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## **ENHANCING END USERS' ICT SKILLS IN THE NEW ECONOMY**

### **STUDY 1: HELP WANTED: END USERS' EXPERIENCES WITH INITIAL AND ONGOING ICT TRAINING AND ASSISTANCE**

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# **ENHANCING END USERS' ICT SKILLS IN THE NEW ECONOMY**

A linked series of papers

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## **STUDY 1:**

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## General Introduction

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).

This set of papers explores empirically the effectiveness of computer skills training in the “new economy.” The above quote is from a 1997 national survey of Human Resources Development executives which concludes that additional training for employees in the use of information and communication technologies (ICTs) is the most critical need in today’s evolving American workplace. Indeed, ICTs and effective end user training are arguably the two most critical success factors for many contemporary organizations. Why is this the case?

- First, most analysts assert that people are an organization’s most valuable asset. As such, top executives and managers might assume that 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 support for training and learning.
- Second, information and the information systems are a vital strategic resource in most organizations. Many organizations commit substantial resources to information and ICTs on the reasonable assumption that these allocations will generate favorable impacts in achieving their organizational goals, whether profit, market share, productivity gain, or some other measure of efficiency or effectiveness.

While these ICTs are powerful tools, the benefits of using many of these ICTs are closely linked to the behaviors and skills of the organizational personnel who use them. Consequently, managers face the challenge of maintaining an appropriate balance between investments in ICT resources, on the one hand, and investments in the training of and assistance for ICT users, on the other hand. It is this strategic blend of information technology capabilities and skilled end users of information systems that supports the competitiveness and success of firms in the new economy. Thus the core of our analyses is an exploration of the nature and assessment of such training and assistance, based on survey and interview data from end users in a large, high-tech company.

There is widespread lip service paid to the homily that people are typically an organization’s most valuable resource. However, in many (perhaps most) organizations, a thorough and sustained program for the initial and especially for the continuing ICT training and assistance for those people is not among the top action priorities. Indeed, most firms do not even engage in serious, periodic assessment of the extent to which their personnel are satisfied with the ICT training and support provided.

These papers report on field research exploring such issues, undertaken in a progressive, high-tech manufacturing company which we call “TechMark”. This multinational company is very much part of the new economy, in which firm performance is based on a high technology infrastructure, work flexibility, and speedy adaptation to change. Our data are especially grounded in the responses of almost 400 sophisticated end users who are engineers, planners, managers and others in key positions. They report on their own training and learning experiences regarding the key information system with which they work. These “mission critical” systems include forecasting and marketing systems, supply chain systems, SAP systems, and so on.

## **STUDY 1:**

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## **INTRODUCTION**

"A major challenge that we face with a lot of clients is that we must get buy in on the view that their company's most valuable asset is their people. You can put in the best system, but if your people don't understand how to use it, you have gained little and probably cost your company a lot. TechMark accepts this view much more than most companies."

Change management specialist from a "Big Five" consulting firm

This paper focuses particularly on assessing the different modes of training and assistance experienced by end users of key information systems at TechMark. This multinational company is very much part of the new economy, in which firm performance is based on a high technology infrastructure, work flexibility, and speedy adaptation to change.

TechMark is also a progressive company that is very aware of the business value of developing its employees' skills. It aggressively recruits talented people and actively encourages them to advance. Throughout all levels of the company, it is understood that the success of TechMark in the new economy is linked to continuous improvement and innovation. In such an organizational culture, it should be revealing to examine how end users of mission critical information systems are trained.

In this paper, we conceptualize ICT training to include the set of activities that provide end user support through time. Thus there might be initial training on the use of a

particular information system, as well as ongoing modes of training and help. Moreover, such assistance might include formal activities and/or informal knowledge-sharing. In Study 1, our core questions are to determine the incidence of different modes of training, the end users' evaluation of the effectiveness of such training, and their preferences for future training.

We distinguish several alternative modes of ICT training available to most organizations. The traditional approach is instructor-based training, typically in a classroom setting. Another "personal" form of training is one-on-one training, which might be provided by a work peer, supervisor, expert from the IS department, or other knowledgeable individual. Third, an individual might engage in self-training by trial and error or by utilizing printed materials, either from the organization, a training provider, or a software provider. Fourth, computer-based training (CBT) is an emerging option in many organizations. Fifth, the end user might receive no formal training at all.

