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## ABSTRACT

This document contains three papers on improving learning with technology. "The Benefits, Challenges, and Implications of Teleworking: A Literature Review" (Susan R. Madsen) reviews the literature on the benefits and challenges of teleworking for individuals, work groups, and organizations and investigates the implications of telework for human resource development (HRD) theory and practice. The report presents eight recommendations for HRD practitioners, including the following: (1) be prepared to design approaches to evaluate, educate, organize, and inform workers; (2) train workers to adapt to a new environment and cope with its challenges; and (3) train managers to monitor telecommuting programs carefully and react in an expedient manner to correct any undesirable consequences. "A Study of e-Learning Practices in Selected Fortune 100 Companies" (Danielle Strazzo, Tim L. Wentling) reports the results of a survey that examined why 7 Fortune 100 companies have introduced e-learning to their employees. The future of e-learning is also discussed. "Human Resource Development for International Technology Transfer within Multinational Enterprises in Singapore" (Aahad M. Osman-Gani) presents empirical information on the status of international technology transfer and the HRD practices used in the transfer process. Two papers include substantial bibliographies. (MN)

# 2001 AHRD Conference

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## The Benefits, Challenges, and Implications of Teleworking: A Literature Review

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*The purpose of this review is to explore the literature related to telework and its benefits, challenges, and implications for individuals, work groups, and organizations. It investigates the possible implications of telework to HRD theory and practice. It lists a number of theories/models and discusses concerns about the lack of researched theoretical frameworks. Finally, after the benefits and challenges are reviewed, HRD recommendations and contributions are presented.*

Keywords: Teleworking, Telecommuting, Flexible working

According to a recent survey conducted for the International Telework Association and Council, 19.6 million people in the United States reported working as teleworkers in 1999 (Pratt, 1999). The number of teleworkers continues to rise. Numerous factors appear to be leading this growth, such as changes in: technology, sociological trends, dual wage earner and single parent families, pressures to balance work and family life, worker values, pressures for environmental conservation, and pressures for organizations to be more competitive, reduce costs, and improve their ability to recruit and retain workers. Some literature, scholarly and non-scholarly, presented telework as one answer to improving the performance of individuals and workplace organizations while other literature reported neutral or opposing findings or views. However, the various conclusions seemed to be based upon limited scholarly research and extensive anecdotal evidence. The conflicting findings may be, in part, because of the ambiguity in telework definitions, the differences in organizational policies and practices, the wide variety of variations in samples and data collection methods, and the differences between perceived and actual results. It is no wonder that many organizations are implementing telework programs with ill-founded expectations.

A key issue in human resource development (HRD) is to identify and determine factors that influence the performance of employees and organizations. Telework initiatives/programs have been found to be one such factor. Currently, many companies are implementing programs without first taking the time to assess, design, develop, and evaluate their programs. Many organizations are allowing employees to telework without first addressing the benefits, challenges, and implications inherent in this type of intervention. As a result, programs have failed and the growth of telework has not increased as rapidly as predicted (Mokhtarian, Bagley, & Salomon, 1998). If designed and implemented effectively, telework benefits outweigh the challenges and problems that employees and employers may face. For HRD professionals to effectively recommend, develop, enhance, redesign, assess, or evaluate this potential performance-improving intervention, they must first have a better understanding of telework (e.g., benefits, challenges, implications) for employees, teams, and the organization as a whole.

### Purpose, Research Questions, Design and Data Collection

The purpose of this review was to explore the literature related to teleworking, and formulate implications to HRD theory and practice. The following questions were investigated: 1) What are the theoretical frameworks for researching teleworking? 2) How do employees, employers, and society benefit from formal or informal telework programs? 3) What are the disadvantages and challenges of telework for employees and employers? and 4) What findings can assist an HRD practitioner in assessing, designing, developing, implementing, and evaluating telework interventions? This review is a content analysis of scholarly literature located in various business (e.g., ABI, General BusinessFile ASAP) and psychology databases (i.e., PsycINFO, Expanded Academic Index). The key words used for the search included: telework, teleworking, telecommute, and telecommuting. Because of the limited scholarly research published in peer-reviewed journals, all seventy-six of the abstracts or texts located from a search in the ProQuest Digital Dissertation Index from 1983 to the present, were also reviewed. Among the numerous articles, abstracts, and dissertations located and reviewed, the ones that were most current and appeared to be most applicable to HRD theoretical frameworks and implications were subjectively chosen for this review.

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## Definitions

To date, there appears to be no clear consensus on an exact or precise definition of telework. The number and types of terms (e.g., telecommuting, networking, flexible working, homeworking, remote working, home-based working, mobile working, electronic cottage, virtual organization, virtual workplace, satellite centers, and neighborhood work centers) used in scholarly and popular literature, referring to teleworking in part or whole, can be confusing. Ellison (1999) explained that the definitions of these terms have been the "subject of substantial deliberation and little consensus for both academics and practitioners" (p. 340). The two most common terms used in the research are "teleworking" and "telecommuting". Some researchers use these terms interchangeably assuming that telework is preferred by Europeans while telecommuting is preferred in the United States.

Because of the wide variety of definitions, four of them will be presented for consideration. First, Fairweather (1999) explained that telecommuting uses information and communication technologies to bring work to the worker and that some, but not all, types of telework should be considered telecommuting. Second, Joice (1999) defined telework as a "work arrangement in which employees work at alternate worksites to conduct some or all of their officially assigned work during paid work hours" (p. 3). He also stipulated that the alternative worksite must reduce the employees' commute, and that the employee must average at least eight hours every two weeks. Third, Kurland and Bailey (1999) interpreted telework as including home-based telecommuting, satellite centers, neighborhood work centers, and mobile working. The commonality in terms is the transition from "in-person supervision to remote managing, from face-to-face communication to telecommunication-related communication, from on-site working to off-site or multiple-site work, and, in the case of groups, from side-by-side collaboration to virtual teamwork" (p. 53). Finally, Jack Nilles, the "father" of telework, defined it as "any form of substitution of information technologies for work-related travel" (Ellison, 1999, p. 341). On the other hand, he defined telecommuting as "periodic work out of the principal office, one or more days per week, either at home, at a client's site, or in a telework center" (p. 341). These are just a few of the many differing definitions that appear to contribute to the blurred boundaries between terms. Questions revolving around why some research findings appear to be contradictory, why it is difficult to compare research findings, and why research and practitioner teleworking measurements are difficult to use remain unresolved. In this paper, telework and telecommute will be used interchangeably; the actual terms utilized in the cited source will be used.

## Theoretical Frameworks

It appears that telework studies lack a common theoretical perspective to guide their research (Hyland, 1999). The frameworks utilized in the literature appear to have been taken from many fields (e.g., business, economics, management, psychology, sociology, communications, and family science). There is little consistency among researchers. The literature discussed a variety of models related to organizational telework adoption and implementation, teleworking intentions, technology acceptance, behavioral adjustment, teleworking withdrawal, and social information processing. The literature also discussed numerous theories. Some of the theories related to the decision to telework included planned behavior, reasoned action, expected utility, expectancy, prospect, agency, institutional, critical mass, job characteristic, economic, and job decision theories. Employee need theories included motivation, human relations, career development, career resilience, and the theory of required needs. Management and organizational theories discussed in the literature included motivation-hygiene, Theory X & Y, situational leadership, innovation, organization and job design, systems, information systems, contingency, and agency theory. Telework communication and support theories included social exchange, social networking, interpersonal communication, and social interaction. Finally, theories related to work and family influences included spillover, segmentation, work adjustment, ecological, role conflict, role overload, and job strain theory. It was unusual, however, to find a specific theory or model mentioned more than a few times throughout the literature. In fact, many of the models presented were original to a dissertation and later critiques or replications were difficult to find.

Some common theoretical threads do appear to address the same three theoretical frameworks discussed in some HRD literature (Swanson, 1997). These three theoretical foundations--economic, psychological, and systems--can certainly provide a solid base for future teleworking research. First, recent telework research does appear to be linked more often to an economic theory than it has been in the past. This research has been (and should continue to be) focused on analysis, action, and measurement of economic outcomes. Unless teleworking expenditures contribute to the "viability and profitability of an organization" (Swanson, 1997, p. 8), directly or indirectly, they should be eliminated. Second, psychological theory can continue to add richness and depth to teleworking research. As with HRD in general, teleworking can draw upon "theories of learning, human motivation, information processing, group dynamics, and psychology-based theories of how we make decisions and behavior in

organizations" (p. 9). Third, systems theory has been, and can continue to be, beneficial as a framework for telework. Studying the system, its parts, its interactions and processes can be invaluable. Some of the current literature begins to utilize the elements of this theory even though it may not be noted as such. Overall, it appears that the narrow focus of research on teleworkers and the lack of a common theoretical foundation have inhibited the broad understanding of telework. As telework becomes utilized by HRD professionals as a performance-improving intervention, researchers may begin to use these theories and begin to create theoretical consistency in the teleworking research arena.

## Literature Review

Scholarly research has been conducted on a variety of telework topics and issues. The topics reviewed in this paper include: utilization demographics and characteristics, productivity, job and organization satisfaction, organizational commitment, recruitment and retention, cost savings, work and family balance and conflict, communication and isolation, career promotion and development, program adoption, organizational culture, and teleworker management.

