



The Conference Board of Canada

***SOLUTIONS FOR EMPLOYERS:
EFFECTIVE STRATEGIES FOR USING LEARNING
TECHNOLOGIES IN THE WORKPLACE***

KNOWLEDGE REVIEW REPORT

Prepared for:



**Office of Learning Technologies
Bureau des technologies d'apprentissage**

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***The OLT ... Your Partner
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Purpose of the Report

Solutions for Employers research will help employers use learning technologies to meet their employees' workplace learning needs.

This *Knowledge Review Report* informs employers about the benefits and challenges of using learning technologies (LTs) and gives them advice about how to select the best LTs to meet their employees' learning needs. It is based on a practical review of literature on learning technologies and their role in formal and informal learning in the workplace.

This report is the first product of *Solutions for Employers: Effective Strategies for Using Learning Technologies in the Workplace*, a Conference Board of Canada research project designed to help employers select and use learning technologies to meet their employees' workplace learning needs.

Project Goals

The overall project has three broad goals:

1. Identify learning technologies, operational processes and strategies that enable more and better workplace learning.
2. Provide employers with a practical, easy-to-use tool that will aid them to get started using technology for employee learning, or help them improve what they are already doing.

By providing a tool for making LT choices, the project will aid them in making well-informed decisions about investing in workplace learning technologies.

3. Support informed discussion and debate about how to increase learning in the workplace.

Ultimately, we hope employers and employees will consider using LTs to meet their workplace learning needs as a way to improve organizational performance and enhance personal success in the workplace. This is not currently the case even though workplaces in Canada are becoming technologically advanced. Better information and communications technology mean that employers can, if they choose, use technology to meet many of their employees' learning needs in the workplace. However, today, most of them are not making that choice.

Current Challenges

Our review shows that despite rapid technological advances in Canada's workplaces and speedy growth of links between our workplaces and the rest of the world, the technological capabilities of most workplaces are under-used in helping employees' gain knowledge and skills:

Workplaces have technological capabilities that are under-used in helping employees gain knowledge and skills.

- There is low awareness and understanding of the value of LTs in developing the basic and job-specific skills and knowledge of employees in the workplace.
- Access to LTs is limited for many employees and their managers.
- There is limited strategic planning, applications instruction, technology training, and external linkages for mentoring and other developmental purposes in workplaces where LTs are installed.
- There is a lack of awareness and understanding of how to engage employees and employers in learning, especially how learnware can be best used in the workplace to help employees learn.

Later phases of this research project address these issues and identify ways that employers can increase workplace learning by using technology.

This report does not replace existing research on program evaluation and technical aspects of applying technology as part of learning solutions. Instead, its findings are being applied in subsequent stages of this project to refine the research methodology and as input into the design and content of the *Framework for Solutions Tool*.

A Management Issue

Overall, the project's primary focus is on LTs as a management issue. The research is being framed to identify problems in using technology for learning and to highlight practical, effective solutions to the problems. Results are being articulated from the perspective of the employers and employees who make decisions about whether and how to invest in workplace learning and determine their own involvement.

The first step in increasing the effective use of learning technologies is to raise awareness of the issue and provide assistance to employers in making investment decisions. By articulating the value of learning technologies this *Knowledge Review Report* is intended to provide an initial impetus to decision-making and investment as well as some practical guidance in identifying and addressing issues and needs.

The *Framework for Solutions Tool* and other products of the research will build on this. They will be successful if they further stimulate employers to consider LTs as a learning option for their employees and if those employees feel encouraged to consider LTs as a way to gain skills and knowledge that can yield them higher earnings, improved job opportunities and security.

**You can access and download the *Solutions for Employers Tool, for free, on the Conference Board of Canada's website:*
www.conferenceboard.ca/nbec/pbs.**

The Tool will be available on-line in May, 2001.

Why Workplace Learning Matters

Employees with the latest skills are needed for Canadian organizations to compete successfully in the national and global economies. Many leading Canadian employers recognize this, but sometimes don't have the time, money, knowledge or means to keep employees up to date with current knowledge.

Canada could use more support for workplace learning. Recent research found that 70 per cent of firms undertook *some* training, (40

*The Conference Board projects that networked learning will experience the greatest growth with the percentage of organizations using intranets rising from 25 per cent in 1997 to 76.3 per cent in 2000 and the percentage using extranets projected to grow from 26.4 per cent to 70.1 per cent.*¹

Learning technologies provide an opportunity for a level learning field – learning technologies can foster broader learning activity across organizations

per cent of it formal and remainder informal).¹ But, employees don't perceive a high level of support from employers; other research found that only 19 per cent of the Canadian labour force indicated they took part in employer-supported training.² On an international level the *World Competitiveness Yearbook* ranks Canada only 23 out of 46 countries for rates of employer-supported learning.³ Learning technologies can increase this level

and breadth of support by employers and participation in workplace learning by employees.

In Canada opportunities for learning are shaped by how much money an employee makes, whether they are permanent or temporary, full-time or part-time, the level of responsibility they occupy, the sector of the economy they work in, and the organization size.⁴ In short, those who are already in a good position in the labour market benefit the most from current modes of workplace learning such as off-site courses, classroom instruction and conferences.⁵ Learning technologies provide an opportunity for a level learning field – learning technologies can provide broader dissemination of content and learning opportunities and foster broader learning activity across organizations and to those who are not in the best position for accessing more traditional means of workplace learning.

Employees have a disposition to learn workplace skills. Research has demonstrated that Canadians take responsibility for their own learning, a strong indicator of positive

¹ Betcherman et al, p. 45

² Betcherman et al, p. 37

³ *The World Competitiveness Report*, p. 481.

⁴ Harris-Lalonde, p.11, and *Adult Education and Training in Canada*, p.41; *Adult Education and Training in Canada*, p. 41, 34.

⁵ Philip Jennings. *Employer-Sponsored Training in Canada: Evidence from the Education and Training Survey*. (W-96-E., Applied Research Branch, Strategic Policy, Human Resources Development Canada, June 1996).

acceptance of employer-supported learning. Indeed, employees do more training on their own than through employers, demonstrating that they are interested in learning.⁶

Fundamentally, the employers' acceptance of the benefits of LTs will encourage increased use.⁷ For some employers, learning technologies may be the best way to achieve their learning goals.

Learning Technologies are an Option

Learning technologies (LTs) are electronic information and communications technologies, such as telephone, computer networks, Internet, World Wide Web, software and voicemail that deliver learning and skills on a one-way or two-way basis

Learning technologies, such as web-based training and CD-ROM, offer Canadian employers a way to give focused, workplace learning to their employees.⁸ Cutting edge employers view employee learning not as a *cost* but an *investment* or *performance enhancer*.⁹ Leading employers such as Nortel Networks and Bombardier are using learning technologies help their employees learn important workplace information and produce world-class results.

⁶ Constantine Kapsalis. *Determinants of Employer-Sponsored Training: An Analysis of the 1994 Adult Education and Training Survey*. (Ottawa: Human Resources Development Canada, 1996, R-96-14E)

⁷ Silvia Bartolic-Zlomislic. "The Costs & Benefits of Telelearning: Two Case Studies," *Distance Education & Technology*, (Vancouver, The University of British Columbia, 1998); Judith O. Wagner, *The World Wide Web and Vocational Education*, (ED411416, ERIC Digest, ERIC Clearinghouse, 1997).

⁸ The European Union (EU), the United Kingdom and the Organization for Economic Cooperation and Development (OECD) all have policies that support lifelong learning through training and adult education. *Adult Education and Training in Canada*, (Ottawa: Human Resources Development Canada and Statistics Canada, 1994) illustrates the "Lifelong Learning Paradigm" through the Traditional Education and Training Model and the Modern Education and Training Model, p. 9. Human capital is defined by the OECD as "the knowledge, skills, competences (sic) and other attributes embodied in individuals that are relevant to economic activity." *Human Capital Investment: An International Comparison*, (Paris: OECD, 1998), p.9; Noah M. Meltz, *Human Capital and Infrastructure*, (QPIR 1993-14, Queen's Papers in Industrial Relations). The United States has the "Technology Literacy Challenge" and the Department of Labor sponsors "America's Training and Education Network (ATEN)" which provides web-base information on where companies can find training technologies; The United Kingdom, "The National Grid for Learning"; and, Germany the "Schulen am Netz". The OECD is investigating LT, in the form of information and communications technology (ICT), through its "ICT and the Quality of Learning" initiatives. The UK enjoys the highest level of LT penetration in the educational system, while the US has the highest spending per capita (OECD, 1999:49). The 1997 OECD Council meeting at the Ministerial level agreed "...on the urgent need to implement effective strategies for lifelong learning for all, to strengthen the capacity of individuals to adapt and acquire new skills and competences (sic)." *Human Capital Investment: An International Comparison*, (Paris, OECD, 1998), p.9.