Moreover, an end user might utilize a training "bundle" which includes several of the modes of support listed above. We shall specifically consider several such bundles: (1) both instructor-based and one-on-one training; (2) instructor-based, plus other modes not including one-on-one; (3) one-on-one training plus other modes, but not including instructor-based training; (4) other modes of training apart from instructor-based or one-on-one; and (5) no training.

## **DATA and METHODS**

The data reported here were gathered primarily from self-administered, web-based surveys completed by 398 ICT end users in TechMark, a large, multinational company engaged in the fabrication of high technology products. The survey was distributed by the company itself, which explained to its employees that it was interested in learning more about the effectiveness of the company's training approaches. Our interpretations of the survey data are enhanced by onsite interviews with end users and with those in the training unit of the organization.

These end users, whose anonymity was assured, responded to an array of questions. Among other questions, they reported their levels of use and evaluation of various modes of ICT training (initial and ongoing) for the specific information system with which they work. The respondents also indicated the extent to which various sources are used to seek answers to questions about the information systems and the usefulness of those sources. They characterized the nature of their knowledge-sharing activities regarding the key information system and their preferences regarding further training. Some personal data were also collected, such as the end user's years of experience with the system and a self-assessment of his/her competency in using the system.

The coded data are analyzed using SPSS, a standard statistical analytic tool. Most tables report the distribution of responses by category and the mean scores on interval- or ordinal-level variables. The statistical significance of between-group differences is assessed by calculating the analysis of variance between group means.

## **HYPOTHESES**

There is minimal empirical research to guide our expectations about the distribution among these alternative types of training within a particular type of organization or about the effectiveness attributed to specific training "bundles" by end users. A major survey of American organizations by the American Society for Training and Development (ASTD) concluded that about 80 percent of training was instructor-led in 1996. However, they estimated that instructor-based training would decrease to only 55 percent by 2000. In contrast, they concluded that there is currently a rapid rise in technology-based approaches, such as CBT, videoconferencing, and other internet-based approaches. These approaches are predicted to constitute about half of all training within a few years (Bassi, Cheney and van Buren 1997: 20).

Despite the lack of empirical data, the existing research and the "conventional wisdom" do suggest several broad hypotheses about end user assistance on major information systems.

- Hypothesis 1. The prevalent modes of initial training remain personal, and especially instructor-led.

- Hypothesis 2. There is now a significant level of CBT and other technology-based approaches, generally termed “e-learning.”
- Hypothesis 3. End users will report as most effective in enhancing their work with a given information system:
  - Initial and ongoing training in multiple modes versus only one mode.
  - Initial and ongoing training that is personal, and especially instructor-led or one-on-one, compared to technologically-based or print-based approaches.
- Hypothesis 4: Work peers will be identified as the most valuable source of ad hoc information in response to questions about system use.

## FINDINGS

### ***What proportion of end users received the various types of initial and ongoing ICT training?***

**Initial Training.** As reflected in Table 1.1, about one in five (21.4%) end users did not initially receive any formal training on the major information system relevant to their functional area of work. Instructor-based training was the central training mode for 36.5% of the end users and received along with one-on-one training by another 9.6% of the end users. **Thus instructor-based training was the most common mode of initial training**, experienced by nearly half (46.1%) of the employees. For 27.2% of the end users, instructor-based training was the only mode of initial training. One-on-one training was the central mode of training for 21.9% of the end users, including 17.5% for whom it was the sole mode. In all, 31.5% had initial one-on-one training. More than half of the end users (54%) experienced only one or both of these two traditional, personal modes of initial training. In contrast, about one in ten end users report initial ICT training that was only print-based or technologically-based (computer-based training or videoconferencing).

