosing a training mode requires attention to the "fit" of that mode to the unique characteristics of the organization and the application. Indeed, even specific individuals have different learning styles and varying ICT skill levels and thus are not necessarily well-served by a common mode of training.

With so many options, how should an organization go about choosing which method is optimal for its specific needs and contexts? Furthermore, how much training should be provided? When? In order to compare different training modes and implementation practices, we now turn our attention to the challenge of measuring training costs and benefits.

Return on Investment

Return on investment (ROI) is a common method by which managers evaluate the worth of an investment. The measurement of ROI typically involves a calculation of the ratio of the income flow generated by a project to the assets allocated to that project:

$$ROI = \frac{Profit}{OperatingAssets}$$

In order to apply the concept of return on investment to the training process, it is necessary that we modify the above equation, because training does not itself produce an independent cash stream. What training can do for a firm is increase revenues and/or reduce costs.

Thus to understand and compare different training programs (or to compare training against other investments), it is necessary to assess the impact that training has on both revenues and costs as well as calculating the cost of the initial training investment. We therefore introduce a variation on ROI, the concept of **return on investment from training (ROIT)**, which is tailored to the particular characteristics of training investment and returns. ROIT is the ratio of the net change in profit (changes in revenues less changes in costs) divided by the investment in training.

WE INTRODUCE THE CONCEPT OF RETURN ON INVESTMENT FROM TRAINING (ROIT), WHICH IS TAILORED TO THE PARTICULAR CHARACTERISTICS OF TRAINING INVESTMENT AND RETURNS:

$$ROIT = \frac{\Delta \text{Re}venues - \Delta Costs}{Investment_{Training}}$$

Our particular focus is to explore what is known about the impacts of training on the employees' knowledge, skills, and attributes regarding the use ICTs in the workplace and employees' application of those KSAs to add value to the organization. This section first discusses the initial training investment, then describes a conceptual model for understanding the impacts of ICT training. Finally, it considers the various short- and long-term changes in revenues and costs that such ICT training might generate.

Initial Training Investment

The cost of the initial ICT training investment is directly measurable, involving the sum of the cost of training fees and materials. It should be noted that different modes of ICT training are subject to vastly different cost structures. Many firms have implemented distance learning initiatives which, through the use of internet and intranet technologies, can reduce their initial training expenses. However, these cost reductions should be weighed against the differential capacities of the various training modes to favorably affect other aspects of ROIT -- the various elements of revenues and costs discussed below.

The Balanced Scorecard Perspective

How should revenues and costs be conceptualized in this ROIT framework? As previously noted, it can be difficult to assess the impact of ICT training on a firm's revenues, because training does not directly produce an independent revenue stream. Indeed, we shall argue below that many key benefits of ICT training are not directly measurable in terms of revenue or profit. Similarly, many potential costs of ICT training are only indirectly financial.

To aid in conceptualizing the impact of ICT training on a firm's costs and especially on its revenues, we introduce Kaplan and Norton's "Balanced Scorecard" view of the firm (1996). This framework helps us visualize how employee learning and growth actually drive

productivity and value-creation processes throughout the firm. Given the general Balanced Scorecard framework, we identify a number of the specific ways in which ICT training contributes to revenue generation and then explore the impacts of ICT training on costs.

Companies have traditionally relied on financial accounting measures to gauge performance. Data points such as "net income" and "earnings per share" dominate both the investment and managerial views of firm performance. In today's competitive environment, however, managers increasingly recognize that such measures are at best proxies for what is really important to the ultimate success of a firm: how well the firm produces and provides value to its customers. Many firms are turning to the Balanced Scorecard view as a way to measure their basic, value-added processes and to link them to the ever-important financial results.

The Balanced Scorecard is a forward-looking view of the firm. It measures and benchmarks internal business processes, including growth potential, and links these processes to customer satisfaction and, finally, to traditional measures of financial success. There are four basic components of the Balanced Scorecard, each of which is linked to the firm's vision and strategy **(See Graph A).**

- The Financial Perspective is, a key component of a firm's viability. No matter what its goals or how it plans to achieve them, every firm must pay close attention to "the bottom line" of financial success. The Balanced Scorecard approach recognizes the significance of this component, locating it at the apex of the framework.