⁹ Jean-Pascal Souque. In a study of learning technologies in the work environment, the American Productivity and Quality Center notes a shift in employer/firm attitude away from viewing training as an "employee cost" to a "business investment". *Technology-Based Training: Global Strategies for Learning*, (American Productivity and Quality Center, 1999).

While learning technologies are not the only solution for delivering lifelong learning, they are flexible enough to fit with the needs of employees, employers and are an extension of the increasing use of technology in work and everyday life. Learning technologies offer possibilities that are only just being tapped and realized by employees. As more and more workplaces and homes increase the use of information and communications technologies, learning technologies will become a popular way for employees to learn at their own pace in a fashion that mirrors and is indeed linked to their workplace and workstations. With LTs, such as the web and CD-ROM, employees can learn on-line from home or at their workstation, as part of a group or on their own.

... learning technologies, such as web-based training and CD-ROM, are a way for employers to give focused, workplace learning to their employees.

Using learning technologies makes sense. But, there is a gap between what organizations need, what LTs they have and their understanding of their potential.¹⁰ To address this gap, employers will have to examine their needs, and those of their employees, strategically and organizationally.¹¹ Once an LT solution is chosen, employers will want to constantly evaluate and improve these.¹²

Determining the best mix of human-mediated and LT-enabled learning is the key challenge for employers who want to reap the maximum benefits of learning technologies.

Employers who use LT solutions will define the cutting edge of the knowledge-based economy. Indeed, the use of LTs is considered by some to represent a new paradigm in how knowledge is acquired and human capital is developed.¹³ Canadian employers can use LTs to participate and lead this shift in how employees learn and ultimately contribute to profits and productivity. Employers are in business to generate profits and compete; skilled employees are key to this. Learning technologies deliver workplace learning, helping employers compete and employees contribute and add value.

¹⁰ Van Buren.

¹¹ Deborah Schreiber argues, that “the most effective strategy for meeting the needs of distance education and training is to employ a variety of forms of instructional technology and electronically mediated instruction.” Schreiber in Schreiber & Berge, p. 17

¹² The OECD cautions that quality should be maintained while meeting the rising demand for learning technologies, especially given the potential of LTs to enhance lifelong learning. “The challenge, in this era of expanding, deepening and diversifying demand for learning over a lifetime, is how best to meet the volume demand while ensuring that the nature and types of learning respond effectively to needs” (p. 5). *Education Policy Analysis 1999*, (Paris: OECD, Centre for Educational Research & Innovation, 1999).

¹³ Bassi, Cheney & Van Buren. See also Richard Koonce, “Where Technology and Training Meet.” www.astd.org. Alexander J. Romiszowski. “What works; what makes sense? New Technologies for Human Resource Development” TechKnowLogia.org, September/October, 1999

Eight Benefits of Learning Technologies for Employers

Benefit 1. COST SAVINGS

Significant savings come from reduced travel expenses related to moving people to and from physical training locations (LTs are often accessible from employee workstations) and from lower resource requirements.¹⁴ The financial benefits may be reduced, however, by the high costs of some technology, and by poor planning and implementation of the technology. Recently, the OECD suggested that while there is no evidence to prove that LTs save money, “if efficient exploitation of [LTs] can be achieved, bringing in educational content, some studies show there are good opportunities for cost benefits resulting from a more effective delivery of education.”¹⁵ Indeed, the OECD suggests that “more adequate levels of recurring expenditure on [LTs] may need to go hand in hand with savings elsewhere.”¹⁶ The other major cost saving is in terms of time; some have noted that more focused content reduces learning time because employees are able to focus on the knowledge they really need, when they need it.

Benefit 2. FLEXIBILITY

One key benefit of LTs is flexibility. Design of content and delivery can be customized and shaped to meet needs in the long run, or immediately, as in the case of just-in-time training.¹⁷ The key benefits of LTs to employers are, the OECD argues, “reducing costs and increasing flexibility.”¹⁸ Course customization may also be easier and faster to do, with content and instruction quality improved due to increased access to experts and multiple program choices.

Benefit 3. LEARNING LINKED WITH WORK

LTs are an especially effective way of linking learning with work. Employers can design training systems that use existing on-the-job equipment and technologies that fit with organizational processes. In addition, learning technologies allow employers to build a learning component into their employees’ work itself. Learning ‘in the work’ is increasingly seen as an effective and valuable way of delivering ‘just-in-time’ learning. “Employer-sponsored training [linked with work] has important advantages, including financial support, accommodation of

¹⁴ ASTD

¹⁵ *Education Policy Analysis 1999*. (Paris: OECD, Centre for Educational Research and Innovation, 1999, p. 61.

¹⁶ *Ibid.* p. 61.

¹⁷ Donna Abernathy. “A Start-Up Guide to Distance Learning,” *Training & Development*, December 1997, p. 39-47.

¹⁸ *Education Policy Analysis 1999*. (Paris: OECD, Centre for Educational Research and Innovation, 1999), p. 25

time demands, and the productivity benefits of applying training in a real work situation.”¹⁹

Benefit 4. INTERACTION & COLLABORATION

LTs by their one-way or two-way, flexible nature encourage information sharing, collaboration, and increased opportunities for interaction. For example, employees can email each other while participating in an online learning program. Instructors, too, often find it easier to interact with employee-students when they are using LTs.

Benefit 5. DECENTRALIZED LEARNING

LT solutions enable facilitators in one location to link to participants in multiple locations simultaneously. Such decentralized training is valuable especially where operations are spread out, a possibility consistent with Canadian geography. Some researchers also argue that LTs provide tireless delivery of training, but this must be taken with caution given the role that humans (who do tire) play in training.²⁰

Benefit 6. ALIGNMENT OF TRAINING WITH SPECIFIC JOB-RELATED NEEDS

Employers can enhance the integration of individual learning with organizational needs by providing LT-delivered training that gives employees the knowledge they need when they need it. Employees will not have to learn entire course contents when instead they can receive the modules of information that fit with their needs.

Benefit 7. MOTIVATE EMPLOYEES

Because they offer flexibility and are different from traditional delivery methods, LTs can motivate employees to invest more time and energy in workplace learning. The key is that the alternative and flexible learning environments allowed by technology can reduce psychological obstacles as well as practical difficulties of scheduling learning activities around work periods and work breaks. The result is more personal commitment to learning.

Benefit 8. IMPROVE RETENTION OF LEARNING

LTs can improve employees' retention of learning, which positively impacts on their job performance. Some employees find learning using LTs particularly suits their personal learning style; they are more likely to retain their learning over time. Other employees retain more because learning is built into the work itself and so is obviously relevant to job performance. For them, seamless and timely learning 'in the work' that is directly tied to job tasks and responsibilities stimulates them to retain more than do traditional learning processes.

¹⁹ Betcherman et al, p. 60

²⁰ Bassi, Cheney & Van Buren

Nine Benefits of Learning Technologies for Employees

Benefit 1. GREATER CONTROL OVER LEARNING

LTs offer flexible solutions that provide employees with autonomy over their professional development, learning and skills development.²¹ Employees can fit their training into their work schedules, determine the pace of their learning and spend time clarifying knowledge and skill areas without being bound to a group.

Benefit 2. EMPLOYEES FOCUS THEIR LEARNING

LTs provide focused and relevant training by allowing employees to focus on the content and match it to their individual learning needs. Since they have control over their learning focus they can identify the most appropriate content and decide how much time to spend on each component of their learning.

Benefit 3. EMPLOYEES INCREASE VALUE TO THEIR EMPLOYER

LTs can help employees gain skills that can increase their value to their employer and productivity. These LT acquired skills can also yield increases in pay. Research has confirmed “significant wage gains...in the order of 10 per cent.”²²

Benefit 4. IMPROVED EMPLOYEE SELF-CONFIDENCE

LTs may be a way of encouraging learning by reducing exposure and embarrassment over the pace or success of learning, with the ultimate reward of improved employee self-confidence.²³ Combined with the element of autonomy and independence that LTs can provide to learners, private progress through an LT training program can be an incentive to learning and a means of ensuring that those who will not admit a lack of knowledge can acquire it in a discreet manner.