**Table 1.1 Proportion Of End Users Experiencing Training In A Particular Mode Or Bundle**

Mode of Training	Percent of End Users	
	Initial Training	Ongoing Training
<b>No training</b>	21.4 %	46.2 %
<b>Instructor-based</b> and more, but no one-on-one	36.5	12.5
<b>One-on-one</b> and more, but no instructor-based	21.9	21.2
<b>Both</b> instructor-based and one-on-one	9.6	4.1
<b>Other modes</b> (Print, CBT, Videoconferencing)	10.6	16.1
Only print	3.3	2.3
Only CBT	1.3	4.3
Only videoconferencing	0.3	0.3

Only one-on-one	17.5 %
Only instructor-based	27.2

N= 324 end users

**Ongoing Training.** The most striking aspect of ongoing training is that **almost half of the end users (46.2%) report no ongoing training**. One-on-one training is the most common mode of further training, experienced by 21.2%, an almost identical proportion to that for initial one-on-one training. In contrast, ongoing instructor-led training has been prevalent for only about one-third as many end users (12.5%) as had experienced this kind of training initially. Similarly, only about half as many end users report both one-on-one and instructor-led training, relative to those who had both training modes initially. The proportion of those using other modes of training increases to 16.1%, constituting a larger percentage of ongoing training than instructor-based training.

In short, Hypothesis 1 is broadly consistent with these data. The dominant provider of initial and ongoing training on key information systems, even for these “high-tech” end users, was another person, either in a classroom setting or in individual interaction. Despite expectations about the growing role of e-learning -- CBT, videoconferencing, and web-based approaches -- these modes have not been crucial for training at TechMark. And an unexpectedly large proportion of end users have had no ongoing training.



### ***Which modes of ICT training on major systems are most effective?***

Based on the evaluations of the end users themselves, there are several key findings regarding the effectiveness of the various modes of training. First, as reflected in Table 1.2, **end users who experienced more modes of training judged their overall training to be more effective.** This is consistent with Hypothesis 3a. A higher mean effectiveness score consistently appears as the group of end users moves from those receiving no training towards those reporting four modes of training. The latter group reported the most favorable mean effectiveness score. The analysis of variance statistic indicates that there is a highly significant difference ( $p < .000$ ) on effectiveness scores between groups with different numbers of training modes.

**Table 1.2 Effectiveness Scores For Initial Training, By Number Of Training Modes**

Number of Training Modes	Effectiveness of Training Score (mean) <sup>a</sup>
Four	2.50
Three	2.06
Two	1.53
One	1.28
None	0.69
Average	1.38

(p) = < .000

N= 310 end users

<sup>a</sup> Effectiveness score: Very good = 3, Good = 2, Satisfactory = 1, Unsatisfactory = 0

**Initial Training.** Second, among the specific “bundles” of initial training, there are clear differences in effectiveness (Table 1.3). Those **end users who received both instructor-based and one-on-one training reported substantially higher mean effectiveness scores** than the scores of those experiencing any other bundle of training. The second highest scores were reported by end users who received instructor-based training, while one-on-one training had the third highest mean effectiveness score. To this point, the more technologically-based modes of training, specifically CBT and videoconferencing, are evaluated as the least effective modes of initial training on the organization’s major systems.

**Table 1.3 Effectiveness Scores For Training, By Bundle Of Training Modes**

Mode of Training	Effectiveness of Training (mean score) <sup>a</sup>	
	Initial Training	Ongoing Training
<b>No training</b>	0.69	0.61
<b>Instructor-based</b> and more, but no one-on-one	1.46	1.35
<b>One-on-one</b> and more, but no instructor-based	1.29	1.62
<b>Both</b> instructor-based and one-on-one	1.92	1.87
<b>Only other modes</b> (Print, CBT, Videoconferencing)	0.94	1.08
Print (and more)	1.48	1.50
CBT (and more)	1.60	1.64
Videoconferencing (and more)	1.25	----
Average	1.38	1.31

(p) = &lt; .000

(p) = &lt; .000

N= 324 end users

<sup>a</sup> Effectiveness score: Very good = 3, Good = 2, Satisfactory = 1, Unsatisfactory = 0

**Ongoing Training.** The absolute scores and relative effectiveness ratings of different modes of ongoing training in the use of key information systems are quite similar to those for initial training. **The highest mean effectiveness of ongoing training is reported by end users who experience both instructor-led and one-on-one training.** In contrast to initial training, however, end users report that for ongoing training, one-on-one training is superior to instructor-based training. Again, the non-personal modes of training are assessed to be the least effective. These data about the effectiveness of different modes of training are consistent with Hypothesis 3b, and the between-group differences are highly significant.