- The Customer Perspective -- the relationships with customers – is the direct driver of the financial perspective. This attention to the needs and behaviors of

customers provides an external balance to the vision of the firm by focusing explicitly on customer satisfaction, creation, retention, and profitability.

- Internal Business Processes, the third component, concentrates on processes that create direct products and/or services of value to the customer. These operations are the heart of the firm's activities.

- Learning and Growth underlies all three of the other components. The fundamental importance of learning and growth within the firm is explained by Kaplan and Norton:

> The objectives established in the financial, customer, and internal-business-process perspectives identify where the organization must excel to achieve breakthrough performance. The objectives in the learning and growth perspective provide the infrastructure to enable ambitious objectives in the other three perspectives to be achieved (Kaplan and Norton, 1996: 126)

In other words, the ability of a firm to learn and grow not only impacts the firm's performance, but it is also *a direct driver* of a firm's success in its own internal business processes, in satisfying customers, and ultimately, in achieving favorable financial results. In a further elaboration of the Balanced Scorecard framework, there are three core elements of the Learning and Growth perspective: (1) the technological infrastructure, (2) staff competencies, and (3) the climate for action.

A firm's technological infrastructure centers in the capital equipment upon which a firm's business processes are performed. *Inter alia*, this technological infrastructure dictates how vital information, including information about customers, flows through the organization. This tends to be the area in which most firms concentrate a high proportion of their ICT dollars, with particular attention on decisions about procurement and implementation of new hardware and software. However, the technological infrastructure cannot effectively drive the business processes, customer, and financial components without

appropriate contribution from the other two Learning and Growth elements, staff competencies and climate for action.

Staff competencies refers to the employee knowledge, skills, and attributes (KSAs) that, in the ICT context, enable end users to make full and effective utilization of the available ICT resources. In static environments, staff competencies might need only to be maintained. However, today's dynamic business environment leaves virtually no organization with the luxury of merely maintaining the KSAs of its employees. In order to compete in constantly changing markets and to take advantage of evolving technologies, staff competencies must be continually upgraded, and, in some cases, employees must be entirely retrained. Enhancing employees' ICT competencies is especially relevant in the context of change -- in business processes, in technological infrastructure, in market dynamics, and so on.. Employees cannot take advantage of the features offered by advanced ICT products unless they gain and sustain the requisite skills. Effective ICT training can yield increases in staff competencies that generate not only productivity gains but also improvements in work quality. Like productivity gains, such quality improvements create value and, in turn, generate revenue.

EFFECTIVE ICT TRAINING CAN YIELD INCREASES IN STAFF COMPETENCIES THAT GENERATE NOT ONLY PRODUCTIVITY GAINS BUT ALSO IMPROVEMENTS IN WORK QUALITY.

An organization's climate for action, the third core element of Learning and Growth, is critical in shaping the ways in which employee skills are utilized in the course of everyday work. The organization's climate for action can directly affect employee motivation, empowerment, and alignment. End-user ICT training provides the organization with the

opportunity to enhance all three of these aspects of its climate for action, thus improving overall management of the knowledge and skill resources of the firm's employees. ICT training can improve employee motivation by introducing solutions to end users' problems or by teaching them effective problem-solving strategies. Such understandings are helpful in cases where employees have been struggling to use software on which they were inadequately or improperly trained, on new software, or on new ICT-supported business processes. Moreover, the firm that places significant emphasis on ICT training signals its employees that it is interested in both their KSA improvement and their general job enrichment. Such support communicates that the firm encourages and expects its employees to engage in learning and growth and to be empowered as they actively incorporate new types of knowledge into their work. Finally, because classroom training is a shift from the everyday work environment, it is an ideal opportunity for a firm to promote enterprise-wide alignment with its goals and introduce new programs and/or projects for which it wants employee commitment.