There appear to be common demographic similarities of individuals who telework. These include married employees, women, parents with children at home, mothers of young children, well-educated employees, and managers or professionals (Mokhtarian et al., 1998; Pratt, 1999). Mokhtarian et al. (1998) reported that women, on average, rated the advantages of telecommuting more highly than did men. Women were more likely than men to have specific motivations for telecommuting (i.e., family, personal benefits, and stress reduction), but, were also more likely to possess various teleworking constraints (i.e., supervisor unwillingness, risk aversion, and concern about lack of visibility to management). In addition, respondents with children rated the stress reduction and family benefits of telecommuting more highly than did those with no children at home.

Many researchers have suggested that only certain individuals are suited to telecommute. They have proposed characteristics as crucial to telecommuter success. Many of these characteristics, however, are based upon speculation or anecdotal evidence. Loverde's (1997) research revealed that the performance of most employees, regardless of personality characteristics, is positively impacted by telecommuting. It is commonly assumed and reported, however, that teleworkers must be self-starters, motivated, focused, self-reliant, and organized.

Many studies (e.g., Bernardino, 1996; Gainey, Kelley, & Hill, 1999; Ross, 1990) have reported productivity and performance improvements with telecommuting. Pratt (1999) found that an employee's productivity was the same or higher when they teleworked. Belanger (1997) discovered that workers perceived productivity and performance were influenced by information system technology, the availability of communication technologies, and the communication patterns of telecommuters within their work groups. Researchers do admit, however, that it is difficult to calculate productivity with the differences in the type and amount of telework, the work environment, and even the family situation of the employee.

One claim often made in citing the advantages of telework is increased employee satisfaction. Studies have reported higher levels of job satisfaction with teleworkers (De Lay, 1995; Pratt, 1999). Coveyduck (1997) found that telecommuters derived relatively high job satisfaction, work autonomy, commitment to the organization and feelings support by the organization. Welchans (1996) agreed that perceived organizational support strongly influenced job satisfaction. However, he added that this perceived support was stronger for those employees who spent some time in their employers' offices. Sturgill (1998) reported that employees who felt their organizations were not supportive of telecommuting, were not as satisfied as those who did. One reason employee satisfaction may improve is because of increased autonomy. Researchers (e.g., Coveyduck, 1997; McCloskey, 1998) have claimed that teleworking enhances employee autonomy by giving them greater control over their work situation. This autonomy appears to be a key determinant for the quality of work. According to Thompson, Vivien, and Wai, (1999), satisfied teleworkers reported "higher productivity, satisfaction with the organization's performance appraisal system, technical and emotional support from management, lack of family interruptions and greater loyalty to the organizations" (p. 34).

Another cited advantage of telework is that it increases organizational commitment. The research in this area appears to have produced conflicting findings. It is sometimes assumed that telework may actually reduce organizational commitment. Tucker (1997) reported that teleworkers had high levels of job satisfaction but relatively neutral levels of commitment. Ellison (1999) explained that when an organization assists employees in solving child care and other family concerns, organizational commitment may be increased. Hill (1995) found that productivity, morale, and organizational commitment were perceived to have been positively influenced by telework. It is important to note, however, that research samples, organizations, and instruments appeared to be very different in each of the studies cited.

In today's competitive job market, management continues to look for ways to improve both recruitment and retention of employees. Various reports (e.g., Pratt, 1999) have noted that teleworking and other family-friendly programs are valuable tools in recruiting new employees and retaining existing ones. Interestingly, Bolin (1995) found that the offer to telecommute by manufacturing firms attracted individuals who are characteristically less likely to participate in teleworking. With the option of teleworking, individuals who may not have been considered in the past (e.g., parents of young children, the disabled) are now possible candidates for job openings (Gainey et al., 1999). With regard to retention, Callaghan (1996) found that companies employing logistics professionals increased employee retention rates by offering telecommuting as a benefit. Hyland (1999), however, reported mixed results and noted that the availability, preferences, and actual use of flexibility were related to intentions to leave an organization.

Another common claim is that teleworking can save an organization money. AT&T, IBM, and other companies have reported huge savings in real estate expenses as a result of telecommuting (Kurland & Bailey, 1999). The International Telework Association & Council (1999) reported that teleworking employees can save their employers \$10,006 each in job retention costs and reduced absenteeism. Another study (Bernardino, 1996) found that teleworking cost saving were perceived to be limited. She suggested that the expected perceived savings and the actual savings may be different. Most research in this area does support the finding that teleworking can reduce costs for both the employer and the employee.

An assumption commonly held by employees and employers is that teleworking will help employees balance their work and family lives more effectively. Chomiak (1998) examined the relationship between hours spent teleworking, reports of flexibility, and work and personal/family life balance. She found that teleworking was a significant predictor of flexibility, but individuals who engaged in teleworking did not report higher levels of balance. It appeared that as many individuals spend more time teleworking, they also spent more time working overall. Hill (1995) reported similar findings and noted that blurred boundaries between work and family can be difficult for many employees. Pratt (1999) disagreed as she found strong support that work-family balance can be improved with teleworking. Cree (1998) also reported that as telecommuting frequency increased, so did work-family balance, flexibility, job satisfaction, and organizational satisfaction. This study, however, was based on the total hours worked per week being kept constant. The key to telecommuter work-family balance may lie in the ability of an employee to maintain the same number of hours as in-office employees.

One aspect of this balance is that of work-family conflict (WFC). Balance is typically determined by the absence of stress or conflict. Stressful factors include work time, schedule incompatibility, quality of the supervisory relationship, job autonomy and demands, family division of labor, and child care. Common to many of these factors is the lack of time. Ellison (1999) explained that dismantling temporal and geographical barriers that separate home and work roles may actually expose employees to the possibility of role conflict. Schreiber (1999) did find, however, that telecommuting reduced role conflict and Coveyduck (1997) concluded that only low to moderate levels of inter-role conflict were identified in a sample of telecommuters. One study (De Lay, 1995) reported that male teleworkers had lower levels of WFC than non teleworker males and that women who telecommuted had higher levels of WFC than males who telecommuted. After six months of telecommuting, the women's WFC levels had decreased. The age of the youngest child living at home was a factor in the women's level of WFC, most likely because many women do feel the pressure of household chores and child care responsibilities. McCloskey (1998) summed up her research by explaining that telecommuting did not appear to be a magical work arrangement that allowed employees to balance both work and family commitments, but neither was it the oppressive work structure that will interfere with family relationships and cause employees to work long hours.

One of the greatest teleworking challenges is that employees may feel isolated. Informal communication in the workplace can provide social support as well as the ideas and information needed to perform a job more effectively. Gainey et al. (1999) found that individuals' levels of comfort, satisfaction, and commitment, as well as high turnover levels, were related to employee isolation. Many telecommuters feel they are making some sacrifices in terms of close involvement with coworkers. Spending work time at the office seemed to improve organizational communication (Sturgill, 1998). Email and richer communication media assist in maintaining the frequency of interactions and the feeling of social support. Fireman (1999) reported that the lack of office social interactions and the lack of supervisor and/or organizational support were reasons employees either reduced or stopped teleworking. Interestingly, Lowry (1996) found that neither the quality nor quantity of communication between a supervisor and employee is related to the distance between the two. Even though the communication seemed to be the same, employees in non-traditional distance jobs felt as if they were more isolated and communicated less with their supervisor. This suggests that teleworkers may actually require more communication with their supervisors than in-office employees. Again, it is difficult to compare research findings in this area because of the differences in the

researchers' teleworking definitions. Some samples included full-time teleworkers, as opposed to individuals who spend only two of five days in a remote location.

Popular literature often cites career opportunities, development, and satisfaction as negative implications of teleworking. Many women and men make choices that reduce career opportunities and development but, because of personal priorities, are satisfied with those choices. Teleworking can be a major advantage to those who do not want to put their full career on hold, but have made the choice to give their primary time and energies to their families. Many employees, however, have reported concern that career development might be negatively effected with teleworking (Khaifa & Davidson, 2000). Schreiber (1999) studied the role of telecommuting in supporting career aspirations for women. Women teleworkers in this study measured their success based on their productivity, their ability to remain visible to managers, co-workers, and clients, and on their initiative in seeking and taking advantage of developmental opportunities. For women that felt success in these areas, telecommuting did not appear to hinder job success.

Research has also been conducted in areas related to teleworking adoption, organizational culture, and telework management. Ruppel (1995) looked at variables between organizations that adopt telework programs and those that do not. Variables common to adopters include a globalized marketplace, a competitive marketplace, the existence of regulatory legislation, a high degree of professionalism among staff, centralized decision-making, managerial attitude towards telework, a high administrative intensity ration, the availability of rich communication media, managers trained in the benefits of telework, the existence of perceived adequate security measures, the existence of a champion, and top management support. One variable common to organizations that do not adopt, is their concern about the negative implications telework may have on existing organizational culture. Taveras (1998) explored the impact of telecommuting on various attitudinal and behavioral components of corporate culture. He found that telecommuting had no statistically significant effect on perceived organizational support, perceived value congruence, job satisfaction and commitment, and other behavioral cultural variables.