The relatively low effectiveness scores for the high-tech modes of training might cause some concern to those who, like Laurie Bassi and her colleagues at ASTD (1997: 2, 20) argue that new e-training technologies, especially videoconferencing, CBT and other web-based approaches, are “revolutionizing” training. These analysts claim that training is shifting dramatically from traditional instructor-based approaches toward such tech-based modes. In part, the ASTD group bases these conclusions on its 1997 survey of Human Resources Development managers, who identify CBT and video-teleconferencing as the top choices for individual learning technologies to deliver training by 2000 (Bassi, Cheney and Van Buren 1997: 20). Similarly, the training group in TechMark describes a

vision of moving rapidly to “robo-help” – a system in which end users receive technical assistance via training and FAQ support that are both web-based.

The TechMark data offer little support for Hypothesis 2. Rather, **high-tech training modes are not utilized at a substantial level**. There are ways to reconcile the data reported above with these enthusiastic expectations about the use of e-learning technologies. Perhaps the existing CBT systems are still rather primitive and, with further refinements, will become more effective training tools. Perhaps end users, even technologically sophisticated ones like those in this study, continue to be somewhat resistant to accepting nontraditional modes of learning, and their acceptance of innovative approaches will take time. And perhaps high-tech training is most effective in combination with more traditional, personal approaches. In Table 1.3, “CBT and other” training modes scores second in effectiveness, lower only than the combination of both instructor-led and one-on-one training.

Our survey provides further data with which to illuminate these issues. Table 1.4 shows that those end users who have been exposed to these different bundles of initial or ongoing training all have rather high levels of interest in further training. The interest in further training among those with tech-based training is not significantly different than that of end users whose initial and ongoing training are predominantly instructor-led or one-on-one. The mean level of interest in more training among all groups is above 3.0, placing the average answer about interest in more training between “Definitely” and “Likely.”

**Table 1.4 Level Of Interest In Further Training, Given A Mode Of Previous Training**

Mode of Training	Interest in Further Training, <sup>a</sup> if Initial Training was:	Interest in Further Training, <sup>a</sup> if Ongoing Training was:
<b>No training</b>	2.77	2.90
<b>Instructor-based</b> and more, but no one-on-one	3.02	3.27
<b>One-on-one</b> and more, but no instructor-based	3.13	3.02
<b>Both</b> instructor-based and one-on-one	3.25	3.13
<b>Other modes</b> (Print, CBT, Videoconferencing)	3.05	3.10
<b>Average</b>	3.02	3.01

(p) = n.s.

(p) = n.s.

N= 387 end users

<sup>a</sup> Willingness to Take Further Training: Definitely = 4, Likely = 3, Possibly = 2, Not Likely = 1, Definitely Not = 0

***What are the key sources of knowledge sharing regarding information systems?***

The end users also responded to a series of questions about their approaches to sharing knowledge about the major ICT systems with which they worked. They indicated the extent of use and the perceived effectiveness of several different sources which might provide answers to their questions about these systems. These sources range from high-tech based to personal and from formal and systematic to highly informal. The sources for answers to system questions considered here are:

- Website
- On-line help
- Printed materials
- Information systems department staff
- Supervisors
- Email
- Telephone conversation
- Office conversation

As indicated in Table 1.5, **end users rely most frequently on the most personal sources of knowledge to answer questions about the key systems in their work.**

Between one-half and one-third of the end users indicated that they relied on office conversation, email and telephone at least once a week to seek answers to their questions. Only one in ten end users indicates that office conversations are never used to seek answers to questions about these information systems. In contrast, nearly 60% reported that they never use printed materials to answer questions about the information systems, and a similar proportion never request answers from supervisors. Even larger proportions, ranging from 64-83 percent of end users never request answers to systems questions from the information systems department, the help line, or website.

**Table 1.5 Sources Used To Answer Questions About ICT Systems**

Knowledge Source	Frequency of Use			<u>Effectiveness</u> % Very good/ Good
	1-2 times per day	1-2 times per week	Never	
Office conversation	16.4 %	28.3 %	11.6 %	68.0 %
Telephone	13.3	19.0	32.3	64.4
Information Systems Department	.6	6.3	63.8	63.3
Email	17.2	15.5	28.2	63.2
Help Line	1.7	1.4	77.4	52.6
Supervisors	6.3	10.7	57.9	49.3
Printed materials	3.2	6.7	58.1	44.8
Website	.7	5.2	82.8	37.1

Since knowledge seeking is informal and relatively voluntary, it is not surprising that there is some relationship between the most frequently utilized modes of knowledge seeking and the effectiveness attributed to a particular mode. (It is worth noting that assessments of the effectiveness of a given source for answers to questions about the systems are provided only by those end users who actually utilize a particular source.) More than two-thirds of the end users evaluate office conversation as a very good or good source for answers about ICTs. The use of telephone conversation and email are rated nearly as positively.