These three elements of the learning and growth perspective -- technological infrastructure, staff competencies, and the climate for action -- work synergistically to produce a dependable yet flexible foundation for all of the firm's business processes. Thus, the impacts of ICT training, in conjunction with the appropriate technology and organizational climate, can generate significant performance impacts throughout the organization and especially on its crucial knowledge management function. The training provides tangible and positive, if indirect, impacts on revenue. In sum, ICT training constitutes a crucial element of the core driver of employee learning and growth, which is ultimately responsible for a firm's effectiveness as well as its profitability.

… THE IMPACTS OF ICT TRAINING, IN CONJUNCTION WITH THE APPROPRIATE TECHNOLOGY AND ORGANIZATIONAL CLIMATE, CAN GENERATE SIGNIFICANT PERFORMANCE IMPACTS THROUGHOUT THE ORGANIZATION AND ESPECIALLY ON ITS CRUCIAL KNOWLEDGE MANAGEMENT FUNCTION.

ICT Training and Increased Revenues

Guided by the Balanced Scorecard framework, we can identify a number of the specific ways in which ICT training can generate increased revenues. First and foremost, ICT training can empower employees to take greater advantage of the technological tools already at their disposal-- tools which can enhance the speed and efficiency with which they perform their work. Such productivity increases result when end users learn to better employ new or existing technologies, saving time and increasing the end user's units of work completed per unit of time.

Second, there are a vast array of effectiveness benefits that can be generated from ICT use by end users whose ICT training increases their competency to take advantage of the technological capabilities. Such end users will be in fuller command of the extraordinary information resources that they can access, manipulate and communicate to others. There is extensive empirical evidence of the substantial value-added contributions to firm performance by highly competent ICT end users who use those information resources purposefully (Barua *et al*., 1995; Hitt and Brynjolfsson, 1996; Mahmood and Mann, 1993; Zuboff, 1988).

GIVEN THE POWER AND IMPORTANCE OF INFORMATION AS AN ORGANIZATIONAL RESOURCE, THERE IS EXTENSIVE EMPIRICAL EVIDENCE OF THE SUBSTANTIAL VALUE-ADDED CONTRIBUTIONS TO THE FIRM'S PERFORMANCE FROM HIGHLY COMPETENT ICT END USERS WHO USE THOSE INFORMATION RESOURCES PURPOSEFULLY.

There are numerous examples of the information benefits associated with higher end user competency with ICTs. In a simple example, employees who learn to link a spreadsheet with a word processing system can create more powerful documents that take advantage of each application's strengths. Also, overall organizational knowledge can increase from greater information dissemination among employees who are skilled at using communications technologies. Faster and more skilled access to multiple data sources can improve the employees' knowledge of clients' needs, understanding of the organization's internal processes, and capacity for decision and action. In addition, the ability to utilize ICT-enhanced modes of communication can help the organization to overcome communication barriers, particularly those of time and space.

Third, productivity can be increased through ICT training when inefficient work habits are broken. Employees who receive such training can become more knowledgeable regarding the applications of ICT that are available and appropriate, when a particular application should be used, and what a given application can and cannot do. For example, employees who have been using a spreadsheet as a makeshift database can learn to harness the power of a true database system, resulting in greater efficiency and/or higher effectiveness.