Benefit 5. JOB SATISFACTION

Employees that have LT-acquired skills to do their jobs will be more satisfied with their performance on the job.

Benefit 6. IMPROVED JOB PERFORMANCE

Employees that have the skills to do their job properly will improve their performance and ultimately their productivity. LTs are means of providing these skills.

²¹ See Manuel London & James W. Smither. “Empowered Self-Development and Continuous Learning,” in *Human Resource Management*, Spring 1999, Vol. 38, No. 1, Pp. 3-15.

²² Betcherman et al, p. 49

²³ Linda Keegan & Sherri Rose, “The Good News about Desktop Learning,” *Training & Development*, June 1997, Vol. 51, Issue 6, p. 24.

Benefit 7. RECOGNITION OF ACHIEVEMENT

Employees can track learning acquired through LTs. Within an integrated IT, training and HR system, the recognition of successfully completed training modules can be tracked and linked with performance reviews and provide an incentive for employee training.

Benefit 8. SAFER WORK ENVIRONMENT

For some employees LTs can result in a safer work environment by providing critical information where and when employees need it, especially in locations where traditional learning methods don't work well.

Benefit 9. IMPROVED E-LITERACY

Learning using LTs, especially 'in the work', can heighten the capacity of employees to use technologies for job tasks. In many cases, the employees actually use the learning technologies in their work processes. As they become more comfortable with using LTs they gain expertise and confidence in using technology. In other words their e-literacy, their ability to understand and use information and communications technologies, is improved.

Nine Common Challenges to Using Learning Technologies

Given the potential benefits of learning technologies, how can employers best take advantage of opportunities for themselves and their employees? What challenges do they need to consider and overcome?²⁴ Employers often resist providing workplace learning opportunities to employees because they fear that employees will leave or be "poached" by other employers. But human capital theorists argue that most employer-provided training is job-specific and not transferable. Research shows that other training barriers exist, including cost, limited resources, and lost downtime, that are more significant training barriers than fears of labour mobility or poaching.²⁵

1. *Lack of Time, Money & Support*

Time, support and money issues pose fundamental challenges to implementing LT solutions. Technology has a reputation as being expensive and unpredictable, and this is often an impediment to examining or considering LT solutions. While LTs might provide a cost-effective solution, the common worry is that they will be more costly than traditional training solutions, especially in the early implementation stages when

²⁴ Gordon Betcherman, Norm Leckie, & Kathryn McMullen, *Barriers to Employer-Sponsored Training in Canada*. (Canadian Policy Research Networks, July 1998), p. 2. CPRN's analysis of barriers to employer-sponsored training in Canada categorizes the disincentives as externalities, information barriers, employee-based obstacles and a miscellaneous group.

²⁵ Betcherman et al, 1998, p. 5.

marginal efficiencies and benefits to productivity have not been realized. Cost is frequently named in the literature as a major barrier to using LTs.²⁶

The Adult Education and Training Survey (AETS) found that lack of time was an even more important challenge than cost for those with training needs, preventing almost half of them from taking part in training.²⁷ In this light, AETS noted that employer support is crucial and recommended that employers allow more time for employee learning. “Time compression”, according to the authors, “rather than price resistance, is a major constraint.” Given this, instructional interventions must be more flexible “so that learning can fit more seamlessly with other activities.”²⁸

2. Technological and Systemic Limitations

Organizations fight a constant uphill battle to use information and communications technologies most effectively for their business processes, and many see LTs as posing unwanted technological demands on their already stressed systems.²⁹ Technological issues include software and hardware compatibility and low bandwidth.

Organizations need to integrate LTs with current systems and so have to keep in mind software and hardware compatibilities and capabilities. When turnkey, off-the-shelf LTs are used, organizations not only have to ensure that they have the technological capacity to run them, they also have to iron out licensing agreements, and train staff on how to use and customize LTs where necessary. As well, much LT, like off-the-shelf software in general, has a short life cycle that requires continuous upgrade and replacement. Proprietary systems, while attractive because they are customized to in-house systems and needs and are often more robust, are more difficult to price and can run into unforeseen delays.

Organizations may also view LTs as an unnecessary load on current ICT capacity. LTs may be prone to system crashes and, for networked learning, low bandwidth and “brown-outs.”

Another technological challenge is the issue of technical support for LTs, especially for proprietary LTs. If there is a problem with the LT, employers want to know that they can obtain help, and some suppliers of LTs may not offer any technical support to users. This frightens some employers away from using LTs as a training solution.

3. LTs Too Difficult to Use

Some employees don’t know how to use PCs or do not yet enjoy access to one. As the Conference Board’s Stephanie Harris-Lalonde notes, “the higher the level of technology used, the more skilled the employee needs to be in order to access the

²⁶ Van Buren; Wagner

²⁷ *Adult Education and Training Survey*, p. 90

²⁸ Winer, Rushby & Vasquez-Abad, p. 4.

²⁹ Wagner argues the barriers as being limited bandwidth, lack of sufficient up-to-date equipment, newness of authoring systems, unreliable links and lack of internet skills.

training.” This may be a barrier to training to “employees in lower paid, lower skilled occupations who may have less know-how to access training via learning technologies.”³⁰

The design of LTs can be a barrier to employee use. Where a complex design of the operating system requires relatively advanced technical knowledge to operate it, or the software or learnware requires relatively advanced language and number skills to understand directions and complete learning activities, some employees will not be able to use LTs to good effect.

One of the most important cultural characteristics of an organization is its *general* ability to utilize technology. One analyst labels the degree of sophistication of an organization’s technical capacity and the application of this to training *organizational technology capability*.³¹ As organizations become more sophisticated, they move from disorganized, sporadic training to developing policies for using LTs, to institutionalizing their policies through action.

4. Outcomes Not Evaluated

Learning technologies may enable highly effective training and skills development but if the learning gains are unmeasured, employers and employees will be less inclined to participate and believe that LTs work. Measuring the effectiveness of LTs can be difficult and is another design challenge, one shared by other types of training and workplace strategies.

5. Resistance to Change

While cost, technological, access and design barriers can hobble an LT solution before it begins, internal barriers within the employer’s organization can impede LT solutions that get past these hurdles. An ASTD survey of executives found that 82 per cent of chief executives and 92 per cent of HR executives agreed that investing in LT was important, but only 26 per cent of the former thought it was very important as opposed to 70 per cent of the latter.³² This illustrates some of the barriers implicit in getting an organization to embrace change and innovation as well as some of the barriers that HR executives face in relation to their management colleagues.

Resistance from managers is a critical barrier to successfully implementing LTs. No matter how well planned and well aligned an LT solution, if managers resist it, it is likely to fail. Managers may resist an LT if they feel it creates more problems than it is designed to remedy or if they simply don’t know how to use it.³³ Often, employees will

³⁰ Harris-Lalonde. P. 2.

³¹ Deborah Schreiber. “Organizational Technology and Its Impact on Distance Training,” in *Distance Training: How Innovative Organizations Are Using Technology to Maximize Learning and Meet Business Objectives*. Deborah A. Schreiber & Zane L. Berge, eds., (San Francisco: Jossey-Bass Publishers: 1998), p. 12

³² Van Buren.

³³ Souque, 1996.

not feel comfortable using it where their managers disapprove of it. A further issue that hinders organizations is what the Rand Corporation calls the “Rand rule.” It argues that if a technology is used to transform learning processes and products, 75 per cent of the total time doing so will be spent attending to non-technical, often complex, and frequently invisible changes in institutional practice and structure.³⁴

6. Lack of Planning

A lack of alignment and planning between the human resources and training staff and the technical and information technology staff can also hinder LTs. A successful LT solution relies on strong ties with the IT function.³⁵ If these organizational functions are not working in tandem, then the LT solution can become mired in confusion, delay and breakdowns. Many barriers follow from a lack of strategic planning and direction, resulting in questioning of the value of LTs to the organization and a lack of alignment with the organization’s goals. Organizations that do not assess their strategic training needs before implementing LT solutions are not well equipped to derive the most value from these, and fail to achieve aligned training outcomes between employees and the firm.³⁶ As one AT&T manager noted about using networked LTs, “this may be the first real technology that encourages true organizational learning. It opens a business and creates a knowledge sharing, rather than a knowledge hoarding culture. There is resistance, as there would be for anything new, but it will fade over time.”³⁷

7. Lack of Communication

Poor communication of the LT solution to managers and employees is also a barrier that will impede the best planning and create confusion. Managers and employees must understand how to use LTs, why they are being used and how they fit with the organization’s strategy and operations.