Telework management research is sparse. Because it is uncommon to find more than one study based on a specific management research question or topic, instrument validity and reliability concerns abound. However, the studies for this review did report a number of interesting findings. Conner (1986) found that management style alone did not determine success or failure of a telecommuting program, and that management satisfaction was more an indicator of perpetuating a telecommuting program than was management style. Speeth (1992) reported that the level of experience, effectiveness, and training of managers directly contributed to the success ratings of the programs in the study. Successful managers appeared to be experienced, effective, well-educated, and show high levels of personal achievement. Reinsch (1999) explained that interpersonal factors can make or break a telecommuting project. He found that employees want managers who share negative information promptly, who react to negative feedback constructively, and who display a high degree of loyalty to subordinates. Klayton (1994) explained that managers used the same methods of performance appraisal as in-office employees and held performance reviews at the same frequency. Even though additional management studies are available for future review, it is common knowledge among teleworking researchers and practitioners that more sound research is needed in this area.

### **Recommendations for HRD**

Academic research has not provided enough rich theoretical and empirical support for the planning and implementation of telework in organizations (Shin, 1997). As with many other HRD interventions, theory, problem statements, and research questions are being developed after observing and experiencing trial and error in the workplace. The information presented in this review can be used as broad guidelines for consideration by HRD practitioners who are assessing and designing customized telework programs for organizations. Each telework situation is influenced by many factors (e.g., organizational culture, the type of work being done, the skills and unique situation experienced by each employee, management). If designed, implemented and managed effectively, teleworking programs can be successful and can reap numerous benefits (see Figure 1). There are, however, individual and organizational challenges that should be considered. Analyzing these benefits, challenges, and their implications for each company can help provide a well-rounded assessment of predicted invention success.

Recommendations for HRD practitioners in working with teleworking interventions include the following: 1) be prepared to design new approaches to evaluate, educate, organize, and inform workers; 2) access and include intervention elements related to: formal guidelines and policies, infrastructure (technical tools, training), job design, availability, communication, task scheduling, meeting scheduling, performance measurement, suitability of work, non-teleworker buy-in, cultural change, and more; 3) because managing remotely requires new skills and attitudes on the parts of both managers and employees, design appropriate training and development interventions; 4) assist

managers in designing an appropriate amount of social interaction required to maintain effectiveness and reduce unanticipated problems; 5) train workers to adapt to a new environment and cope with the challenges it poses; 6) design or utilize existing assessment instruments and procedures that can assist companies ensuring that workers and managers can be successful in this new relationship; 7) train managers to monitor telecommuting programs carefully and react in an expedient manner to correct any undesirable consequences; and 8) ensure that any telework intervention is first supported by top management and then strategically aligned with the organization's goals and objectives.

Figure 1. Possible Advantages and Challenges for Organizations and Employees.

ADVANTAGES FOR ORGANIZATIONS	ADVANTAGES FOR INDIVIDUALS
<ul style="list-style-type: none"> <li>Adherence to government regulations</li> <li>Improved employee recruitment</li> <li>Improved employee retention</li> <li>Improved productivity</li> <li>Improved quality</li> <li>Improved satisfaction</li> <li>Increased morale</li> <li>Increased organizational commitment</li> <li>Opportunities for better service</li> <li>Promoted diversity</li> <li>Reduced absenteeism</li> <li>Reduced expenses</li> <li>Reduced office space requirements</li> </ul>	<ul style="list-style-type: none"> <li>Avoidance of office politics</li> <li>Better work/family balance</li> <li>Can work with disabilities/health problems</li> <li>Child care issues less stressful</li> <li>Flexibility to relocate</li> <li>Improved morale</li> <li>Improved productivity</li> <li>Improved quality of life and work life</li> <li>Increased autonomy</li> <li>Increased family and leisure time</li> <li>Increased job satisfaction</li> <li>Increased technical skills</li> <li>Less distractions</li> <li>Less spillover</li> <li>Lower stress level</li> <li>More community ties</li> <li>More flexibility</li> <li>Reduced commute time</li> <li>Saves money on gas and parking</li> </ul>
CHALLENGES FOR ORGANIZATIONS	CHALLENGES FOR INDIVIDUALS
<ul style="list-style-type: none"> <li>Alignment with organization goals and mission</li> <li>Attitudes of in-office employees</li> <li>Career promotions</li> <li>Clear common aims and procedures</li> <li>Communication concerns</li> <li>Compensation and benefit packages</li> <li>Consistent policies and contracts</li> <li>Coordinating work</li> <li>Corporate buy-in</li> <li>Creating synergy</li> <li>Disruptions in work teams</li> <li>Employee accountability</li> <li>Initial financial investment</li> <li>Management control and trust</li> <li>Management and staff training</li> <li>Measuring productivity</li> <li>Organizational culture</li> <li>Redesign of processes</li> <li>Reduced informal mentoring</li> <li>Reduced networking</li> <li>Security issues</li> <li>Technical support</li> <li>Thorough organizational and individual assessment</li> <li>Union concerns</li> <li>Unrealistic expectations</li> </ul>	<ul style="list-style-type: none"> <li>Accessibility to others</li> <li>Career development and promotions</li> <li>Development of interpersonal skills</li> <li>Handling expenses</li> <li>Interruptions from home</li> <li>Intrinsic motivation</li> <li>Isolation and social satisfaction</li> <li>Lack of management or improper management</li> <li>Reduced informal communication</li> <li>Reduced informal mentoring</li> <li>Reduced informal training and development</li> <li>Reduced social networking</li> <li>Remaining "visible"</li> <li>Self-efficacy</li> <li>Shared work space in office</li> <li>Tendency to work more hours</li> <li>Unrealistic expectations</li> <li>Work space in remote locations</li> <li>Work/personal time blurred</li> </ul>

This literature review has provided information that can be helpful for HRD professionals interested in pursuing teleworking interventions. Because many elements of telework are different from the traditional work



setting, many unique variables need to be considered. This review was also designed to introduce telework as an important and meaningful area for future HRD research. It is clear that current and expected advances in telecommunications technology will facilitate a continued increase in the number of teleworkers throughout the world. Thompson et al., (1999) purported that

Teleworking may yield many substantial advantages to organizations and individuals, and that the widespread adoption of teleworking may produce significant economic, environmental and societal benefits. Teleworking has great potential in improving the living and working status of employees as well as allowing organizations to increase their efficiency and competitive advantage. (p. 46)

If designed and implemented effectively, telework benefits do outweigh the challenges and problems that employees and employers may confront. HRD practitioners should be at the forefront of teleworking interventions in the workplace. As growth in telework accelerates, organizations will face exciting new changes and challenges. HRD researchers and practitioners should be prepared to meet and accept these challenges. Teleworking can be effective in improving both individual and organizational performance.

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## A Study of e-Learning Practices in Selected Fortune 100 Companies

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*Recent advancements in technology and the transformation of traditional corporations have sparked the integration of technology and learning in the private sector. This survey-based study examined why seven Fortune 100 companies have introduced e-Learning to their employees and the issues and barriers that resulted.*

Key words: E-Learning, Technology, Corporate

The concept of the learning organization (Watkins & Marsick, 1993) has grown exponentially with the technological era. Mcree, Gay & Bacon (2000) related that today, corporate learning and the corporate learning organization have ascended to a position of strategic prominence in the context of managing and growing the enterprise. Urdan & Weggen (2000) identified the knowledge-based economy, the paradigm shift in the way education is viewed and delivered, and huge knowledge gaps as significant trends that have given rise to e-Learning. In addition, they mentioned that the second largest sector of the U.S economy is \$772 billion education industry, and the increase in complexity and velocity of the work environment brought about by technological changes are also major issues that have fueled e-Learning. Mcree, Gay & Bacon (2000) presented the shift from the industrial to the knowledge era, rapid technological change, the ever shortening product developmental cycles, lack of skilled personnel, enterprise resource planning implementations, and migration towards a value chain integration and the extended enterprise as being prominent contributors to e-Learning growth. Mcree, Gay and Bacon (2000) also recognized the robust economy and the increasingly competitive global business environment as central to the e-Learning movement. Ticoll, Lowy & Kalakota (1998) related that the competitive environment requires companies to work together to create online networks of customers, suppliers, and value-added processes – that is, an e-business community (EBC).

The trends discussed above have given birth to several business issues that need to be quickly addressed if companies are to retain their competitive edge. Furthermore, the literature shows that as companies digitally transform their businesses, knowledge and training become rapidly obsolete, just-in-time training becomes a basic survival need, and identification of cost-effective ways of reaching diverse global workforce becomes critical (Urdan & Weggen, 2000). Additionally, new learning models are needed given the skills gap and demographic changes, and flexible access to lifelong learning is highly desired. Stated differently, the use of e-Learning within an operating entity forces organizations to change the traditional learning paradigm. To coincide with this change, new strategies for managing and developing their employees are a must. Companies who do not react in such a manner or fail to use the technology to their advantage may find themselves losing to their competitors. In contrast, for those companies who do capitalize on this change, will have the potential to build and develop a workforce that performs at rates higher than their current workforce; in turn, reaping benefits that enhance their organization's bottom line.

### **Purpose of the Study and Research Questions**

The purpose of this study was to provide an external perspective to the development and delivery of e-Learning activities within the private sector. To achieve this purpose, the study examined the events that propelled the implementation of e-Learning within the corporate sector, in addition to the frequent issues and barriers that existed as a direct result. A series of six research questions drove the data collection, analysis and reporting of the results, they include: 1) What is the source of motivation for companies to use e-Learning in corporate training? 2) What are

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the company based events that led to distributed corporate training? 3) What is the current status of development and implementation of e-Learning? 4) How is e-Learning evaluated within the companies? 5) To what extent have companies adopted e-Learning in their international locations? 6) What are the future directions of distributed corporate training within the companies?

