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ENHANCING END USERS' ICT SKILLS IN THE NEW ECONOMY

Study 2:
Comparing the Utilization and Value of Alternative Modes of End User Assistance

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ENHANCING END USERS' ICT SKILLS IN THE NEW ECONOMY

A linked series of papers

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STUDY 2:

COMPARING THE UTILIZATION AND VALUE OF ALTERNATIVE MODES OF END USER ASSISTANCE

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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 2:

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"To Train or Not to Train?: Is that the Question?"
Anonymous

INTRODUCTION

We have noted that many organizations pay lip service to the importance of training. They recognize the value of enhancing the skills of their employees, but they are also aware of the costs and risks associated with extensive training. Among the most serious costs from training are the lost work time during training, the actual costs of training, the disruption to standard operating procedures associated with new approaches, and the expectations raised among those employees who are trained (for example, for higher compensation, more interesting work, reclassification) (see Danziger, Jennings and Park 1999). There is also skepticism about the level of retention of most of the material introduced during training.

Given these costs and the pressures of work, it might often be the case the companies place extended, systematic, formal training on the "back burner." If this is true, then it is not unreasonable to assess whether employees in progressive companies in the new economy, like TechMark, actually do benefit from more comprehensive training in the use of the firm's information systems.

Consequently, the main objective of this report is to compare users with a "complete training regime" with users who have experienced other types of training regimes,

especially users with no training. A training regime is defined as the mix of initial and ongoing training on a major information system used by an employee. Our analyses focus on four training regimes: (1) a complete training regime, which consists of both initial and ongoing training; (2) end users with only ongoing training, but no initial training; (3) end users with only initial training, but no ongoing training; and (4) end users with no formal training, either initial or ongoing.

The goal is to understand the similarities and differences among those employees in these four different training regimes and to assess whether training enhances users' skills in using the major information systems and influences their perceptions of self and their behaviors. This paper explores the following attributes of end users:

- Users' self-evaluation of their own information system competence – that is, their skills in data entry or analysis
- The types of tasks on which the information system is used
- The duration of their experience using the system
- Users' assessments of the quality and quantity of initial and ongoing training
- Modes of training support
- Their preference for future training

HYPOTHESES

Based on the limited existing empirical research and our understanding of other writings on end user assistance with information system, we propose the following hypotheses:

- Hypothesis 1: Given that TechMark is a progressive company which emphasizes the importance of human resource development, we expect that most information system end users will experience a complete training regime.

- Hypothesis 2: End users with formal training will at least have had initial training. This belief is based on the assumption that initial training will be viewed as vital to acquaint employees with the key systems used in their work.

- Hypothesis 3: Users involved in analysis and reporting tasks have more training than users involved in data entry tasks, since analysis and reporting tasks are harder to master.

- Hypothesis 4: Users with the complete training regime will have the highest self-evaluation of their system skills, while users with no training will have the lowest self-evaluation.

- Hypothesis 5: Users with the complete training regime have the most experience using the system, and users with no training have the least experience. We assume that as users have more experience, they have had the time and opportunities for both initial and ongoing training.

- Hypothesis 6: Users with the complete training regime are more satisfied with their training than users of other training regimes, since the experiences of initial and ongoing training reinforce each other. Users with no training will be the least satisfied with their training experiences.

- Hypothesis 7: Users with no training use coworkers, as a source of information, and office conversation, as a method of sharing system knowledge, more often than users with training. The assumption is that because of their larger system knowledge gaps caused by lack of formal training, users with no training rely more on informal support than those with training.

- Hypothesis 8: Users with no training have the greatest interest in future training. This expectation is based on the assumption that their lack of training has negatively affected their sense of their own ICT skills and work performance, and thus they particularly want further 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.

FINDINGS

We hypothesized (1) that most users surveyed would have the complete training regime because the importance of training is widely accepted and TechMark is a progressive company. Table 1 indicates that the majority of the users surveyed have <u>not</u> had the complete training regime. However, the largest single group -- 45% of the users surveyed -- have had both initial and ongoing training. About 1/3 of the users had only initial training and 7% had only ongoing training. One in six system users has had no formal training at all.

Table 1 Proportion of End Users Within Each Training Regime

Training Regime	% of End Users
Initial and Ongoing Training	45%
Only Initial Training	31%
Only Ongoing Training	7%
No Training	16%

N = 392 end users

The second hypothesis concerning the emphasis on initial training is supported. First, **fully 76% of the system users had initial training** (including the 45% with the complete training regime), compared to 52% with ongoing training. And second, of those who have not had the complete training regime, there are more than four times as many users with only initial training as users with only ongoing training.