8. Lack of Leadership

Finally, a lack of leadership, especially from senior staff can also present a barrier to effectively using LTs. If there is no LT champion or leader, other initiatives will gain more attention and be more successful.

9. Learner Resistance

Adult learners and employees can be resistant to learning new content or using new methods, including LTs, and may view LTs as a threat to their jobs or knowledge base.

³⁴ David J. McArthur & Matthew W. Lewis. *Untangling the Web: Applications of the Internet and Other Information Technologies to Higher Learning*. Rand Corporation, 1998, p. 37.

³⁵ Tom Barron. “APQC Study: Technology-Based Training Pays Off.” www.astd.org

³⁶ Mark Van Buren. *Mainstreaming Learning Technologies*. American Society for Training and Development www.astd.org/CMS/templates/template_1.html?articleid=11599.

³⁷ Sacha Cohen. “Knowledge Management’s Killer App,” *Training & Development*, January 1998, Vol. 52, Issue 1, p. 50.

As well, employees may resist becoming involved in learning initiatives for a variety of reasons including lack of time and lack of support from managers/supervisors. The AETS found that of those employees who couldn't participate in training, 55 per cent were "too busy" and 29 per cent found the time or location inconvenient.³⁸

Resistance to learning can result from conflict between learner and trainer, and from a fear of failure. Learners may also view LTs with suspicion because they are not given adequate information about what is being taught and why they should learn it. Learners may simply be resisting change and possible inconvenience or alteration of their jobs.³⁹ Another learning barrier is that employees resist using LTs for training. A UBC study found some resistance by learners to LT, specifically telelearning.⁴⁰ The participants found that the time commitment was extensive and felt inhibited by having to post to a common listserve. They were afraid of appearing unintelligent and having their comments scrutinized. They were also afraid of being misunderstood because of the lack of face to face interaction.

Nine Steps to Selecting Learning Technology Solutions

So how does an organization go beyond these barriers to reap the benefits of LTs? How can an employer make a plan to use LTs and pick the right ones for their needs? These are significant management issues that are increasingly preoccupying HR managers.

The Conference Board of Canada identifies "adaptation to new technologies" as the second most pressing HR management issue today, after training.⁴¹ A recent report by the International Data Corporation found that many Canadian organizations are having trouble "keeping up with IT training demands and were beginning to recognize the advantages of anytime, Web-based training."⁴²

Successful LTs are based on learning needs, desired outcomes and technological fit.

Generally, the literature cautions that LTs are not a panacea, that they work best in conjunction with human-mediated training and other technologies. The lack of conclusive evidence that any specific LT is 'the best' is strengthened by the argument that LTs are specific to context and learning needs. **In other words, effective use of LTs must be premised on learning needs, desired outcomes and technological fit.**

The following summarises solutions to effectively using LTs that have been identified by researchers and practitioners, in the 1980s and 1990s and identifies nine

³⁸ Kapsalis, 1996.

³⁹ Masie, p.41

⁴⁰ Silvia Bartolic-Zlomislic. "The Costs & Benefits of Telelearning: Two Case Studies," *Distance Education & Technology*, (Vancouver: The University of British Columbia, 1998).

⁴¹ *The Conference Board of Canada.*

⁴² Colleen McCloy, Ellen H. Julian. *Using the Internet/Intranet to Deliver Training Services to the Canadian Market.* (International Data Corporation – IDC. Report #W18623, December 1998, www.itresearch.com).

steps for employers to follow in managing the LT selection and implementation process. (A subsequent section deals with specific learning technologies).⁴³

1. *Figure Out What Your Organization and Your Employees Need*

Employers should conduct needs assessments of their organization, its current information and communications technology capacity and the learning needs of employees. The gaps in these needs then have to be determined and prioritized to guide the selection process. Successful delivery of programs depends as much on the recipient as on the method and the content. The ASTD argues that firms need to “focus on how individuals learn, *then* use technology to provide a learning environment.” (italics theirs)⁴⁴ As the Office of Partnerships for Advanced Skills advises, “effectiveness...is dependent on the appropriateness of the technology to the content and to the learners’ requirements.”⁴⁵

2. *Figure Out What Your Technology & Infrastructure Can Do*

Organizations must assess their technological requirements and limitations when considering LTs. This may involve taking an overview of workplace information and communications technologies and structures, operating systems and storage capacities, computer literacy of the employees, bandwidth of the firm, networking capabilities, workstation capabilities (such as CD-ROM drives), and clarifying intellectual property and licensing issues. As a recent study by the American Productivity and Quality Center notes, the success of LTs relies on strong ties with the information and communications technology provider, and flexibility in developing and deploying LTs according to demand.⁴⁶

3. *Select the Learning Technology Solution*

Once an organization knows what it needs and what it can handle, the LT solution can be selected. Matching the right LT to the needs of employees and the organization is critical. The ASTD found that many executives are ready to use LTs but hesitate because they don’t know how to make a choice. The biggest challenge they face is keeping pace with change yet the least accessible information is how to chose a LT solution.⁴⁷ Today, a number of models and guidelines are available to help employers select effective LT solutions.

⁴³ Schreiber and Berge present a similar model, p. xvii. Their guiding principles are: analyze business needs; identify strategic distance training events and programs; apply conceptual frameworks of learning to distance training; identify and select delivery tools (develop organizational technology plan); correlate distance learning instructional materials to technology delivery tools; secure implementation support; implement a balanced roll-out strategy; and evaluate distance learning processes and measure transfer.

⁴⁴ Koonce. ASTD

⁴⁵ *Effectiveness of Learning Technologies*. p. 3.

⁴⁶ *Technology-Based Training: Global Strategies for Learning*, (American Productivity and Quality Center)

⁴⁷ Van Buren, *Mainstreaming Learning Technologies*.

Tony Bates offers one such method for decision-making. Bates recommends that managers and educators employ the ACTIONS method for selecting LTs:

- Access (how accessible and flexible is the technology);
- Costs (costs for technology and per learner);
- Teaching and learning (types of learning needed);
- Interactivity and user-friendliness (interaction and use);
- Organizational issues (organizational requirements and barriers);
- Novelty (newness of technology); and,
- Speed (quickness of implementation and content modification).⁴⁸

The Conference Board of Canada also identifies criteria that HR managers can use to identify and choose external providers of training.⁴⁹ A study of best practice organizations by the American Productivity and Quality Centre found that organizations were defining their LT in terms of compatibility and standardization of software and hardware. The Office of Partnerships for Advanced Skills' provides a model based on "decision filters". The five filters are Content requirements, Learners' requirements, Delivery formats, Resources and Cost Analysis.⁵⁰ Checks and questions that employers need to consider are:

- desired level of interactivity (one-way vs. two-way, networked vs. stand-alone),
- the level of complexity,
- how frequently the LT change,
- consideration of the characteristics of the learners (current skills, geography),
- time (frequency, quickness of delivery),
- current and future technological capacity and flexibility, and
- support capacity and costs.⁵¹

4. Don't Forget About Human-Mediation

Employers should recognize and build upon the capacity of current staff to support employees' learning. The place of human-mediated learning in conjunction with LTs has changed but is still valuable.⁵² Human mediation is key to ensuring that LTs fit learners' needs. Roger Schank, an expert on using technology for employee learning argues that learning facilitators need to get involved in the design process so that designers and technical people understand the learning needs of those who will be

⁴⁸ A. W. Tony Bates. *Technology, Open Learning and Distance Education*. (New York: Routledge, Studies in Education, 1995), p. 1.

⁴⁹ Dave McIntyre. *Outsourcing: Getting the Most from Your Training Dollar*, (Ottawa: The Conference Board of Canada, 1996), p. 5.

⁵⁰ *Effectiveness of Learning Technologies: The Costs and Effectiveness of Technology-Based Approaches to Teaching and Learning*. Office for Partnerships for Advanced Skills, April 1998.

⁵¹ Office for Partnerships for Advanced Skills, 1998.