## **Method**

*General Approach.* The current study employed semi-structured phone interviews to gather the research data. This method included the identification of seven industrial partners at the National Center for Supercomputing Applications (NCSA) at the University of Illinois at Urbana-Champaign who had e-Learning activity underway; the identification of appropriate respondents from each company; and the engagement of individuals in an extended phone interview.

The company participants were from a variety of industries including: retail, manufacturing, technology, oil, and insurance.

*Sample.* A convenience sample of twenty-one individuals was studied. All participants were Managers or Directors for a specific training department, the Human Resources department within their company, or their company's Corporate University. These respondents were specifically chosen because they were identified by their company's NCSA liaison and/or by a NCSA staff member who had worked with the partner companies and thus, was familiar with the employees' area of expertise. In addition, once a selected respondent was interviewed, participants were asked to suggest a colleague that, ideally, would have a longer or different perspective on e-Learning within the organization.

*Instrument.* NCSA's team, based on input from three company representatives, developed an interview protocol. Questions were developed around the 6 research questions presented above. Beta-tests were conducted in December 1999 and completed in January 2000 with three company respondents. Revisions were made according to interviewees' suggestions and feedback. The resulting interview instrument was six pages long and included a series of sub-questions or probes for each of the six broad research questions.

*Data Collection Procedure.* Nominated respondents were contacted by email to invite them to participate in the study. The email included a detailed explanation of the project's purpose and an indication of the time commitment required for participation. Email communication continued until an interview was scheduled.

The Principal Investigator conducted each telephone interview. To ensure consistency in questioning and probing, the Co-Pi listened to several of the interviews.

The phone interviews were all recorded to facilitate analysis. The interviews began in February 2000 and were completed by April 2000. The average interview length was 55 minutes long. After each interview a thank you e-mail was sent to the participant. In cases where additional information was needed (sometimes realized during the analysis stage) an e-mail was sent to specific respondents for additional information or clarification.

*Analysis Method.* The analysis included a summary of each interview and a cross interview analysis. This analysis began with the recorded interview being transcribed verbatim. Then, the verbatim transcripts were analyzed by reviewing all information that pertained to a specific research question. The results of the analysis were summarized in tabular format when appropriate and in the recording of key points where quantification was not possible.

The small sample size of the current study does not enable the results to be generalized across all Fortune 100 Companies. Nonetheless, these results can intrigue companies that are debating to introduce e-Learning to their employees. Furthermore, for those companies who have already implemented e-Learning, such companies can use this study to benchmark their progress and to learn from this sample's own progression.

## **Company Motivation for e-Learning**

Respondents were asked to provide information regarding the motivation or rationale for their unit or company becoming involved in e-Learning activities. Not all of the survey participants were part of their organization during the initial adoption of an e-Learning medium. Of the 15 participants who were employed by their respective company at that time, each interviewee's answer fits into one of the following four categories of motivation: Accessibility, Training Need, Training Expenses, and Employee Preference.

*Accessibility.* At least one person from all of the seven participating companies (100%) indicated they were attracted to e-Learning because their employees could have immediate access to the learning tool. In other words, their employees did not have to commit more time to training than their workload allowed, nor did corporate trainers have to spend valuable time traveling to disparate locations. From the respondents' perspective, such opportunities were appealing. They noted that e-Learning enabled them to reduce the amount of training time demanded from shift workers and a geographically dispersed population. In addition, a respondent specifically noted that e-Learning eliminated potential inconveniences that may occur with the delivery of classroom-based training (i.e. cancelled training courses).

*Business Need.* At least one employee from four of the seven sampled companies (57%) viewed web-based technology as a means to achieving a business objective. The business objectives varied across industries. Respondents from two companies viewed e-Learning as a new and better way, in the sense of saving both training costs and time, to meet mandates set by OSHA and other regulatory agencies. On the other hand, respondents from two other companies viewed the medium as a more effective and efficient way to communicate with their sales and marketing departments. From these respondents' perspective, the fact that product information is anything but stable enhanced the attractiveness of web-based technology.

*Training Expenses.* Respondents from four companies (57%) were interested in e-Learning for the opportunity to minimize training costs. In fact, by avoiding travel expenses, room rentals, and the cost of food, a respondent from one organization noted they could deliver online training at about 60% of the cost of classroom-based training.

*Employee Preference.* Participants from two (28.5%) of the sampled organizations reported that their organizations adopted e-Learning to appeal to their employees. The companies could leverage off the learners' level of comfort with computers, as well as be more sensitive to employee time constraints.

#### Current Status of e-Learning courses

To begin assessing the status of online learning at each corporation, respondents were asked to estimate the percentage of their training budget that is invested in corporate e-Learning. As noted previously, because of different areas of expertise and years of experience within the company, participants provided their best estimations. As shown in Table 1, the business departments of the various companies differ in their investment of e-Learning from 5-50%.

Table 1. Percentage of Company Training Budget Invested in e-Learning

Company	A	B	C	D	E	F	G
	Corporate Enterprise, Very small, could not give %	15% 10%	10-15%	15% 2%	20% 10% 25%	50%	5%

*Course Content.* Table 2 identifies the number of courses that the participants' departments and companies have delivered outside of a traditional, instructor led classroom.

Examining the 30 different course topics listed above, it becomes apparent that companies are primarily offering performance improvement courses. These give employees the opportunity to improve their performance on the job either directly or indirectly. In contrast, selected departments within the sample are providing information that might not only enhance employee performance but is in fact needed to perform the primary role in the organization. Table 2 also shows that there is only one company from this sampled who identified online courses that have a soft skill focus.

*Development of e-Learning Courses.* The sampled companies vary from 25-100% in developing their courses in-house. As shown in Table 3 there was also varying levels of the educational requirements that the departments of the interviewees demand of their instructional designers. Among the five companies that provided this information, the range extends from no educational requirements to requiring a Master's Degree.

Table 2. E-Learning Courses Offered Within The Interviewees' Company or Particular Department

Company	Course Offerings
A	Course content is across the board: contract language, financial basics, meeting OSHA and EPS requirements Other courses topics: How do I run a pump? How do I keep myself safe when entering a vessel? How do I use a fire extinguisher? LearnLinc technology is used to train employees on a basic end-user software program
B	Online Microsoft Office suite programs and courses on leadership training Tutorials on: introduction to online courses, bodily injury evaluation, and interpersonal skills (i.e. people skills, customer service, negotiating)
C	Online programs to train employees SAP software programs that will take the organization from 2,500 different but integrated systems, to one primary system Worldwide Web product training
D	Online courses targeted for the Engineering population
E	28 online training modules, including courses on print reading, business law, systems engineering, company custom software (i.e. quality and reliability workbench) 250 online classes via the WWW Internet for the IT community: Microsoft Office, Java Programming, Lotus Notes, Cisco Routers
F	1,000 online courses that can be transferred to the desktop or taken remotely Online training for first time managers 600 titles of computer based instruction for engineers and IT professionals that can be accessed anywhere in the world
G	Online campus provides over 200 courses and each operating entity provides online courses. (i.e.) the IT Department has courses on Microsoft Office and Lotus Notes the Service Department is converting 100 of their print courses to the Web Online product training An online Human Resources core curriculum will be distributed in the year 2,000

In addition to the above data, one participant specifically noted that his organization could not utilize external vendors. The argument was the following, "most instructional designers have been brought up around how you deliver manuals; yet, instructional design on the web is about ease of use and about incorporating all learning preferences, while keeping it simple." From the interviewee's perspective, "these are two different groups of people that would do that and it is very hard to find them today, since they have not been produced."

*Length of Distributed Learning Courses.* From this sample, the average length of non-traditional courses within the seven companies is two hours long. The courses are divided into modules that vary in length from 10-30 minutes. One respondent noted the length of the modules is dependent on the demographics of the end users. For instance, the company has created 10-minute modules for the print reading courses, versus 30-minute modules for the engineering courses.

*Use of Multi-Media.* Company respondents were asked to describe the extent of multimedia used in their non-traditional courses. Respondents from three companies revealed that their organization's inclusion of multimedia is not a 'free' choice, but rather is a choice dictated by the company's infrastructure. Therefore, e-Learning courses accessible in non-U.S. locations exclude audio and streaming video because of bandwidth limitations. To compensate for this absence, one company requires the employees to solve problems after every 400-500 words. Online quizzes and direct comparisons of the learner's typed in answer to an instructor's opinion are also included. In contrast, one company's Intranet courses, targeted for its engineers and accessible in every country but Antarctica, are described as page-turners; including text and graphics only.

Different than the examples immediately above, one participant's department has been able to take advantage of technology and include full motion video, audio effects, and animation in their online courses that are distributed throughout the United States. This enables the online courses to be very close to reality when they model behavior. Moreover, the designers of these courses are sensitive to more than simply gender and race, as they have also integrated diversity into modeling behavior (i.e. various dialects). Humor is also included.