To examine the differences associated with groups of end users experiencing different training regimes, it is useful to analyze the key attributes of each group. In particular, we examine the system tasks in which the end user engages, the user's skill level with the system, and length of experience using the system.

System Tasks

As posited by the third hypothesis, **those engaged in analysis and reporting tasks have more extensive training than those engaged primarily in data entry.** The hypothesis is based on the assumption that the more complicated the tasks, such as analysis and reporting, the greater the need for training. Table 2 indicates that fully half of those who engage in analysis and reporting tasks have experienced the complete training regime, in comparison to 38.5% of those who do only data entry. The complete training regime is most frequent among the end users (55.7%) who do both data entry and analysis and reporting tasks. Exposure only to initial training is much more common among those doing only data entry. Across all combinations of tasks, the same proportion of end users (between 13-15%) have had no training.

Table 2 End User's Training Regime, by Main System Tasks

System Tasks	Training Regime: Initial and Ongoing Training	Only Ongoing Training	Only Initial Training	No Training	Average
Data Entry	38.5%	5.5%	41.8%	14.3%	23.2%
Analysis & Reports	50.0%	6.9%	29.2%	13.9%	36.7%
Both Data Entry and Analysis & Reports	55.7%	8.2%	22.7%	13.4%	24.7%
Total End Users	179	27	123	63	

(p) = n.s.

Information System Skills

As suggested in the fourth hypothesis, users with the complete training regime have the highest self-evaluation of their ICT skills and users with no training have the lowest (Table 3). The differences between training regimes are highly significant statistically for both data entry tasks and analysis and reporting tasks. Interestingly, data entry users with only ongoing training have a higher proportion of very good and good ratings than any other group, whether complete training or initial training.

Compared to the mean scores on data entry skills, the mean scores on analysis and reporting skills are lower. But the relative skill ratings for those end users performing analysis and reporting tasks (who are exposed to different training regimes) are the same as for data entry users. More than half (53.1%) of users with both initial and ongoing training rate their system skills on analysis and reporting tasks as very good or good. Users with no training have the lowest mean skill ratings and only 30% report that their skills are very good or good.

Overall, Table 3 data indicate the very positive impact of both initial and ongoing training on end users' assessment of their skills using key information systems. Users with the complete training regime assess their system skills (measured as mean scores) 48% (data entry) and 45% (analysis and reporting) higher than those with no training.

Table 3 System Skills Ratings for Those Engaged in Data Entry Tasks or Analysis & Reporting Tasks, by Training Regime

Training Regime	Data Entry Skills Rating of Very Good and Good %	Data Entry Skills Ratings (mean) [a]	Analysis & Reporting Skills Rating of Very Good and Good %	Analysis & Reporting Skills Ratings [a] (mean)
Initial and Ongoing Training	73.2%	2.03	53.1%	1.54
Only Ongoing Training	78.9	1.95	42.1	1.26
Only Initial Training	56.1	1.72	34.8	1.17
No Training	46.4	1.37	30.0	1.06
Average	--	1.83	--	1.34
		(p) < .001* **		**(p) < .004** **

Data Entry N = 280 end users; Analysis & Reporting N = 323 end users

[a] Skill Rating: Very Good = 3, Good = 2, Satisfactory = 1, Unsatisfactory = 0

Experience Using the System

The fifth hypothesis states that users with the complete training regime are also likely to have the most lengthy experience using the system, while users with no training will have the least system experience. Tables 4 and 5 show that this hypothesis is only partially correct.

Table 4 Time Using System, by Training Regime

Training Regime	Experience Using the System: Less than 1 Month	1-2 Months	3-6 Months	6-12 Months	1-2 Years	More Than 2 Years	Total End Users
Initial and Ongoing Training	2.8%	3.4%	10.7%	14.7%	28.2%	40.1%	177
Only Ongoing Training	3.7%	--	3.7%	11.1%	33.3%	48.1%	27
Only Initial Training	7.4%	3.3%	11.6%	19.8%	32.2%	25.6%	121
No Initial or Ongoing Training	17.7%	8.1%	27.4%	11.3%	17.7%	17.7%	62
Total	6.7%	3.9%	13.2%	15.5%	28.2%	32.6%	387

(p) =< .000***

Table 5 Experience Using the System, by Training Regime

Training Regime	System Experience (mean score) [a]
Initial and Ongoing Training	4.82
Only Ongoing Training	5.15
Only Initial Training	4.43
No Initial or Ongoing Training	3.56
Average	4.52

N = 387 end users

[a] More than 2 Years = 6, 1-2 Years = 5, 6-12 Months = 4, 3-6 Months = 3, 1-2 Months = 2, Less than one Month = 1

As we posited, those with no training are the least experienced system users. However, contrary to our prediction, the data show that users with only ongoing training, not users with the complete training regime, have the most lengthy system experience. We have no compelling explanation for this unexpected result. In absolute numbers, the largest group of experienced users has had the complete training regime, while the second largest group

is actually those with only initial training (given the large number of users in these training regimes).