⁵² Koonce. ASTD. Elliot Masie. "Seizing Your Intranet," *Training and Development*, February 1997, Vol. 51, Issue 2, p. 51.

using the technology.⁵³ Human mediation is significant to the initial design of LTs, and in the actual facilitation and application of learning through LTs. One key to effective LTs is finding technical people who can understand employees' learning needs and can work well with designers of workplace learning programs.⁵⁴

While facilitators should be involved in design, they also need to be taught to use LTs so well that it becomes second nature. "Training the trainer" is a twist in the literature on this issue. There is evidence that facilitators of the learning process will need additional competencies and must adapt current ones in order to facilitate effectively using LTs. For example, the ASTD offers thirty-one competencies for trainers using LTs under the headings of general competencies, management competencies, distribution method competencies, and presentation method competencies.⁵⁵

5. Improve Access to and Availability of LTs

Employers can select LTs that are easy to use, increase their availability and promote their use. They can increase access by making more hardware and software available, increasing bandwidth, improving technical support and providing dedicated time and space to LTs for their employees. Employers can provide more opportunities for employees to use LTs, during and outside of normal work hours.

6. Align Learning Technologies with Organizational Needs

Learning technologies should match strategic organizational needs and plans.⁵⁶ Rolling out an LT solution should include a budget, ICT framework, links with management responsibilities and performance management. The LT plan should be disseminated to all managers and employees and led by a senior manager. Communicating an LT initiative and how it fits in the organization is imperative to its success. The literature notes the importance of planning, especially on a strategic and organizational level, and the importance of setting objectives, targets and goals.^{57 58} These steps are essential to ensure that money is not wasted.⁵⁹

⁵³ Theresa Minton-Eversole. "Roger Schank Talks Training," *Technical Training*, www.astd.org. See also, Roger Schank, *Virtual Learning: A Revolutionary Approach to Building a Highly Skilled Workforce* (New York: McGraw-Hill, 1997).

⁵⁴ Koonce.

⁵⁵ *ASTD Models for Learning Technologies: Roles, Competencies & Output*

⁵⁶ Rachel Borowoski. "Effective Training Leads to Workplace Excellence, Achievement." *Business Journal*, Issue 322500, 08/16/99, p.14.

⁵⁷ Masie, p. 260.

⁵⁸ Richard Lytle. "One-way Learning Networks for Knowledge Workforce Learning." *Journal of One-way Learning Networks*, Volume 3, Issue 1, May 1999.

⁵⁹ Masie, p. 79.

7. **Secure Corporate Culture and Management Buy-In**

Having a corporate culture and management that encourages the use of LTs is essential to the success of LTs. Initially, a champion from the executive ranks is often necessary to overcome organizational barriers and resistance towards LTs. Schreiber and Berge suggest that for LTs to become short-and long-term successes, an organization “must evolve beyond individual championship. However, at start up this focus is critical.”⁶⁰ Schreiber notes that effective use of LTs “requires not only a new organizational chart but often a transformation of the corporate culture itself.”⁶¹ Involving managers early in the planning process, as part of a cross-functional planning committee, is a good way to encourage broad management support for LTs.⁶²

8. **Determine What Works and Fix What Doesn't**

Despite increasing awareness among employers of the importance of measurement, “only 1/3 of organizations surveyed can put a precise figure on their training costs.”⁶³

The WTS found only one-third of Canadian employers track training expenditures and less than half measure training impacts.¹

Organizations need these data to assess effectiveness, productivity, employee retention, costs and for continuous evaluation of LT

solutions, just as they do for all their learning and training methodologies. Employers have no definite way of knowing that a learning technology works if they are not measuring it on a consistent basis. Evaluating the financial and learning effectiveness of LTs is key to establishing and improving their use in training. To measure LT performance, employers should collect data and set clear indicators, including usage, training scores and learner evaluations of the LTs. These data can be used for continuous improvement of training and delivery.

9. **Develop Partnerships with Experts, Schools and Other LT Users**

Employers with smaller budgets can get around the limitations of LTs by partnering with other organizations or educational institutions. Roger Schank observes that partnerships are sometimes flawed because the wrong model is used for the learning process, such as classroom formats for workplace related training.⁶⁴ But, partnerships in general are an important solution to lack of know-how or funding and can bring all parties who are involved in the lifelong learning process to the table.

⁶⁰ Schreiber in Schreiber & Berge, p. 395

⁶¹ Schreiber, p. 17.

⁶² Schreiber echoes this sentiment in Schreiber & Berge, p. 398

⁶³ Souque, 1996.

⁶⁴ Theresa Minton-Eversole. *Roger Schank Talks Training*. Technical Training, ASTD, www.astd.org

Technology Options

So, what learning technologies do employers favour? While two-way LTs are gaining ground because of their interactive nature and because of the uptake of networked technologies by firms, one-way solutions are still favoured and useful for some situations.⁶⁵ Both types of LTs, especially in conjunction with human-mediated learning, can offer effective solutions for employers. But employers have to beware of becoming transfixed by the glamour of technology as “fascination with what technologies can do may actually confound a practitioner’s emphasis on exploiting technologies to maximize teaching and learning outcomes.”⁶⁶

The table below presents technologies in terms of their type of interaction. The table’s authors say, “there is no one ‘best’ technology. Each technology has different characteristics – strengths and limitations – that make it more or less appropriate for a given learning need.”⁶⁷

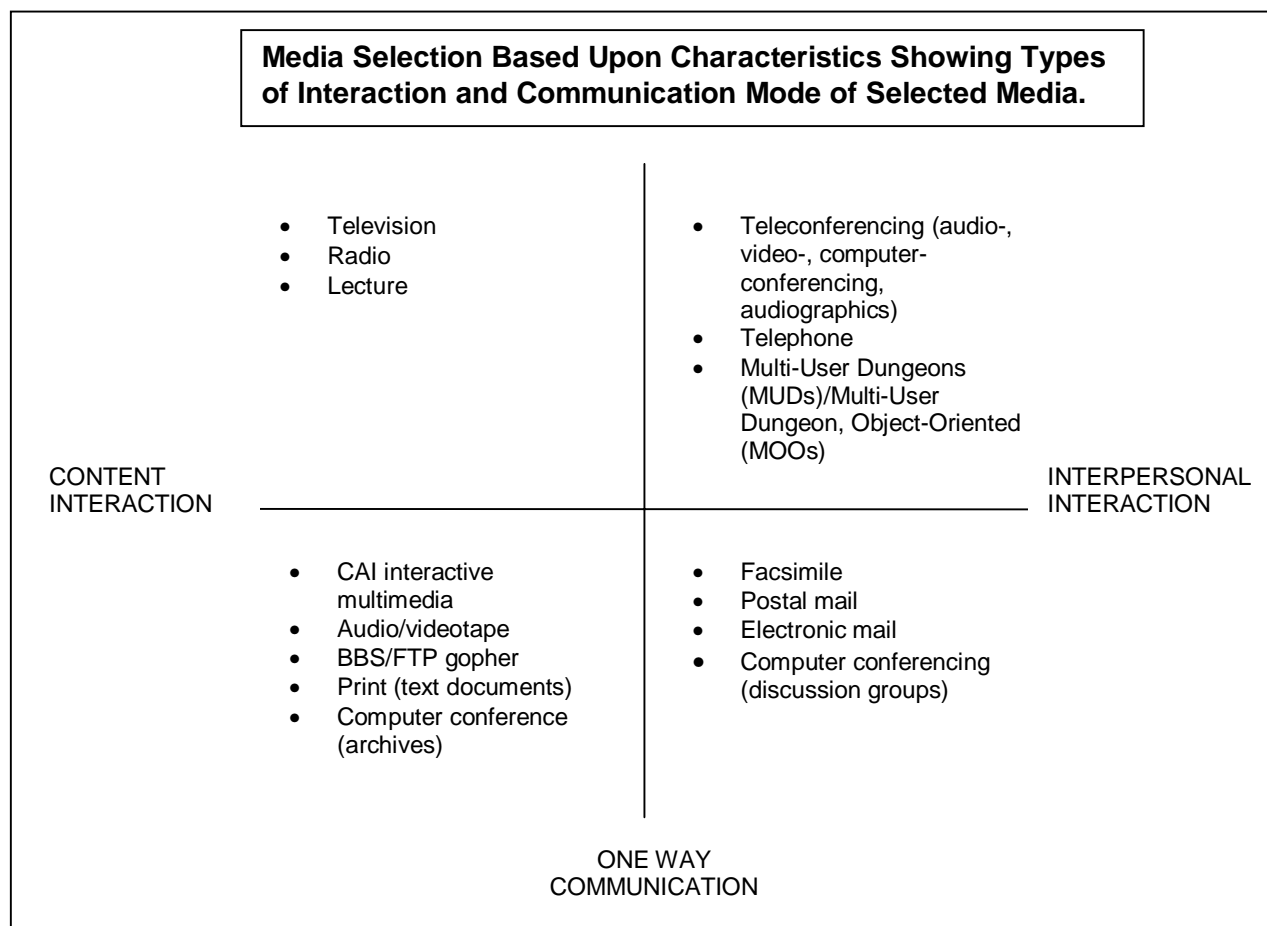
Type of Interaction	Learning Technologies ⁶⁸						
	Audio	Data	Video	Type of Message			
				Audio/Data Examples	Video/Data Examples	Audio/Video Examples	Audio/Video/Data
One-way	Audiotape, radio broadcast, dial access audio resources Voice mail	Computer-based training, videotext, bulletin boards, internet e-mail, internet	Videotape, video broadcast, one-way video, video on demand (VOD) Video messaging	Audio programs supplemented by on-line access to WWW resources Audio programs supplemented by e-mail, voice mail	Video programs supplemented by CBT, videotext, WWW resources Video programs supplemented by E-mail, video messaging	Audio or video programs supplemented by audiotapes or videotapes, dial access, audio, VOD Audio or video programs supplemented by voice mail or video messaging	Multimedia programming Multimedia messaging
Two-way	Phone, audioconferencing	Telecollaboration, internet	Interactive visual distance learning (IVDL), two-way video	Audiographics, personal computer application sharing, telecollaboration	Video programs supplemented by telecollaboration	Audio or video programs supplemented audioconferencing or IVDL	Interactive multimedia telecollaboration