*Communication Modes/Interactivity Features.* Respondents were asked to identify the percentage of asynchronous vs. synchronous communications as well as any design feature(s) that enable(s) employees to interact with each other and/or with a course instructor or a member of management. In this sample, all e-Learning courses,

Table 3. Educational Requirements for Instructional Distributed Learning Designers

Educational Requirements
Master's Level Certification of Special Design, learning principles and theories, emphasis on organizational development
Minimum requirement is a Master's in Education or Learning and has experience with multi-media online training
No educational requirements
The Writers usually have an Associate or Bachelor's degree and they are selected from the work environment because they are subject matter experts and have demonstrated very good writing skills and good communication skills. Developers are responsible for the narrower pieces, training for a particular job area like online customer service. These individuals are responsible for the design work, writing objectives, designing the test instruments.
Instructors and developers are subject matter experts from the field technical resources. The SMEs that are selected are required to complete instructional design courses and they become certified in instructional design.

with the exception to one, have asynchronous communication modes. Even the one course is only 5% synchronous. Specifically, the course has chat lines to the executive team, yet no chat lines to enable team-based learning. Therefore, in this study's sample, the capability for employees to interact in real time is nearly non-existent.

Moreover, the data shows there is even minimal opportunity for the end users to engage in communications with one another offline. Table 4 summarizes the communication mechanisms the sampled companies are including in their e-Learning courses and emphasizes the absence of technical features that encourage team-based learning. With the exception of the ability to contact subject matter experts, there is a lack of capability for colleagues to share information that could supplement the online courses' teachings.

Table 4. Inclusions of Interaction Features

Online management course includes the option for its learners to access subject matter experts via email
Five of 27 e-Learning courses have employed a system where an individual is videotaped and a manager scores the employees' performance.
Courses are all self-study
Simulation type courses enables the end users to connect to a help desk immediately by phone to have their questions answered immediately or to be connected to someone who can provide help
Ability to send comments and ask questions throughout the training, using either email or "contact us" buttons
LearnLinc: synchronous virtual classroom

The data collected above reveal that the majority of the sample is taking advantage of e-Learning in the sense of forgoing the need to schedule times for employees to interact. This is particularly interesting since the trend in online learning in universities is moving toward more collaborative environments and synchronous communication.

In contrast to the overwhelmingly majority of the e-Learning courses in this sample that are devoid of end user communications, one company has deliberately chosen to use a technology that supports synchronous communications. The company is using LearnLinc, a synchronous virtual classroom to teach employees a basic end-user software program. Because of the corporate culture, the Learning Consultant believed this was the most appropriate choice: "Based on what I have seen in this culture, people are very attuned to face-to-face training. The employees like the touch and feel of coming to a training class and having that interpersonal communication. With computer based training, whether it does provide it or not, there is a perception with our customers that it does not provide that [the interpersonal communication] and this negative perception is all it takes." This direct quote does more than simply indicate to the reader the influence corporate culture will have on employee acceptance of e-Learning. The comment also suggests that employees might have misperceptions of e-Learning. Another interviewee even noted "the downside of non-traditional learning is employees seeing it as a 'cheap' substitute for what use to be a nice perk." Such findings indicate that it would be to a company's advantage to distribute mass emails or brochures, or to arrange face-to-face meetings to correctly inform their employees about e-Learning. An organization's proactive involvement may eradicate misperceptions and prevent employees from misconstruing the benefits of these new learning tools.

## **Evaluation of e-Learning**

Respondents were asked to indicate how they evaluate their e-Learning courses and to describe the results of such assessments. The interviewer did not explicitly ask that the answers be stated according to Kirkpatrick's four levels of evaluations; however, many of the beginning interviewees provided an answer that in fact was in accordance with this model of evaluation. Therefore, for ease of data analysis, the interviewer probed other interviewees to respond in a similar manner.

Companies are not implementing e-Learning courses without integrating some type of evaluation tool. As these tools differ in regards to the type of information they gather, each company has used a minimum of two evaluation assessments.

*Level One.* Interviewees from five companies (71%) have distributed at least one formal attitude survey to employee users of non-traditional learning mediums. The results of these surveys indicate that the majority of employees are generally positive about the new learning tool. However, the feedback also indicated that the employees are having difficulty committing time to desktop training and even when they do they are often interrupted by the phone or colleagues. One respondent shared that the biggest complaint given by his employees is focused on the complexity of setting themselves up to use computer based training.

These results suggests that for organizations to be more successful in their implementation of non-traditional training, they should or may want to consider being sensitive to their employees' time constraints. More specifically, it may be to an organization's advantage to initially create an e-Learning laboratory where employees have immediate access to a technology help desk. By following such a suggestion, a company would incur only minimal expenses and yet be able to easily encourage their employees to experiment with the new technology. A positive first experience with the tool may minimize the employees' opposition to accept e-Learning.

*Level Two.* In addition to simply measuring the employees' reactions to these training tools, employers have incorporated pre and posttests into their e-Learning courses. Perhaps it is no surprise that all the participating companies (100%) are using pre and post assessments. One of the primary goals of any training or learning course, despite its design, is to ensure that employees have retained novel information.

As the sample companies are in different stages in their initiative toward corporate e-Learning, not all participants have calculated their learning gains from their e-Learning medium. In one company, they have determined that on average, the learning gain from an e-Learning medium has ranged from 18.5%-41.65%.

*Level Three.* If retaining new information is one of the two primary goals of e-Learning courses, than being able to apply this information is the second goal (level three evaluation). Respondents from one company (14%) reported that they commit time to this particular type of assessment. The respondents also reported that a level three assessment occurs in two of the firm's departments where it is relatively easy to measure an employee's performance both prior to and after the delivery of a training course. Hence, these departments have the opportunity to verify that there was or was not transfer of training to the job.

*Level Four.* Participants from two companies (28.5%) have calculated a Return on Investment (ROI) for the adoption of an e-Learning medium. The interviewees' comments that supplemented this information are very interesting.

While one company has taken the time to calculate a ROI, because the process consumes many resources, the company has lessened its initiatives towards deriving this number. More recently, the company has had some renewed interest in calculating the ROI; yet, they continue to rely primarily on user feedback.

Another company has also calculated a ROI and has seen a return on investment for approximately two million dollars. Regardless of this significant return calculation, the company argues that the other benefits that the company has gained maybe even more significant. For example, the company is much more consistent in what they do today and thus, are not inadvertently violating any legal requirements from a compliance perspective. In addition, because of the combination of the e-Learning course and the similar technology employees are using on the job, the employees' level of job satisfaction has increased; hence, the department has experienced a lower turnover rate.

## **Global Distributed Learning**

The data collected indicated that five (71.4%) of the seven sampled companies give their non-U.S. locations access to e-Learning courses. Respondents from three of the companies have translated their courses in at least one other language, while the other two companies have not. One interviewee argued that there is certainly the need to offer



training in other languages; yet, solely from a business perspective, translating the courses may not make much strategic sense, since English is such a common language. Nonetheless, the individual also asserted the importance of providing not only a verbal translation for the international employees, but also a cultural translation. Beyond conquering language and learning style barriers, when providing global e-Learning courses, a major barrier is infrastructure. The discussions on this issue can be summarized in the following quote: “technology allows you to do a lot of neat things, but it is the infrastructure of your company that may stop that.”

Another potential barrier in global e-Learning is a result of the multiple regulations enforced in each country. In some countries, such as Germany, it is not possible to export information on people (i.e. results of a skill assessment), outside of the country without prior documentation approval. The consequences can be as minor as a fine or as serious as a prison sentence.

Even if companies overcome the barriers that the interviewees noted above, companies are still challenged with gaining the international employees’ acceptance of e-Learning tools. Because international e-Learning courses are not extensive throughout the sampled companies, this study will not be able to fully address this issue; however, any noted experiences are important, as they may be able to guide future research. Table 5 includes the feedback from the companies.

Table 5. Participant Responses on International Acceptance of e-Learning

<p>“We have found that the people over there [England, Brazil, Belgium, Switzerland, France, China] are much more receptive. It is my own perspective that this is because what has been ingrained in these cultures is the concept of being told what to do, be expected to do it, and so, they do it. Conversely, in America we have the tendency to be told what to do, but yet we are able to modify those expectations and possibly even avoid the task.”</p>
<p>“In our experiences, Europeans, particularly in France, really prefer to have training face-to-face. I don’t think they so much object to training online, but it is the absence of the classroom that they most resist. On the other hand, China is requesting that our training for SA P is woven into our e-Learning initiative.”</p>
<p>“I think you can make generalities about the younger workforce in China. They are extremely computer literate and would readily accept and embrace this type of training, but certainly the older workforce in the manufacturing plants is going to be a big problem. Furthermore, many cultures in Europe, especially the French, expect to be taught by an expert. So the idea of self-directed learning is expected to be an issue.”</p>
<p>“When you say that the French want more classroom based environments, the same holds true within the U.S.; but again, it is how the organization and the culture within that organization supports how you can use online or e-Learning for some things and how the classroom can be used for others. Just from basic human nature, I think many people still want the classroom, the question is how do you help people understand the value of e-Learning compared to a classroom environment and understand the business requirements behind that? There is just basic business reality that says life is changing so quickly that yes we would all like to have that classroom intervention, but there is just not a lot of time for it for every single thing that we do in an organization.”</p>
<p>“They don’t like it because they don’t know what it is. The degree of acceptance is different for each country. For example, people from countries such as the United Kingdom, Sweden, and Norway can learn easily from CD-ROMs. However, people in France, Spain, Italy, Greece, the Middle East, and even in Eastern Europe typically prefer to learn with a professor that will lecture and conclude with questions.”</p>

The data in Table 5 is from individuals working within the United States, excluding the last comment. The last comment is from an individual employed in Paris, France, and thus, is perhaps closest to the issue of global e-Learning. Moreover, his comments emphasize the challenge in gaining cross-cultural acceptance of non-traditional training, as he points out the diverse learning styles of international employees.