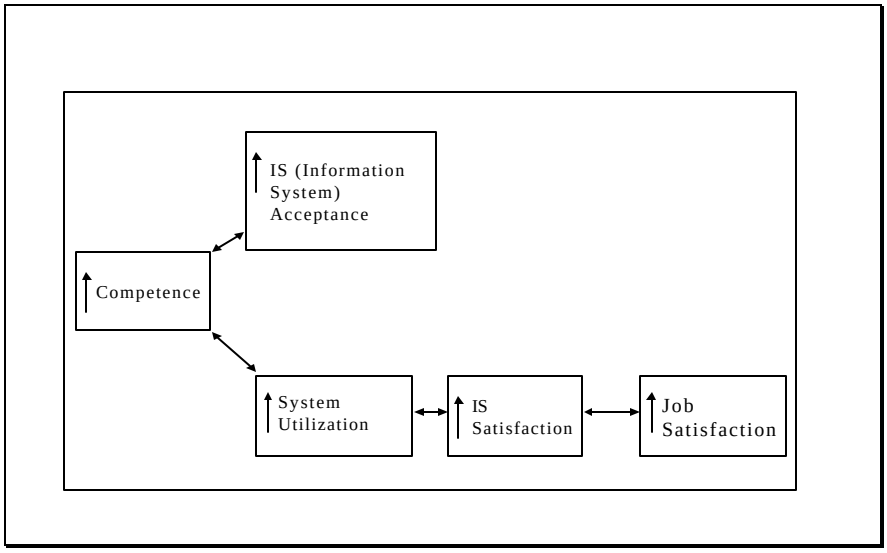
Fourth, the "technological transparency" that well-trained end users enjoy can enhance productivity. This means that the end users grasp not only how to use ICTs properly but also how to solve problems that they might encounter in using those ICTs. When employees are no longer stymied by their ICT applications, they can stop focusing on the technology itself and get back to work. For example, employees who have been properly trained to use embedded online help systems, such as Microsoft's Office Assistant, are more likely to be able to quickly solve their own problems. Employees who have not been trained or have been trained perfunctorily or informally are generally less likely to use such on-line help because they are uncertain how to use it. Instead, they may spend hours attempting to resolve their issue by trial and error, distracting peers by asking for ad hoc assistance, or over-burdening help desks and other end user support facilities.

Fifth, training can be the catalyst for interactions between work peers regarding the effective use of ICTs. These "network effects" can be extremely valuable, as employees who have been in training share their new knowledge with coworkers, extending their ICT skills to others and thus expanding the overall efficiency of the organization's work processes. In some organizations, "power users" are designated in each work group to assist peers who are stymied about the use of particular ICT applications.

Furthermore, studies demonstrate that using ICT training to familiarize employees with online help systems can increase their self-efficacy and their beliefs about their own capacity to achieve favorable results (Desmarais, *et al.*, 1997). Moreover, such improved self-efficacy positively influences employee satisfaction and performance (Gardner *et al.*, 1998). Overall, these studies suggest that in addition to enhancing employee performance through improving specific skills, ICT training may also enhance performance by improving

employees' psychological orientation toward their jobs. Gattiker (1992) concurs that increased morale and job satisfaction generate such benefits as higher productivity, decreased absenteeism, and higher employee retention.

Fifth, a high level of ICT competence may also lead to increased system acceptance and utilization. Employees who are more confident about the likelihood of successfully utilizing an ICT system will generally utilize the system more often than employees who are less confident. In addition, they are more open to trying new uses of ICT in their work. One recent study (Lee *et al*., 1995) focused on a connected series of positive effects on end users' activities with ICT and their attitudes toward work, grounded in their ICT competence:



EMPLOYEES WHO ARE MORE CONFIDENT ABOUT THE LIKELIHOOD OF SUCCESSFULLY UTILIZING AN ICT SYSTEM WILL GENERALLY UTILIZE THE SYSTEM MORE OFTEN THAN EMPLOYEES WHO ARE LESS CONFIDENT, AND THEY ARE MORE OPEN TO ADAPTING TO NEW POSSIBILITIES IN THE USES OF ICT IN THEIR WORK

These patterns were verified both by ICT end users and also by the managers responsible for end user training. It is also notable that increases in job satisfaction have been demonstrated to lead to a decrease in absenteeism and turnover, increases in job performance, and positive improvements in firms' financial performance, measured by such indicators as stock performance and profitability (Grant, 1998; Locke, 1976). In a recent survey, 200 large United Kingdom organizations reported whether they have identified benefits associated with increasing their employees' competencies. The majority of organizations which have increased employee competencies also report increased staff motivation and performance, a more skilled workforce, and specific improvements in the quality of the goods and services they produce (Management Development Review, 1995) .