⁶⁵ Ellen D. Wagner. “Interactivity: From Agents to Outcomes,” in Cyrs, p. 19-26.

⁶⁶ Wagner in Cyrs, p. 21.

⁶⁷ Chute, Thompson & Hancock, p. 25.

⁶⁸ Modified from Alan G. Chute, Melody M. Thompson & Burton W. Hancock. *The McGraw-Hill Handbook of Distance Learning*, (New York: McGraw-Hill, 1999), p.24



One-Way Learning Technologies

Examples of one-way learning technologies include CD-ROM, e-mail, radio, and television.

While one-way LTs do not allow for live communication or collaboration, this drawback can be an advantage. The stand-alone nature of one-way LTs such as CD-ROM gives learners flexibility and convenience. Employees does not have to rely on a network of real-time colleagues and trainers to train them, hence allowing them to independently design their schedule and pace of learning. Jean Lumb notes the potential of hypertext resides in its ability to mimic and mirror how people learn and think by “explicitly mapping the semantic network of an expert on the hypertext, learners may come to think like an expert more readily.”⁶⁹ Virginia A. Ostendorf describes some of the challenges involved in using television for teaching and notes that

⁶⁹ Jean Lumb. “Thinking Styles and Accessing Information on the World Wide Web.” <http://computed.coe.wayne.edu/Vol2/lumb.html>

it “can only succeed when the remote learner is at the center of everything.”⁷⁰ Keegan and Rose argue that CDs are best used for knowledge and awareness training.⁷¹

One example of how a one-way learning technology can fit specific needs is a telecourse provided by the British Columbia Open Learning Agency over its educational television service. This course, for entrepreneurs and small business owners whose work habits and business pressures make it difficult for them to access traditional educational services, allowed them to learn within their own space at their own pace. Another initiative by the British Columbia Construction Industry Skills Improvement Council met the need for skills upgrading of construction worker who are resistant to traditional, classroom-based learning. The Council provided customized computer-based training programs that were available through a training facility six days a week at the workers convenience. The positive aspects of this initiative included individualized programs, shorter learning times and increased skill retention.⁷²

Two Way Learning Technologies

Examples of interactive, two-way learning technologies include web-based training, internet, intranet, Wide area networks (WAN), Local Area Networks (LAN), interactive TV, videoconferencing and teleconferencing.

Two-way LTs add value to employee learning because its interactive nature simulates the communication and collaboration of the work process.⁷³ Live learning of a collaborative, team-based, just-in-time nature is also attractive to employers because it is a method that provides immediate feedback and recognition of learning. One of the greatest benefits of two-way LTs is that they can provide a quick response to the immediate needs of the workplace and can train large numbers at once.

While LTs in the workplace are relatively new, some organizations have been progressive in their use and the Royal Bank, whose Learning Institute won an award from the ASTD for its use of LTs, are employing LTs in their training practices.

The recent trend in LTs is Electronic Performance Support Systems (EPSS). These just-in-time learning solutions reconcile formal learning with on-the-job learning; employers access the information as they need it. According to the American Society for Training and Development (ASTD), “the rapid pace of changes requires that workplace learning occur on a just-in-time, just-what is-needed basis.”⁷⁴ For examples of EPSS and many case studies visit www.epss.com

⁷⁰ Virginia A. Ostendorf. “Teaching by Television,” in Cyr, p. 51-52

⁷¹ Linda Keegan and Sherri Rose. “The Good News About Desktop Learning” *Training & Development*, June 1997, Vol. 51 Issue 6, p. 24.

⁷² Open Learning Agency. *Instructional Technology Showcase* brochure.

⁷³ Koonce. www.astd.org

⁷⁴ Laurie J. Bassi, Scott Cheney, Mark Van Buren. “Training Industry Trends 1997,” *Training and Development*. (ASTD, November 1997), p. 47.

Northwood Pulp and Timber developed an interactive video instruction tool to train sawmill and forestry operations supervisors in remote locations. While geography and travel drove up the costs of traditional face-to-face training, Northwood used interactive video instruction that provided targeted, flexible training that greatly reduced travel time and production down time.

Olgren argues that that effective use of the telephone for teaching relies on awareness of the medium's limitations and strength, design appropriate to audio medium, engaging learners through effective teaching and humanizing methods, and managing the on-line environment. Olgren outlines steps to carry out before and during teaching. She stresses that teaching by telephone has the capacity to humanize learning and that the key to its success rests in understanding and using that capacity.⁷⁵ June Lee suggests that where computer-based instructional simulations are used, hybrid simulations involving presentation and practice, not one or the other, are more effective.⁷⁶

In addition to the growing use of LTs, the types of LTs being used are also changing. While the Conference Board of Canada found, in 1996, that the most used technologies were one-way, stand-alones such as CD-ROMs and the least-used was networked learning, recent research reveals a rapid growth in networked learning.

⁷⁵ Olgren "Teaching by Telephone," in Cyrs, ed. p. 65.

⁷⁶ June Lee. "Effectiveness of Computer-Based Instructional Simulation: A Meta Analysis," *International Journal of Instructional Media*, Vol. 26 (1), 1999, pp. 71-85.

Conclusion

The most successful 21st century countries will focus on lifelong learning; the most innovative of these will use learning technologies to do so...

The most successful countries of the 21st century will focus on lifelong learning; the most innovative will use learning technologies to do so, according to many analysts. They reason that a well-trained labour force that consistently learns new skills will drive economic prosperity to new heights, and see LTs as the new tools that will enable most employers to ensure their employees gain those skills. They also argue that LTs will be the tools of choice for 21st century employees who need access to flexible, just-in-time learning systems.

Infinite Value of Knowledge and Human Capital

Economists like Paul Romer believe that knowledge and human capital can yield infinite outputs, compared with the finite outputs of traditional factors of production. Human Resources Development Canada echoes Romer's argument that the knowledge-based economy has unlimited possibilities for growth: "knowledge is a key determinant of sustained economic growth because knowledge, unlike other factors of production, is not subject to diminishing returns."⁷⁷ But the importance of knowledge and human capital development is not limited to academics and government policy makers. Books such as journalist Thomas Stewart's *Intellectual Capital* have provoked recognition and discussion in the broader business community on how to capture, nurture and value knowledge and human capital. Of the two, developing human capital by nurturing people's skills and knowledge is the more pressing need. Learning technologies are a vital key to meeting the challenge.

Canada's population is among the most educated in the world. It has the highest levels of post-secondary education participation and education attainment in the OECD. As Canadians move from school to work to join those already employed, LTs can sustain their lifelong learning and continuously enrich and extend the human resource capacity that Canada has invested in. New and improved LTs will meet the constant demand for quicker and better renewal of knowledge and will powerfully buttress future human capital development. Statistics Canada observes that,

... increasingly, human resources are seen to be the lifeblood of a growing economy, along with technological advancement. This view has led to calls for greater attention to the management and development of human resources. Education and training are increasingly seen as a central policy prescription for improved prosperity.⁷⁸

⁷⁷ Applied Research Branch, Strategic Policy, Human Resources Development Canada, *Technological and Organizational Change and Labour Demand: The Canadian Situation*, R-97-1E, October 1996.