While being new to the system may explain why many users have not had initial and ongoing training, it does not explain why initial training is not provided once employees are using the system. More than 1 in 3 users with no training have had more than one year of experience with the system. Therefore, being new to the system does not fully explain why these users did not receive any formal training. And among users with only initial training, more than 1 in 4 have more than two years of system experience. This delayed provision of ongoing training or this lack of ongoing training may prove to be unwise, as the previous analysis on system skills and the analysis on informal modes of support illustrate the beneficial effects of ongoing training.

Amount and Effectiveness of Training

Table 6 indicates that highly significant differences exist across training regimes in end users' satisfaction with the amount and effectiveness of their training. As suggested in hypothesis 6, end users with the complete training regime are most satisfied with their training. A possible explanation for this high satisfaction level is that most end users find that these two learning experiences support and reinforce each other.

TABLE 6 Amount and Effectiveness of Training,[a] by Training Regime

Training Regime	Amount of Initial Training (mean)	Effectiveness of Initial Training (mean)	Amount of Ongoing Training (mean)	Effectiveness of Ongoing Training (mean)
Initial and Ongoing Training	1.41	1.50	1.30	1.44
Only Ongoing Training	0.65	1.17	1.24	1.33
Only Initial Training	1.20	1.28	0.42	0.62
No Training	0.25	0.44	0.75	0.86
Average	1.80	1.38	1.13	1.31
	(p) < .004**	**(p) < .000*****	**(p) < .01***	**(p) < .000*****

Amount of Initial Training N = 321 end users; Effectiveness of Initial Training N = 307
Amount of Ongoing Training N = 235 end users; Effectiveness of Ongoing Training N = 216
[a] Very good = 3, Good = 2, Satisfactory = 1, Unsatisfactory = 0

The data are more ambiguous regarding the part of the hypothesis concerning users with no training. As predicted, users with no training did report the lowest satisfaction ratings for amount and effectiveness of initial training. But this group was not as dissatisfied with (their lack of formal) ongoing training as were users with only initial training. A possible explanation for this unexpected pattern is that users with only initial training are particularly displeased that they have not received further training to build on and reinforce their initial training.

Knowledge Sharing about Information Systems

Whether an end user has had formal training or not, there are other means to share knowledge and learn about information systems-in-use. Our survey examined end users' behavior regarding two such means: (1) asking coworkers for help when a question arose about system use; and (2) sharing system knowledge via office conversation. (For a fuller discussion of alternative modes of knowledge sharing regarding information systems, see the paper Managing Knowledge in a High Tech Company: Knowledge Sharing about Information Systems).

Hypothesis 7 predicts that end users with no training rely on these informal modes of support more often than users who had formal training. Our assumption is that those with formal training are more capable of consulting printed materials, online help and technical staff, while those without training might not feel confident with anything but personal, one-on-one assistance from peers. Unexpectedly, the data in Table 7 and 8 contradict this hypothesis.

Table 7 Frequency and Usefulness of Asking Coworkers Questions about the System , by Training Regime

Training Regime	Frequency of Asking Coworkers (mean) [a]	Usefulness of Asking Coworkers (mean) [b]
Initial and Ongoing Training	1.25	1.94
Only Ongoing Training	1.21	2.06
Only Initial Training	1.03	1.75
No Training	0.86	1.71
Average	1.12	1.86
	(p) < .025*	**(p) = n.s.**

Rates of Asking Coworkers N = 349 end users; Usefulness of Coworkers N = 281

[a] Scores of Rates of Asking Coworkers: 1-2 Times a Day = 3, 1-2 Times a Week = 2, 1-2 Times a Month = 1, Never = 0

[b] Scores of Usefulness of Using Coworkers: Very good = 3, Good = 2, Satisfactory = 1, Unsatisfactory = 0

Table 8 Frequency and Usefulness of Office Conversation about System, by Training Regime