Table 3: Effects of Increased Staff Competence in 200 U.K. Companies

Finally, there are situations in which ICT training does much more than merely enhance the productivity of current work practice -- it is essential for the continued viability of the business. If an organization introduces novelty into its internal processes, whether replacing by a legacy ICT system or by engaging in fundamental business process redesign (for example, the implementation of an enterprise-wide resource planning package [ERP]), its employees must be trained to understand and utilize the changed ICT system. This process of learning and mastering the new system requires time and is virtually always enhanced if specific ICT training is provided. Inadequate ICT training not only results in the lost benefits associated with the incomplete utilization of the new system, but can also generate very substantial costs due to employee resistance to and disruption of the new business processes.

INADEQUATE ICT TRAINING NOT ONLY RESULTS IN THE LOST BENEFITS ASSOCIATED WITH INCOMPLETE UTILIZATION OF THE NEW SYSTEM, BUT CAN ALSO GENERATE VERY SUBSTANTIAL COSTS DUE TO EMPLOYEE RESISTANCE TO AND DISRUPTION OF THE NEW BUSINESS PROCESSES.

ICT Training and Costs

ICT training has the potential to impact costs in several areas, each of which can result in cost increases or cost decreases. We have indicated above that cost decreases may be the result of productivity enhancements, especially in the area of general administration and other forms of information processing, where the firm's operating costs can often be significantly reduced through expanded use of ICTs. From an accounting perspective, these cost efficiencies can generate net benefits in the ROIT, although they can be best measured and understood as reductions in the cost factor of the firm's business processes rather than

as an increase in revenues. Clearly, such efficiency-grounded cost reductions are often the primary goal of managers who decide to invest in ICT training.

However, it is important to recognize the possibility, in a full conceptualization of ROIT, that ICT training might actually increase certain costs. Cost increases include not only the cost of the training itself (noted above as the "investment in training" – the denominator of the ROIT formula), but also other potential costs, which are specified below and should be considered in assessing the ROIT.

The most obvious cost outside of the training fees is the opportunity cost of diverting workers' attention and energy away from their everyday work. Whether the training is formalized, *ad hoc*, or merely trial and error activities by an end user, the time consumed in training is not directly linked with the direct production of a good or service. And although continued efforts by the end user to master or "play" with new ICT skills might generate serendipitous benefits for job performance, there are measurable costs associated with such ongoing lost work time.

Additionally, ICT training can introduce novelty into the skills repertoire of the end user in ways that generate a variety of nonproductive activities associated with the technology. For example, when the end user is given better understanding of how to navigate the Internet to find work-relevant information, that end user also develops new skills for accessing the multiplicity of other of available information resources while using the firm's ICTs (e.g., cheap airline fares or movie reviews). Another possibility is that the end user's greater familiarity with ICT will displace his or her activities from a more productive task to a less productive one. For example, as the end user gains mastery over the subtleties of a word processing or graphics application, it is possible the end user will spend

unnecessary time overly refining the quality of the product (a situation termed "gilding the lily"). Moreover, the end user might decide to take direct responsibility for undertaking various kinds of information processing tasks that previously were delegated to a subordinate or were completed by another worker with greater skills at completing the task efficiently.

In some cases, and particularly where ERP or other forms of process redesign are associated with the applications of ICT that the end user is learning, there are disruptions to the SOPs (standard operating procedures) of the worker or the work group. Disruption to the end user's normal work processes can ultimately be a very positive factor for the organization, by stimulating improved or innovative approaches to work output. However, until the new ICT skills are routinized in the end user's work processes, it is likely that the playful exploration and focused learning associated with new capabilities will have some negative effects on net productivity.

Even more broadly, when end users develops new tools and information skills, they might expect others with whom they interact also to have similar levels of technological expertise. This can generate a variety of costs and nonproductive situations as workers whose activities were previously integrated and coordinated are now at different levels of sophistication in ICT use and information processing activities. In a simple example, if one end user moves to a more sophisticated version of a word processing system, the work then transmitted to a colleague who has not made the transition to the new system will no longer be as transparently useful between these coworkers.