⁷⁸ *The Evolving Workplace* – Catalogue No. 71-583-XPE, Statistics Canada, p. 2

Learning Technologies Stimulate Lifelong Learning

The Adult Education and Training Survey results argue a “greater use of new technologies in the delivery of education and training” is a key to “reduc(ing) or eliminat(ing)...training barriers.”⁷⁹ LTs can contribute significantly to creating a lifelong learning culture, and make adult education and training more accessible to everybody, whatever their residence, their age or their employment status.

LTs can be combined with human mediation to greatly heighten the learning gains of workers.

While LTs won't replace human mediated learning, they are an excellent complement to it, and sometimes the best means for employees to learn. In many cases, LTs can be combined with human mediation to greatly heighten the learning gains of workers. In work environments where more

traditional forms of learning are not appropriate or where geography limits training, LTs can fill the special needs.⁸⁰ As an added benefit, LTs build knowledge in a way that accommodates changing learning, living and working patterns. As Betcherman et al. suggest, “new participation patterns are altering the rhythms of learning and working ... requir(ing) *more flexibility in terms of both delivery methods and when people can access training* (their italics).”⁸¹

Implementing Cost-Effective LTs

Academics and researchers are continually developing new methods and theories about using LTs for all manner of learning needs. More and more employers believe that LTs provide a cost effective, reliable, innovative, measurable and integrated method for training employees. The maximum value of LTs is gained when they are used as part of broader organizational plans, with trainers who are taught how to use them effectively. Many researchers agree that effective LT solutions need:

More and more employers believe that LTs provide a cost effective, reliable, innovative, measurable and integrated method for training employees.

- to follow from a thorough assessment of organizational and employee needs
- to be supported by managers and the performance review process
- to be situated within an aligned implementation plan
- to be continuously evaluated for cost effectiveness and learning outcomes
- to be designed and facilitated with adult education expertise

Linked by evaluation, planning and communication with strategic organizational and employee needs, and working environments, LTs are often the best way to train. Leading Canadian employers have already used a wide range of LTs to meet their training needs and ensure the capacity and satisfaction of employees.

⁷⁹ Adult Education and Training Survey, p. 99

⁸⁰ Applied Research Branch, p. 50.

⁸¹ Betcherman et al, p. 4

Having observed the growth of employer interest in LTs and summarized research findings about their value, it remains to be noted that LTs are not *yet* a universal choice for solving all the problems faced in increasing learning in Canada's workplaces. In fact, the literature review has identified several major challenges to overcome before LTs can be expected to reach anything near their potential as a source of learning solutions for the vast majority of Canada's adult working population.

Managing Learning Technologies

There are two key barriers to employers using LTs. The first is the lack of awareness of the economic benefits and cost effectiveness of using technology to build employees' knowledge and skills in and for the workplace. The second is the practical difficulties employers face in accessing, assessing and selecting appropriate learning technologies for their own workplaces.

The Solutions for Employers Tool will encourage both employers and employees to consider LTs as an option whenever they want to gain knowledge or skills in the workplace.

The Conference Board is investigating these barriers in order to create a decision-making tool for selecting LTs that will contain practical solutions for overcoming these barriers. By defining the benefits of LTs and enabling effective choices, it is hoped that the *Solutions for Employers Tool* will encourage both employers

and employees to consider LTs as an option whenever they want to gain knowledge or skills in the workplace.

**You can access and download the *Solutions for Employers Tool*, for free, on the Conference Board of Canada's website:
www.conferenceboard.ca/nbec/pbs.**

The Tool will be available on-line in May, 2001.

Appendix

Adult Learning

Adults learn differently than young people. European adult educators have labeled this adult learning mode *andragogy*, as opposed to *pedagogy*, the art and science of teaching children.⁸² Adults, according to Masie, respond to functionality as opposed to children who respond to stimulation.

The dominant learning theories of the 20th century have been cognitivist, behaviourist, and positivist in approach. The behaviourist approach of practice, reinforcement and feedback is intended to enlarge learning and memory so action becomes automatic. Cognitivists add purpose and understanding. Positivists use objectives, with an emphasis on competence, context and role conception.

An alternative learning theory, constructivism, is gaining favour amongst psychologists and educators. Constructivism is premised on the active participation and reflection by the learner and recognizes the flexible and dynamic nature of knowledge. It relies on social interaction and views learning and understanding as products of the individual's creation of meaning from experience and prior knowledge. Each individual constructs meaning in interaction with their environment, learning through interaction and in meaningful contexts. Constructivism's supporters argue that it develops adaptive learners who function well in difficult, changing environments that require interaction to solve ill-defined problems."⁸³ Adult education and training is tending towards constructivism as the approach best suited to meeting workplace learning needs.

How adults think should be considered when designing and delivering curriculum. There are four categories of how adults think. Reflective thinkers look at information subjectively, relating it to their own experience and are highly participatory. Conceptual thinkers prefer to get their information in pictures, maps and models and favour organized and logical information. Practical thinkers are concerned with essential information that relates to their specific needs on the job and prefer hands on training. Creative thinkers bore easily, enjoy challenges, often experiment with information and prefer unstructured, unguided practice.⁸⁴

People learn differently and have varying degrees of confidence with the information and communications technologies that are used in LTs. As Masie points out, adults tend to be self-directed rather than dependent, bring a lifetime of experience to learning and dislike memorization or being told to memorize. These characteristics

⁸² Elliot Masie. *The Computer Training Handbook: Strategies for Helping People to Learn Technology*, (Minneapolis: Lakewood Books, 1997), p. 27.

⁸³ Winer, Rushby & Vazquez-Abad. P. 24; Berge, p. 20

⁸⁴ Masie, p.59.

need to be taken into account in designing LTs to ensure the effectiveness and absorption of learning. Berge notes three other important factors to consider in designing training: the type of *interaction* students engage in, the *synchronicity* of interaction when it involves interpersonal communication and the amount of *control over the content and pace of instruction*.⁸⁵

In a seminal 1974 study, Wilbur Schramm of Stanford University found that no single technology could solve all problems; variation in learning depended more on how a technology was managed, organized and represented in context rather than which one was used. Reviewing Schramm today, Wolff feels that his work is still relevant and that while technology has become cheaper, more flexible and more interactive, the same principle applies. Learning using technology still depends more on how it is planned and managed than on the choice of technology.⁸⁶

Wolff further points out that the motivation to learn, the ease with which the teacher uses the technology (complementarity), and organizational support and leadership are fundamental to use LTs effectively. Similarly, Sanders notes, “the quality of instructional design is much more important than the method in which it is delivered.”⁸⁷

Evaluation and Measurement

Types of measures in use are changing from number of hours spent in training and other input data to measures of cost, benefit and return on investment (ROI). Cost and ROI issues are the top concerns for training and development and is the most frequently measured of all HR services.⁸⁸ Despite this trend towards ROI, conventional accounting only measures the costs of workplace learning.⁸⁹

Evaluation methods, based on Total Quality Management principles, are available from such organizations as the ASTD and the American Productivity and Quality Center (APQC). In 1959, Donald Kirkpatrick set out one of the main evaluation methods used by human resource professionals.⁹⁰ Kirkpatrick’s Evaluation Framework for evaluating training remains the standard and features four levels of evaluation: reaction (how well participants liked the program); learning (knowledge gained by learners); behaviour (positive changes in work performance due to learning); and, results (impact of learning on performance of organization and employees). An ASTD 1997 HRD Executive Survey found that 67 per cent of organizations used the Kirkpatrick Model for evaluations of training.⁹¹

⁸⁵ Berge, p. 27

⁸⁶ Laurence Wolff, “Instructional Technology: Then and Now” *TechKnowLogia*, September/October 1999

⁸⁷ Leanne Eline, *A Trainer’s Guide to Skill Building*, (ASTD, www.astd.org)

⁸⁸ Souque, 1996.