### Future of e-Learning

Participants were asked to discuss their vision of e-Learning at their company within the next three years. Table 6 shows the percent increase in the use of e-Learning that was provided by the respondents.

What Table 6 is not able to show is that the majority of the respondents believe that this increase will be the result of using e-Learning as a supplement, particularly prior to, traditional classroom training. They believe that using the medium in this manner will provide several advantages. These include: enabling new hires with varying levels of skills and education to be equally prepared for classroom instruction; enhancing traditional training by allowing the instructor to focus on application of materials specifically within the corporate culture; and not depriving employees of social interactions between an instructor and amongst their coworkers. Companies are still not convinced that everything should be solely online (i.e. soft skill course).

Table 6. Percentage of Distributed Learning Use in the Year 2003

Company	A	B	C	D	E	F	G
	70-80%	15% 30%	5-10%	100% 25% 50%	30%	40% 75% 70-80%	30%

## Conclusions

This study investigated the utilization of e-Learning within seven Fortune 100 Companies. Specifically, the findings revealed that each company was motivated towards a non-traditional learning tool to be able to give their employees immediate access to pertinent information, particularly without any inconveniences of traveling or cancelled classes. Interestingly, the findings also show inconsistent educational requirements that the sampled companies expect that their in-house, online developers hold. Independent of the course designers' level of education, the data indicated that the non-traditional courses in this study's sample do not enable employees to interact in real time. Furthermore, as shown in Table 4, the findings showed that the asynchronous communication tools that do exist encourage offline communications between the end user and a course designer and/or a subject matter expert; yet, no mechanisms, (i.e. web board) are in place to encourage course users to facilitate information between one another offline. Boshier et. al.'s (1997) survey of adult web-based courses, showed that this lack of learner interaction is not atypical.

Nonetheless, other literature shows that collaborative learning techniques driven by course content and the process of informal techniques established by end users and enhanced by collaborative technologies are excellent mediums for interaction and communication. Soo & Bonk (1998) in asking experts to rank types of interactions found that asynchronous learner-learner interaction was rated the most important type of interaction. Soo & Bonk, however, also noted that technology seems to be the factor that both enables and constrains the learning we want to instill in online environments. Therefore, while the luxury of e-Learning allows employees to take a self-study course, the lack of asynchronous interaction between end users inhibits the sharing of knowledge and hence, does not incorporate the full potential of e-Learning. Interestingly, this study's findings indicated that the absence of learner interaction and minimum multimedia were not important for self-paced courses. These results suggest that more studies are needed to understand how a learner's initial perceptions of the course, experience with technology, and profession can influence acceptance of e-Learning.

Finally, this study's results showed that companies do foresee a greater use of e-Learning within the near future. More specifically, they believe that a hybrid approach is the most optimal way to use the new learning tools. Using technology to provide the foundational information, and then the classroom for application of material within the context of their corporate culture, companies are confident e-Learning will give them the opportunity to gain a competitive advantage.

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# Human Resource Development for International Technology Transfer within Multinational Enterprises in Singapore

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*MNEs are key players in the international transfer of technology from corporate HQ to its subsidiaries, or among its subsidiaries located in various parts of the world. In this regard HRD was found to play significant role in improving the effectiveness of technology transfer. But, very little research has been conducted to investigate this phenomenon. This paper presents some empirical information on the status of international technology transfer, and the HRD practices used in the transfer process.*

Keywords: International Technology Transfer, HRD, Singapore

Organizations have to maintain the technological edge needed for their survival and growth in today's competitive global business environment. This can be accomplished either through technological innovation or through technological acquisition and adaptation. The innovated or acquired technology is then transferred to different units of the organization, located at different geographical locations of the world. The technology transfer, implementation, and use phenomena are crucial for total organizational success of multinational enterprises (MNEs). MNEs are especially noted for their involvement in the international transfer of capital, goods and technology from headquarters (HQ) to subsidiaries or among the subsidiaries.

Technology has been categorized into different types, and various nomenclatures have been used in this regard based on the research interests of the different scholars. Technology may be classified broadly into three types: Product, Process, and Management. Product technology is the set of ideas embodied in the product itself, process technology is the set of ideas involved in the manufacture of the product, or the sequential steps and decisions necessary to combine/process the materials to produce a finished product. Management technology is the set of management procedures associated with selling the product, or the ways in which managers organize their work systems to make best use of human resources for accomplishing organizational goals. For effective transfer and use of any type of technology, management technology acts as an indispensable catalytic agent in the transfer of product and process technologies. In this regard, human resource development (HRD) plays significant role for improving the effectiveness of any type of technology transfer in achieving the desired organizational objectives (Wallender, 1979; Negandhi, 1981; Mascarenhas, 1982; Sahal, 1982; Stobaugh & Walls, 1984; Deihl, 1987; Capon & Glazer, 1987; Von Gilnow & Teagarden, 1988; Osman-Gani, 1991; 1999).

## Research Problem

The transfer of technology has increased in complexity as various types of technologies are transferred across different geographical locations through several mechanisms. These technologies are more difficult to transfer because they contain a higher content of tacit knowledge that is context-specific. The context can refer to the distinctive culture and domestic conditions which the transferor and transferee face as they interact with each other. These interactions often encounter difficulties, and HRD is proposed by scholars as a means of facilitating more effective interaction while transferring technology internationally (Black and Mendenhall, 1989; Osman-Gani, 1999). Although much research has been done on international technology transfer (ITT), most of those studies covered economic, financial and technical aspects of the transfer. Very little empirical research is available that investigated the HRD issues related to ITT. Moreover, most of those studies focused on how technology is transferred from developed to less developed countries, as well as among the developed countries in North America and Europe. No study has been found that looked specifically into the HRD issues (such as training & development) for ITT, or provided any empirical information on the status of ITT or HRD practice, particularly in Asia. This paper

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presents some empirical information on the status of ITT in MNEs in Singapore, as well as on the HRD practices, such as training and development.

### **Review of Literature/Theoretical Framework**

Technology can be transferred in many ways and for a variety of reasons, but the three most prominent situations are the following: (a) Technology can be transferred within the realms of science and technology themselves, to further the cause of those disciplines; (b) Technology can be transferred within a societal level from one geographical location to another, usually for economic gain; (c) Technology can be transferred from one societal level, both internationally and intranationally, ostensibly for development. By definition a transfer of technology will always result in a change - in process, in product, in power, in attitude, in wants and desires, and/or in situations that are either political, social, economic, or environmental (Pytlík, Lauda, & Johnson, 1985).

Technology transfer can be either vertical or horizontal. Vertical transfer is generally internal to the enterprise and takes place by the incorporation of new knowledge from the idea stage to its final development. Horizontal transfer involves the transfer of proven or tested technology from one industry or country to be adopted, modified or applied in another industry or country (Bradbury, 1978). A further distinction can be made between three phases of horizontal technology transfer: material transfer, design transfer, and capacity transfer (Hayami & Ruttman, 1971).

The first phase is characterized by the importation of new products or materials with no adaptation to the local environment. The second phase of transfer involves the transfer of the capability to manufacture the product domestically, or in the case of process technology, to utilize the process domestically. The third phase involves the transfer of knowledge and the capability to develop new technology (Teece, 1976). The domain of this paper, HRD for technology transfer, is focused more on the horizontal transfer falling into the design and capacity phase as defined above.

#### *MNEs in International Technology Transfer*

It has been established that, MNEs are the dominant institutions in transferring technology across national boundaries (Quinn, 1969; Dunning, 1970; Pavitt, 1971; Branson, 1971; Choy, 1983; Rugman, 1983). MNEs transfer product, process, and management technology to their subsidiaries or branches located in different countries at different geographical locations for improving overall organizational performance, and thereby ensuring success and growth. Generally, the source being the MNE headquarters and the destinations being the overseas subsidiaries and affiliates. Each of these organizational units operates within unique socio-cultural, political and economic environments of the specific country concerned. For effective and efficient transfer of technology, the source MNE unit generate policies and procedures that determine the nature of technology to be adopted (or adapted) and transferred. The technology recipient MNE unit(s) adapt and implement those policies and procedures, which determine the acceptance of the transferred technology.

MNEs are noted for the investments that they inject into the host countries in the form of capital goods and skills (Fayerweather, 1982). These foreign investments are instrumental in providing economic development. Vernon (1985) pointed out that diverse governments might try to use multinationals as instruments for projection of their own will. Heller (1985) stated out that the new technological innovations introduced by MNEs bring in new values, but also has the potential to displace old ones.

The mechanisms of technology transfer are as varied as the agents. This variation depends in part upon the type of technology. Among possible mechanisms are foreign direct investment (FDI) by an MNE, which provides the training (or other HRD activity) to provide the skills needed to implement the technology. Licensing by MNEs is also another type of transfer mechanism, which is closely related to FDI. Franchises and trademarks are primarily transfers of reputation or goodwill rather than technology, although they include some transfer of management technology required for quality control, and generally involve some training and technical assistance. Turnkey investments are another mechanism for transferring technology, in which an organization constructs a productive facility, provides necessary training, and then turns over operation entirely to a local firm or other organization. In terms of types of technology transfer, turnkey investments may be limited to operational capability, without the investment and innovation capabilities that are typically associated with direct investment.