New ICT skills based on training might also have a complicated impact on the end user's perceived needs. As the employee feels more competent in using ICTs, that employee

might also decide that he/she has various other work-related requirements that now ought to be met. For example, the employee might now expect a higher salary level due to his/her perception of enhanced job skills based on ICT training and use, even in the absence of demonstrable productivity improvements. Other new needs could include, inter alia, a desire for more sophisticated technological capacity on the desktop than is currently provided, alterations in the end user's array of primary work tasks, or upgrading of the end user's job classification.

Concluding Observations

Given the enormous impact of ICTs on organizations, there is a growing interest in measuring those impacts. One 1997 study reported that senior management in more than 45% of the organizations surveyed now require the IS group to calculate ROI for ICTs (Information Week 1997). We have developed the concept of returns on investment from training (ROIT) to help specify a core focus for research. We have also identified and summarized existing empirical analyses that focus explicitly on the impacts of ICT training.

We offer several striking conclusions from our survey of the relevant analyses.

First, and most importantly, **there are few rigorous studies which offer insights regarding returns on investment from training (ROIT)**. Most such studies have focused rather narrowly upon direct links between training and profitability. Yet even in these cases, such linkages have been difficult, if not impossible to demonstrate empirically. As the American Society for Training and Development observes:

> One of training's most vexing problems is how to measure the results of investments in training and how to compare one company's results with those of others…. If you wanted to answer training's biggest question – How does training affect an organization's profits and earnings? – forget it. The data and measurement standards

> for making good decisions just haven't been there. Without those hard facts, training has little ammunition to defend itself against budget cuts and assaults on its value." (Covey, 1999).

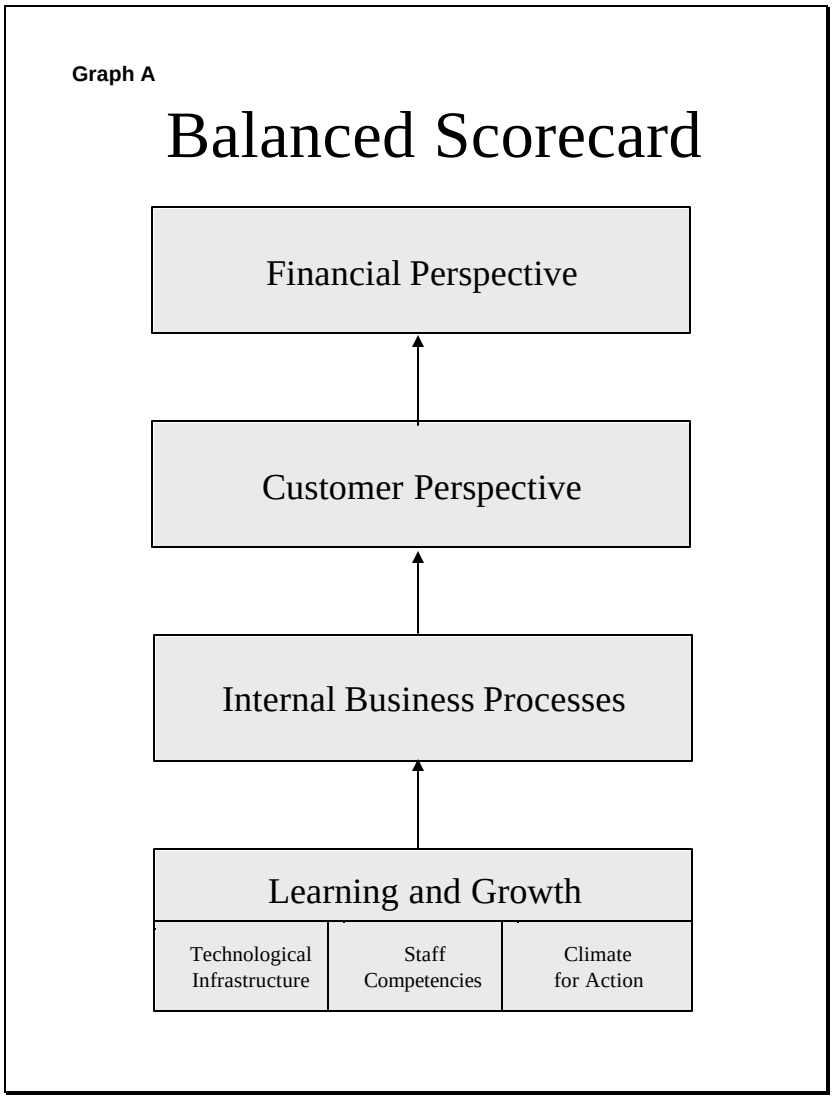
Second, it is increasingly evident that **one must take a much richer and more comprehensive view of the impacts of ICT training, including "intangible" benefits as well as profit in order to develop a reasonable assessment of benefits**. This approach is central to recent conceptual research measuring the benefits of ICTs (Allen, 1996; Barua, Kriebel and Mukhopadhyay, 1995; Hitt and Brynjolfsson, 1996). It recognizes that many of the most crucial benefits attributable to ICTs are essential to firm performance, such as product quality, customer satisfaction, and speed of product to market. This more comprehensive perspective regarding costs and benefits suggests that an organization and its executives should maintain a broad vision when considering the most effective modes and allocation of investments in ICT in order to achieve a more favorable ROIT and ultimately, to increase the firm's profitability.