Interestingly, although only about 7% of the employees request answers of the staff in the IS Department as frequently as once per week, a substantial majority have favorable

assessments of the quality of the answers they receive. Interactive requests for answers from the help line and supervisors and use of printed materials are evaluated very good or good by between 53% and 45% of the end users. Informational assistance on the website is used at all by only about one in five employees, but the effectiveness of that help is rated lowest of all sources in the table.

Thus, as predicted in Hypothesis 4, ongoing knowledge seeking, as a key component of continuous learning, is considerably more extensive and is evaluated more positively in those modes that are most personal and peer-based. Sources of answers that are more technically-grounded and especially those that operate in a more high-tech mode are generally used less frequently and are attributed less value.

These findings about knowledge sharing behavior are consistent with those in other recent analyses. In a revealing case study of Xerox repair technicians, John Seeley Brown and Estee Gray (1998) discovered that knowledge sharing among those technicians was quite different from what the company assumed. Xerox had created detailed books to guide the technicians' work. However, most technicians had developed a variety of creative techniques that improved or streamlined the work. These were communicated among the technicians informally, around the proverbial coffee-machine in the workroom. The company discovered this practice somewhat serendipitously, when an anthropologist was studying the technicians' work routines.

Xerox management was clever enough to facilitate this knowledge sharing, by creating a network of communications among the technicians that encouraged them to share their insights with each other. The company recognized the importance of encouraging this behavior in the organization's work culture and established tangible rewards for those who shared knowledge. However, management was surprised to discover that most technicians willingly shared their knowledge, not primarily to achieve tangible rewards, but because it enhanced their status among their work peers.

## **DISCUSSION**

TechMark is clearly committed to being a "learning organization" and enhancing the morale and skills of its employees. The company's managers understand that an

important element of business success is a workforce that uses mission critical information systems with skill and effectiveness. Nonetheless, the data from end users and from interviews, elaborated in other papers in this set, suggest that training and learning opportunities could be significantly improved. Initial training is sound, but end users generally believe that their overall training could be “more and better.” The lack of initial system training for some employees is problematic and no mode of initial training receives an average effectiveness score above 2.0 (good). The limited scope of ongoing training is another significant issue, especially since there is a high level of interest in further training. Overall, these points indicate a very favorable environment for learning.

Does the company intend to take advantage of these opportunities? TechMark, like the firms surveyed by ASTD, seems committed to rely more extensively in the near future on high tech approaches to provide end user training and assistance. While this is defensible, it is also important that such firms consider the kinds of end user assistance that are dominant in the existing learning culture. Even technologically sophisticated workers like those at TechMark continue to rely on and value the most personal modes of learning and knowledge sharing and to prefer that future training be instructor led.

It is certainly possible that a culture shift will occur in the preferred modes of learning for such personnel. If new (and improved) e-learning techniques are perceived by end users to be very effective, the users should be more inclined to adopt them. And as new generations of employees who have been raised and educated in a technologically-centered manner enter the workforce, the use of CBT and other web-based approaches to end user assistance will seem “traditional” and normal.

However, a company which ignores the current realities of the learning and knowledge-sharing behaviors and preferences of its personnel does face risks. Such a company might allocate a large proportion of its training budget to CBT, web-based support tools, and other new e-learning technologies. If end users find such approaches ineffective and, even worse, if they do not use them, the company can encounter negative consequences. Moreover, if employees attempt to rely on more personal and informal approaches, and

the organizational processes and culture do not support and reward the providers of such informal knowledge, the situation might become even more negative.

Many companies seem to be attempting to limit expenditures on training, even as they expand their investment in new ICT hardware and software, and to look for more “cost-effective,” technologically-based approaches to human resources development. Such companies might be exacerbating the gap between the technological capabilities available to their workforce and the employees’ competence to take full advantage of those capabilities. Equally damaging, if the high-tech learning approaches are at variance with the high-touch preferences of employees, such companies might undermine the very positive desire of employees to learn and to master new skills.

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