#### *Role of HRD in International Technology Transfer*

To successfully transfer technology across nations and cultures, one must begin by understanding one's own culture, how it contrasts with host country culture, and the impact of these cultural differences on HRD and

other organizational operations. HRD and management policies and procedures must be adapted to that new culture. Finally, personnel must be selected and trained who can effectively implement these modified, culturally sensitive HRD activities. Successful HRD professionals are very conscious of the socio-cultural values as they plan technology transfer, design training programs, and select personnel.

Technology transfer via HRD by foreign business firms takes place in three steps. The first is the recruitment and training of local workers in the skills (primarily managerial and professional) required to master and implement the technology used by the firm. The second step is the advancement of the workers thus trained to positions of greater responsibility as they gain experience, gradually replacing the expatriates who were initially needed both to train them and to perform managerial and professional functions in the firm. The third step, which can occur at every level of technology transfer capability, is the turnover of trained and experienced managerial and technical personnel insofar as they employ their skills in starting new domestic enterprises or in modernizing domestic organizations. The main vehicle of international technology transfer is ultimately the turnover of trained and experienced managerial and professional employees from MNEs to domestic firms/subsidiaries and other domestic organizations. It is conceivable for technology transfer to proceed without such turnover, with the continued expansion of MNEs as a share of industry and the economy (Stewart & Nihei, 1987).

Of all the individual activities related to HRD, countries differ in how they view their work environments, and that these differences can be grouped into clusters of countries (Hofstede, 1984; Ronen & Shenkar, 1985). A substantial amount of this research, conducted from international comparative management and cross-cultural perspectives, supports the assertion that national boundaries and cultural identities also account for certain responses, independent of job level or work group (Trompenaars & Hampden-Turner, 1998).

Managers from different countries have been shown to differ in their perceptions on a variety of issues, and management technology was considered to be one of the most significant issues facing managers, and managers' perceptions of management technology within an MNE also differed. Therefore, it is important to understand these differences especially among managers of MNEs regarding the transfer and use of management technology across national boundaries (Osman-Gani & Jacobs, 1996).

It has been concluded from a study that national differences of managers affect the transfer and use of management technology across national boundaries. In addition, certain demographic characteristics such as experience, gender, and occupation level also influence the transfer phenomena at varied degrees of importance. Following the national differences, it has been further observed that certain pattern of country clusters emerge from the managers perceptions of transferring and using management technology across national boundaries (Osman-Gani, 1991).

*Transfer of knowledge.* Technology has been closely associated with knowledge (Schmookler, 1996; Rosenberg, 1982; Knap, 1987; Jegathesan, 1990). Without the inherent knowledge, technology cannot be applied to solve any task. Hence, it naturally follows that transfer of technology tantamount to transfer of knowledge.

Polanyi (1974) identified two types of knowledge: explicit and tacit knowledge. Explicit knowledge can be easily codified and communicated between different people in systematic ways. Tacit knowledge is the knowledge of experience that is highly context specific, and therefore difficult to formalize and communicate. The value of such tacit knowledge can only be maximized by making it widely available in the organization (Nonaka & Takeuchi, 1995). This implies that knowledge must be transferred quickly and efficiently throughout the organization. However, the smoothness of transfer is affected by the degree of tacit content contained in the knowledge (Zander, 1991; Szulanski, 1996).

Knowledge transfer is also affected by factors other than its tacit content. Bresman, Birkinshaw and Nobel (1999) argued that factors such as the frequency of communication between the transferor and transferee, the use of protracted modes of interaction like extended visits and joint training programs and the size of the transferee entity will act to facilitate the process of knowledge transfer. This is consistent with the study done by Dakin and Lindsey (1991) who stated that technology or knowledge can be transferred through the exchange of personnel, responsible for its development, between the supplier and the recipient. Zirger (1997) also emphasized that training provided by knowledge transferor enables the recipients to learn from their vast experience in the field of knowledge inherent in the technology.

### *International Technology Transfer in Singapore*

Being a small country with limited resources and options for growth, Singapore was compelled to adopt a strategy of export-oriented industrialization with heavy reliance on foreign capital and technology (Pasuk, 1990). In this regard HRD was identified as the crucial factor for sustaining its competitiveness and economic development (Osman-Gani & Tan, 1998).

The role that the government plays in international technology transfer cannot be possibly overemphasized. It permits free repatriation of profits and allows foreign ownership in most economic sectors up to 100%. This secures commitment from the MNEs to transfer advanced skills and know how to Singapore (Tatsuo, 1991). The government also sets up various institutional bodies to facilitate the transfer of technology. Recognizing the importance of learning, the government works towards building a sound system of education and training to develop the human resources in the country. The aim is to increase receptivity to new technologies and the ability to disseminate knowledge and know how (Lee, 1994).

Increased emphasis is now been given on developing creativity and innovation skills, and investments are pouring in the research and development areas. Also, national policy makers and business leaders are emphasizing on technology acquisition and adoption through technology transfer. But, not much research has been done to study the role of HRD in effective transfer of technology. To bridge the research gap, this study attempts to identify the status of technology transfer in MNEs of Singapore, as well as to provide empirical information on the HRD practice in transferring technology.

### *Research Questions*

In order to achieve the objectives of this study, the following research questions were formulated:

- 1) What mechanisms are used in transferring technologies within MNEs in Singapore?
- 2) What training and development programs are used in transferring technology within the MNEs?
- 3) What training delivery methods are used by MNEs in transferring technology?
- 4) Who are the effective training providers for transferring technology within MNEs in Singapore?

### **Research Methodology**

This descriptive study used an exploratory design for collecting primary data from the MNEs operating in Singapore. Preliminary interviews were conducted on 20 companies selected randomly for gathering first-hand knowledge about ITT, and this was followed by an extensive survey conducted on a sample of managers from various types of MNEs.

The population for this study comprises MNEs in the four major industrial sectors, and from five countries of origin. The four industrial sectors are namely: Manufacturing, Financial (banking, insurance and investment), Transportation and Logistics (airlines, shipping, warehousing and courier) as well as Others (telecommunication and engineering services). The different countries of origin are namely: the United States of America, Japan, Germany and France and the United Kingdom. Most of the established MNEs in Singapore were found to operate in the above sectors, and their corporate headquarters are located in the above mentioned countries. The sampling frame for the study was compiled from the five directories of Japanese, American, French, German and British Businesses in 1999. The survey was conducted on a sample size of 600 MNEs, representing the above industrial sectors, where most of the technology transfer was found to occur. A proportionate stratified random sampling procedure was followed in drawing the sample from the sampling frame. The respondents were general managers or HR managers of the selected MNEs.

A questionnaire was designed based on the findings from the interviews and the literature. The questionnaire also includes some validated items from previous instruments identified through the literature review. The questionnaire was subjected to the tests for reliability and validity. The questionnaire was administered to 600 MNE managers through Facsimile system.

### **Results and Discussions**

A total of 105 completed responses were obtained, which were used for subsequent analyses. Among the respondents, 52.5% were from the manufacturing industry, 22.8% from the finance sector, 15.8 from the telecommunications and engineering service sector and 8.9% from the transportation and logistics sectors. The distributions of respondents from MNEs of different countries of origin are: USA (41%), Japan (24%), Germany (15%), UK (13%) and France (7%). Most of these MNEs (70.3%) have employment size of less than 150. About 11% respondent companies employed more than 450 people in their business operations in Singapore. Although more than half of the respondents (52%) were from manufacturing sector, those MNEs were found to operate mostly in high tech capital intensive industries, such as electronics and petro-chemical sectors.

*Research Question 1: What mechanisms are used in transferring technology within MNEs in Singapore?*

It was found that training and development of employees was the most frequently used (mean = 3.55) mechanism for transferring technology (Table 1). This could be due to the observed need for new knowledge and skills to deal with the transferred technology that require persistent training and skill development (Prayoon, 1991). This issue will be investigated further through subsequent research questions. MNEs were also found to frequently send employees from headquarters to Singapore (mean = 3.27) for facilitating the ITT. The expatriates from the headquarters can help the locals in adapting to the new technological environment through sharing their experiences of advanced knowledge and expertise on the specific aspects of the transferred technology. No significant difference was found among companies from various business sectors or countries of origin in terms of transfer mechanisms used.

*Research Question 2: What training programs are used in transferring technology within MNEs in Singapore?*

The different training programs mentioned in this respect were: technical training, management/supervisory training and education/awareness training. Among them, technical training was most frequently used (mean = 3.89). This can be due to the state of technical sophistication of technologies transferred, which required special technical knowledge for effective transfer and use. Management/ supervisory training was the least frequently (mean = 3.02) used program. This may be due to the relatively fewer managerial and supervisory level interventions needed in the transfer and implementation process of technology than operational employees who have to come into more direct contact with the day to day operation of the newly transferred technology.