We have suggested the use of the Balanced Scorecard framework (Kaplan and Norton 1996) as a means to conceptualize these broader impacts. That is, many of the impacts of ICT training are identifiable and demonstrable empirically, even if they do not translate directly into profits. Although the impacts are intangible in the sense that they do not generate immediate financial benefits, they are critical to the success of the firm. The impacts of ICT training can be pervasive, as they "informate" important business processes, as they sustain and empower employees to become more significant contributors to the organization's key objectives, and as they facilitate the transformation of the organization's standard operating procedures (Zuboff 1988).

Third, and at a more basic level, **ICT training is crucial because most end users within the organization simply do not have the level of ICT competence to take full advantage of the technology that is already on their desktops**. Arguably, one of the most significant drags on productivity for some (many?) employees is their limited understanding of what they can accomplish with the ICT tools already available to them. We believe that insufficient end user competence results in a significant loss of productivity, in lost time attempting to respond to confusions and failures to use ICTs properly, and in frustration with the technology that spills over into the end user's broader attitudes toward work.

It is evident that further empirical research on end user training (and other forms of assistance, such as ad hoc help) is necessary. Such carefully designed and targeted empirical research will gather data that enable us to uderstand more fully the effects of ICT training on individual and organizational performance. Consistent with Kirkpatrick's (1979) well-know four-level approach, such research should measure such factors as the learners' subjective response to training, their ability to demonstrate new abilities, their actual use of the learned behaviors on the job, and the effects of those behaviors on the individual and organizational performance. Most organizations could benefit greatly from an informed strategy regarding when and how to provide end users with ICT assistance in order to enhance performance and achieve the organization's goals.

Graph A


Balanced Scorecard
Financial Perspective
Customer Perspective
Internal Business Processes
Learning and Growth
Technological Infrastructure
Staff Competencies
Climate for Action

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Appendix

Our search methodology centered in a literature review of the existing works directly relevant to the training of ICT end-users. We used the University of California's online library catalog system to conduct the majority of our search. For book searches, the University of California's MELVYL database system was used; PsychInfo (psychology periodicals) and ABI Inform (business periodical) databases were employed to locate relevant articles. We concurrently searched the Internet's World Wide Web through browsers such as Yahoo and Lycos, using the same keywords. Key words used for all database searches were:

- Employee
- Performance
- Training
- Self-efficacy
- Competency
- Job satisfaction
- Benefit
- Information technology

Even after extensive search, only a limited number of relevant empirical articles on the topic was found. The following is a list of sources that we have assessed, grouped by topic (note that some articles address several topics but are classified within the most relevant topic):

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