⁸⁹ Betcherman et al, 1998, p. 7

⁹⁰ For more on this framework see <http://learnnet.gc.ca/eng/rescentr/fulltx/value-2.htm>

⁹¹ *National HRD Executive Survey, Measurement and Evaluation*. 1997 Fourth Quarter Survey Report, www.astd.org

For managers who are concerned about the cost and financial value of LTs, evaluating and calculating financial returns is critical. Jack J. Phillips, who wrote two classics in training and evaluation, *Return on Investment*, and the *Handbook of Training Evaluation and Measurement Methods*, reinforces the importance of measurement and evaluation in his recent book *HRD Trends Worldwide: Shared Solutions to Compete in a Global Economy*.⁹² He ranks the top three worldwide human resource trends as the monitoring of training and development costs, the measurement of return of investment in training and development, and systematic evaluation processes to measure the success of training and development.⁹³ Masie advises a simple way of assessing training costs: Learners' salaries + Trainer's salary + Developer's salary + Materials + Equipment + Facilities + Travel + Supervision + Support = Total Training Cost.⁹⁴ Schreiber warns that organizations must not forget to include marginal costs in ROI calculations. She further argues that the result of doing so is a "projected ROI for distance training that is significantly lower than anticipated."⁹⁵

In addition to evaluating LTs financially, they must be evaluated for their learning effectiveness. The Process/Outcome Evaluation Model (POEM) assesses not only what is learned, but also how this learning occurred. Kovalik and Dalton propose that this is a very effective evaluation method when LTs are used for training because the learning process, especially with LTs, is as important as the outcome. As well, Kovalik and Dalton note that LTs facilitate evaluation by capturing data on learner progress.⁹⁶ Masie notes that evaluation of LTs must be conducted on five levels:

- learner performance
- instructor performance
- course
- software/hardware
- managerial/environmental factors.⁹⁷

Schreiber cautions that while practitioners focus on terminal training outcomes, "minimal attention is being paid to the process of transfer of learning from distance instructional events back to the workplace."⁹⁸

⁹² Jack Phillips. *HRD Trends Worldwide: Shared Solutions to Compete in a Global Economy*, (Houston: Gulf Publishing Company, 1999), p. 10. *Handbook of Training Evaluation and Measurement Methods*. (San Diego: Gulf Publishing Company, 1983). *Return on Investment in Training and Performance Improvement Programs*. (Birmingham: ProPress, 1997).

⁹³ Phillips, *HRD Trends Worldwide*, p. 10.

⁹⁴ Masie, p.255

⁹⁵ Schreiber in Schreiber & Berge, p. 396.

⁹⁶ Cindy L. Kovalik & David W. Dalton. "The Process/Outcome Evaluation Model: A Conceptual Framework for Assessment," in the *Journal of Educational Technology Systems*, Vol. 27 (3), 1998-99, p. 185

⁹⁷ Masie, p. 221; Michael R. Simonson. "Evaluating Teaching and Learning at a Distance," in Cyr, pp. 87-94.

⁹⁸ Schreiber in Schreiber & Berge, p. 408

Glossary of Learning Technology-Related Terms

Analog: A signal that is received in the same form in which it is transmitted, while the amplitude and frequency may vary.

Asynchronous: Communication in which interaction between parties does not take place at the same time.

Asynchronous Transmission Mode (ATM): A method of sending data in irregular time intervals using a code such as ASCII. ATM allows most modern computers to communicate with one another easily.

Bandwidth: Information carrying capacity of a communication channel. The greater the bandwidth, the greater the carrying capacity. Often used in reference to Internet access.

Browser: Software that allows you to find and see information on the Internet.

Chat (Internet Relay Chat or IRC): Chatting is real-time, interactive online conversations on the Internet, allowing Internet users to join theme discussions or post comments on their screen at the same time as other participants. Chatting can also include communication in virtual reality environments using avatars (the virtual representation of the user by a 2D or 3D character).

Compressed Video: Video signals that are downsized to allow travel along a smaller carrier.

Computer Assisted Instruction (CAI): Teaching process in which a computer is used to enhance the learning environment by assisting students in gaining mastery over a specific skill.

Desktop Videoconferencing: Videoconferencing on a personal computer.

Dial-Up Teleconference: Using public telephone lines for communications links among several locations.

Digital: An electrical signal that varies in discrete steps in voltage, frequency, amplitude, locations, etc. Digital signals can be transmitted faster and more accurately than analog signals.

Distance Education: The process of providing instruction when students and instructors are separated by physical distance, involving technology, often in tandem with face-to-face communication.

Glossary of Learning Technology-Related Terms

Distance Learning: The desired outcome of distance education.

Electronic Mail (E-mail): Messages sent from one computer user to another.

Facsimile (FAX): System used to transmit textual or graphical images over standard telephone lines.

File Transfer Protocol (FTP): A protocol that allows files to be moved from a distant computer to a local computer using a network like the Internet.

Fully Interactive Video: (Two way interactive video) Two sites interact with audio and video as if they were located in the same place.

Interactive Media: Frequency assignment that allows for a two-way interaction or exchange of information.

Internet, intranet and extranet: The Internet (Inter Network) is the "mother of all networks." It is an immense computer and telecommunications network that spans the globe. Started by the American military in 1969, as ARPANET, and quickly expanded for use by universities. In 2000, over 80 million Internet users have access to the Net to communicate (by electronic mail), access and download information and files, exchange data files (FTP), publish information (WWW), stage videoconferences, and much more.

Intranets are smaller and more secure versions of the Internet – private internal networks used within an institution or business. Extranets are the gateway to an intranet; remote users can use a network (Internet, dedicated lines, RNIS, telephone lines, etc.) to access the intranet securely.

Interactive communication: Interactive communication brings people together, speeds up information-dissemination and learning processes, and enables users to interact in real-time without distance being an obstacle. Today, two people can develop a product from opposite ends of a continent, benefit from a person's expertise even though they are thousands of kilometers away, and use multimedia elements: sound, video or fixed image, text, sharing of software and much more.

Listserve: An e-mail program that allows multiple computer users to connect onto a single system, creating an on-line discussion.

Local Area Network (LAN): Two or more local computers that are physically connected.

Glossary of Learning Technology-Related Terms

Modem: A piece of equipment to allow computers to interact with each other via telephone lines by converting digital signals to analog for transmission along analog lines.

Multimedia: Any document which uses multiple forms of communication, such as text, audio, and video.

Network: A series of points in different locations connected by communication channels.

On-Line: Active and prepared for operation. Also suggests access to a computer network.

Streaming - Live Radio/Audio and Video: This "continuous" broadcast mode, called streaming, can be found on the Internet and intranets to process data (display images, video, or play sounds or music) before they are fully down or uploaded. The information is compressed at the source, usually by MPEG, then decompressed by the user. Several users can simultaneously view or listen to the posted files. Streaming technology allows the user to listen to, view, and even interact while viewing or listening to multimedia files. The streaming mode is essential for listening to radios, conferences, and television programs live or in delayed broadcast, although the video broadcast quality is entirely dependent on the telecommunication network and the user's hardware (modem, processor, etc.).

Synchronous: Communication in which interaction between participants is simultaneous.

Telecommunication: The science of information transport using wire, radio, optical, or electromagnetic channels to transmit and receive signals for voice or data communications using electrical means.

Telecommunication network: The interconnection of computers, communication, and technology. The Internet is a network of networked computers, a "highway" that enables various media and new telecommunication means to be displayed or broadcast.

Teleconferencing: Two way electronic communications between two or more groups in separate locations via audio, video, and/or computer systems.

Glossary of Learning Technology-Related Terms

Videoconferencing and Desktop videoconference: Videoconferencing makes it possible for two or more people to communicate in real time. There is two-way , sending and receiving of sound and images (video) from different locations. There are two kinds of videoconferencing: personal (or face-to-face) via personal computers; and group (person or persons talking to a group of persons) via a dedicated videoconference system; via monitors or televisions. The basic system includes a monitor (television or computer screen), a camera, a microphone and speakers. Sounds and images are conveyed either by the telephone network, ISDN lines, or more economically, by the Internet. Compression (CODEC) is required to transmit sound and video, because the digital format files are enormous in terms of data (bits).

Video Teleconferencing: A teleconference including two way video.

Virtual Reality and 3D imaging: Consists in the representation of real and imaginary objects or places, in computerized form, to create simulations. It is also known as "web3D. "Entire worlds are created in digital format and made available in video games, on CD-ROMs and on the Internet. The possibilities of virtual reality are endless.

World Wide Web (WWW): Hypermedia system (digital data, audio, video and other media used as hypertext elements) which facilitates searches for information on the Internet. The information available on the Web is presented as Web pages; a set of Web pages constitutes a Web site. A Web page can contain text and still-frame images, animations, video, sounds, etc., and links to other pages. Those links allow users to explore information in a specific order (or randomly) and to interact with the contents of the Web page. Documents on the WWW are published in HTML code and other protocols (DHTML, stream, JAVA, etc.)

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