Training Regime	Frequency of Office Conversation (mean) [a]	Usefulness of Office Conversation (mean) [b]
Initial and Ongoing Training	1.62	1.98
Only Ongoing Training	1.65	2.24
Only Initial Training	1.27	1.81
No Training	1.53	1.84
Average	1.50	1.93
	(p) < .014*	**(p) = n.s.**

Rates of Using Office Conversation: N = 326 end users; Usefulness of Office Conversation: N = 298

[a] Scores of Rates of Using Office Conversation: 1-2 Times a Day = 3, 1-2 Times a Week = 2, 1-2 Times a Month = 1, Never = 0

[b] Scores of Usefulness of Using Office Conversation: Very good = 3, Good = 2, Satisfactory = 1, Unsatisfactory = 0

In fact, end users with no training and those with only initial training did not ask coworkers questions and use office conversations very often to share system knowledge. Furthermore, they generally found these two modes of support less useful than did users with the complete training regime or with ongoing training. Also unexpected is the fact that users with the complete training regime used both of these modes of support very often and found such support very useful. Moreover, users with only ongoing training generally had even higher patterns of utilization and satisfaction with these two modes of

support than users with the complete training regime. The only exception is that users with the complete training regime asked coworkers for help slightly more often than users with only ongoing training. It appears that **training, and particularly ongoing training, stimulates end users to ask coworkers questions and to engage in office conversations, in which system knowledge is shared**.

In building the expertise and competence of ICT end users, a reinforcing learning environment seems powerful. Indeed, the failure to provide ongoing training seems particularly risky, since end users with limited or no training are less inclined than others to use informal means to seek system knowledge. Some minimally trained end users might be embarrassed to reveal their lack of system knowledge and hence be reluctant to ask questions. Others might lack the system understanding to ask good questions and grasp the responses provided. For an organization, a particular challenge is to develop approaches that will enhance the desire to learn and to share system knowledge among those with minimal or no formal training in using the information system.

Interest in Future Training

Hypothesis 8 posits that users with little or no training will want to catch up with their more extensively trained peers and thus will have the strongest interest in future training. However, consistent with the findings above about knowledge sharing, **users with the complete training regime are the ones with the highest interest in further training**, not users with no training (Table 9). Conversely, those with no formal training have the lowest willingness to participate in training in the future.

Table 9 Interest in Further Training, by Training Regime

Training Regime	Interest in Further Training (mean) [a]
Initial and Ongoing Training	3.12
Only Ongoing Training	3.07
Only Initial Training	3.03
No Training	2.65
Average	3.01

(p) = n.s.

N = 383 end users
[a] Scores of Interest in Future Training: Definitely = 4, Likely = 3, Possibly = 2, Likely Not = 1

Regarding interest in future training, the differences of the mean scores are minimal among users with complete training, users with only ongoing training, and users with only initial training. All three groups have similar, rather high levels of interest in more training. But the relatively low interest in further training among those with no training is especially problematic, since this group has the lowest skill ratings.

CONCLUSION

By analyzing the various attributes of end users, from their evaluation of their system skills to their preferences for future training, this report has shown that users who have experienced the complete training regime are drastically different from users with no formal training. Compared to those with no training, **users with both initial and ongoing training are:**

- **more confident of their abilities** in carrying out their data entry and/or analysis and reporting tasks with key information systems;
- **more actively and constructively engaged in searching for and sharing system knowledge**;
- **more eager to undertake further training**.

Assuming that other factors remain the same, these differences between users with complete training and users with no training illustrate the positive and motivating impact that training has on end users. We suggest that training stimulates the development of the kind of employee needed for the learning organization – one who has taken advantage of past opportunities to learn, who shares knowledge more actively, and who is motivated to extend his/her learning. Conversely, users with no training give themselves the lowest skill evaluations, have the lowest satisfaction with their training, and are the least interested in future training. A clear need exists to find effective means to draw them into a training regime and stimulate their interest in skill development and learning.

Our field research reveals that TechMark seems to place greater emphasis on initial training than ongoing training. We agree that initial training is vital in building users skills with key systems. But our analyses have shown that ongoing training seems to have particularly positive effects on users, such as bolstering their confidence in their system skills and increasing their willingness to share system knowledge. Initial training acquaints users with the system, while ongoing training might be more effective in stimulating deeper, more continuous learning. Although TechMark is a progressive company, the fact that nearly half (47%) of the end users report no ongoing training could result in detrimental impacts on the organization.

Our study shows the importance of training, with the provision of both initial and ongoing training – what we have termed the "complete training regime" – as the most desirable. These learning experiences seem to reinforce and supplement each other, and the lack of one part of training, especially ongoing training, can negatively affect the skill development and knowledge sharing of the employee.

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