*Research Question 3: What training delivery methods are used by MNEs in transferring technology?*

On-the-job training (OJT) was found to be most frequently used (mean = 4.11) training delivery method for transferring technology compared to several other methods. OJT provides the trainees with the maximum exposure to learning under real life operating environment. This is consistent with findings from other related studies (Osman-Gani & Jacobs, 2000). Other training delivery methods included for respondents' relative rating of use were: audio-visuals, self-instructional materials, computer-based training and tertiary courses. However, these methods were found to be less frequently used (all means < 3) in the technology transfer process. Technology transfer involves transferring new advanced skills and know-how where effective learning effectively takes place through mere visuals or written instructions alone.

In analyzing the differences among companies from various business sectors, significant differences were found in terms of using the OJT, seminars and workshops and audio-visual aids as training delivery methods for ITT. OJT was most frequently used by MNEs from the manufacturing sector (mean = 4.33), while MNEs from the transportation and logistics sector used it less frequently (mean = 3.33). This can be due to the frequent movement of employees/trainees from their job sites in the latter sector as they carry out their freight delivery duties. On the other hand, employees of MNEs from the manufacturing sector, are permanently positioned at the production job sites where supervisors can provide training steadily and offer more constant attention (Broadwell, 1986).

Seminars and workshops were most frequently used by MNEs from the telecommunication and engineering service sector (mean = 3.69) while those from the Transportation and Logistics sector use it least frequently (mean=2.67). Seminars and workshops are highly adaptable to convey a broad spectrum of fast changing ideas to many people at a time (Munson, 1984), which suits the fast pace of changes and developments in the telecommunications sector. In contrast, employees from the transportation sector can be absent from home base for substantial period at varying times of the year (Harper, 1982), which makes it difficult to organize seminars where all can attend in a location at one point of time.

Audio-visual aids were most frequently used by the MNEs from telecommunication and engineering services sector (mean = 3.67) while those from the finance sector used it least frequently (mean = 2.63). This can be because visual aids are useful tools for stimulating interests of engineers and technicians in the telecommunications industry towards the field of business knowledge, which needs to be integrated within the businesses itself (Vargo & Hunt, 1996; Pinnington, 1992).

In studying differences among companies from various countries of origin, significant differences were observed in using the classroom training and lectures as a training delivery method (Table 2). This method is most frequently adopted by American MNEs (mean = 3.55), while Japanese MNEs use it least frequently (mean = 2.17). Classroom training setting was found to enable American trainees to exercise self-reliance and individual learning through interactions in line with their individualistic culture. Conversely, it is not conducive for the Japanese who prefer group learning process (Elashmawi, 1998).

*Research Question 4: Who are the effective training providers for transferring technology within MNEs in Singapore?*

Expatriates professionals were found to be most frequently used training providers (mean = 3.37), compared to various other personnel, for ITT. This is consistent with the earlier findings on the mechanisms of transferring

technology. This was explained considering the expert knowledge possessed by the expatriates from the headquarters, where the technology was most often innovated or acquired, and the decisions are taken for its transfer to overseas subsidiaries. Departmental managers and in-house training consultants were also used for such training but with relatively less frequency. Other training providers such as external consultants and academic professionals were not found to provide ITT training as frequently (mean = 2.24 and 1.83 respectively). This may be because they are costly to engage and they may lack the contextual knowledge of organizational culture and updated information about the industry and the competition. The confidentiality and exclusivity of the information about the new and transferred technology could also be the concerns in this regard.

### Conclusions and Recommendations

Based on the findings of this study, it may be concluded that management technology has not been given as much importance compared to the process and product technologies in international transfer of technology across national boundaries. This can be attributed to the fact that management technology contains a high content of tacit knowledge which render its transfer to be more difficult, and also its importance was not often recognized by the top management (Alange, Jacobsson & Jarnehammer, 1998). The strategy of training and skill development can enhance the long run capabilities of employees in the firm. This will sharpen the competitive edge of MNEs as employees acquire valuable knowledge needed for the success of technology transfer. MNEs should emphasize more on technical training and on-the-job training (OJT) programs for ITT. OJT enhances experiential learning and allows trainees ample scope for clarifying issues relating to the technology with their supervisors.

After an exhaustive analysis of the responses received from various MNEs in Singapore, the following recommendations may be proposed for MNE managers for their improved decision making in ITT, as well as to the HRD scholars for future research. Top management of both the transferring and the recipient organizations should exercise strong commitment towards the technology transfer process. Lack of such commitment may lead to ineffective transfer of technology resulting in considerable loss of organizations' resources. More comprehensive technical training programs should be developed, where employees can be trained at different stages of the technology transfer process. This would increase their "breadth" of knowledge and skills required for the transfer of new technology. More training should be conducted at local sites, as this would provide the scope for clarifying relevant issues of the transferred technology against local requirements. A well-structured on-the-job training system should be established. It will internalize among the employees a sense of values, culture or ways that is hard to reproduce in manuals. This requires a team of proficient trainers and supervisors to monitor the performance of the trainees. The guidance provided by their supervisors can ensure that they learn the right methods at all times. Eventually, they will be more effective in applying the transferred technology. MNEs should rotate parent company personnel (expatriates) to work at the overseas subsidiaries. Similarly, the subsidiaries' managers should also be rotated to work at the parent company for a period of time. This will allow executives from both the parent HQ and the subsidiaries to gain valuable cross-cultural experience.

Future research may be conducted to measure the impact of management technology on the successful transfer of process and product technology. This will provide valuable insight for managers to consider to what extent management technology can serve as a catalytic agent in the transfer of the other two types of technologies. This study focused only on Singapore, similar comparative studies should be done in other ASEAN countries like Malaysia and Thailand, to determine if there are significant differences in transferring technology to different countries of destination in the region. This will contribute to building a comprehensive pool of knowledge for better understanding the transfer of technology in the ASEAN region and in Asia in the future. It has been highlighted in the literature that career development affects employee's willingness to learn and their motivational levels to strive towards proficiency in applying the transferred technology (Kung, 1994). Hence, future research may be conducted to explore the impact of career development on technology transfer. Furthermore, other human resource issues like selection, recruitment and compensation could be studied in future to identify their impacts on HRD issues in respect of international technology transfer. Empirical results from this study might provide useful insights as a stepping stone in designing and conducting future research in this area.

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**Table 1: Analysis of Variance on the Types of Technology Transfer Mechanisms by Country of Origin**

Types of Transfer Mechanism	USA			Germany			France			Japan			UK			F	Sig.
	N	M*	SD	N	M*	SD	N	M*	SD	N	M*	SD	N	M*	SD		
Training and skills development of employees	42	3.62	1.08	13	3.77	0.73	7	3.71	0.73	23	3.09	1.24	13	3.85	0.90	1.385	0.237
Sending employees from HQ to Singapore	42	3.31	1.26	14	3.29	1.33	6	3.33	1.21	24	3.42	1.32	11	2.73	1.27	0.477	0.665
Use of corporate intranet systems to share skills and know-how	41	3.44	1.27	13	2.77	1.17	7	3.71	0.76	23	1.74	1.57	12	3.67	1.30	1.632	0.159
Sending employees to HQ	42	3.45	1.31	14	3.29	1.38	6	2.67	1.37	24	2.54	1.32	12	2.92	1.16	1.853	0.110
Rotating employees among different subsidiaries	41	2.07	1.17	13	1.46	0.78	7	2.86	0.69	23	1.83	0.98	12	2.08	1.24	1.748	0.132

\*1=least frequently, ..... 5=most frequently

**Table 2: Analysis of Variance on Training Delivery Methods by MNEs' Country of Origin**

Training delivery methods	USA			Germany			France			Japan			UK			F	Sig.
	N	M*	SD	N	M*	SD	N	M*	SD	N	M*	SD	N	M*	SD		
Classroom training and lectures	40	3.55	1.34	14	2.57	1.28	6	3.17	1.33	23	2.17	1.19	12	3.25	1.36	3.825*	0.003
On the job training	41	4.07	0.98	14	3.93	0.92	7	4.00	0.58	24	4.21	1.02	13	4.31	0.63	0.316	0.902
Audio-visual aids	38	3.11	1.23	13	2.85	1.21	6	3.33	0.82	23	2.39	1.12	11	2.91	1.30	1.236	0.299
Tertiary courses	39	1.92	1.01	13	2.23	0.93	7	2.43	0.79	22	1.86	0.89	10	2.50	0.85	1.347	0.252
Self-instructional materials	39	2.74	1.19	12	2.92	1.16	6	3.33	0.52	23	2.74	0.86	11	3.00	1.18	0.532	0.751
Computer-based training	40	2.78	1.25	14	2.86	1.17	6	2.83	1.33	23	2.30	1.02	12	3.08	1.38	0.894	0.488
Seminars and workshops	41	3.10	1.34	14	3.36	1.22	7	4.14	0.69	24	2.67	1.17	12	3.00	1.13	1.870	0.107
Overseas training	40	3.48	1.01	14	2.86	1.41	6	3.83	0.41	24	2.92	1.25	11	2.73	1.10	2.011	0.085

Significant @ 0.05 level. \*1= least frequently used; ..... 5 = most frequently used

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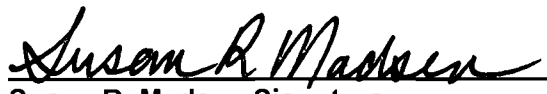
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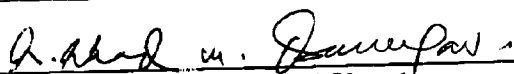
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