The Future: Just-in-Time Learning Expectations and Potential Implications for Human Resource Development

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The problem and solution. The expectation for “just-in-time learning” (JIT learning) in the workplace is growing. JIT learning is broadly conceived as anywhere, anytime, anyhow learning that is just enough, just for me, and just in time. However, despite the increasing demand for JIT learning, we are only beginning to comprehend what it is and its implications for the field of human resource development (HRD). This article provides a current perspective on JIT learning and summarizes issues likely to confront HRD practitioners and theorists.

Keywords: just-in-time; technology; learning; performance

The future search conference highlighted the growing demand in the business environment for increasing the speed of learning (Dewey & Carter, 2003 [this issue]; see Article 1 of this issue). The terminology of “just-in-time” (JIT) learning was used to reflect this expectation among the scholar practitioners and academicians engaged in the future search process. The expectation for JIT learning was also linked to three other notable subtrends: the move toward the virtual workplace, the growth of knowledge capital, and the increasing rate of change. Consequently, the rationale for JIT learning emanates more from the concepts of the knowledge-based economy and associated concepts of intellectual capital coupled with communications innovations of information technology (IT). The purpose of this article is to offer a description of JIT learning as well as present three scenarios that depict how technology and human resource development (HRD) can be integrated to maximize JIT learning. Finally, some possible
trends for JIT learning and implications for the human resource development profession are offered.

**Just-in-Time Learning: A Description**

JIT learning is a subjective concept (Paul, 1997) that has not been well defined in the literature, in part because it does not refer to a particular learning theory or method, nor is it embodied in any specific process or technology. In the practitioner literature, JIT learning is often conceived as anywhere, anytime learning that is just enough, just for me, and just in time. Weintraub and Martineau (2002) contend that JIT learning requires nurturing more responsive and innovative behaviors in the time-to-market knowledge cycle as a response to the immediate learning that is required to accomplish work in real time. They suggest that key elements of JIT learning are anticipatory knowledge requirements and capture, knowledge structuring and restructuring, intellectual capital for learning, collaborative learning, modularization, communities of practice, and learning counselors. Traditional HRD practices have often been predicated on determining gaps in knowledge and skills and then developing appropriate learning or performance interventions to address them based on links to organizational plans. However, such approaches are often too slow in today’s competitive marketplace and therefore it becomes incumbent on HRD practitioners to proactively anticipate and identify emergent organizational needs so that such discoveries become the “raw material for learning” (Weintraub & Martineau, 2002, p. 53). Then, structuring that learning so that it is accessible and input into formats that can be quickly used by learners becomes an operational requirement.

In contrast to traditional classroom-based training, and technology-mediated approaches to training, such as e-learning, the concept of JIT learning is more closely associated with informal, learner-driven knowledge acquisition and use (Weintraub & Martineau, 2002). JIT learning is therefore predicated on a framework that attempts to anticipate learning and performance requirements as opposed to being responsive to them. JIT learning is truly learner driven where the control shifts to learners, especially including groups of learners, who create their learning environment, select vehicles for learning, establish priorities and pace, and set expectations for outcomes. JIT learning is viewed as a dynamic and adaptive approach to learning where standards and outcomes are not controlled or contrived by designers, but are considered fundamentally user centered, user designed, and user managed.

Table 1 offers a summary of many attributes concomitant with JIT learning. The trends and phrases used to describe the attributes were collected
from numerous sources, especially from ASTD’s state of the industry report (Van Buren & Erskine, 2002).

The JIT environment is not an alternate means for the acquisition of skills, fundamental knowledge, and attitudes depicted in the left-hand column. Rather, its fundamental applications are focused on real-time creation of knowledge and solutions that cannot be separated from a job function. As Cross (2002) suggests, “Learning and knowledge exist only to improve work. They have no independent existence. It is time for forward-looking organizations to reject the old paradigm and accept nothing less than the full integration of intellectual capital and work” (p. 3).

The authors view JIT learning as a movement or set of concepts that are only beginning to be understood and realized. There is little doubt that the mere existence of JIT learning has technological underpinnings because without the recent advances in information technologies, little of what currently can be characterized as JIT learning would be possible. However, the concept is far broader than its technological infrastructure and has significant social and organizational consequences for its implementation.

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Just-in-Time Learning: Drivers and Enablers

**JIT learning is driven by the knowledge economy, the importance of learning, and the need for speed.** In the past decade, many scholars have acknowledged that we have entered a new economy in which the knowledge embodied in products and services has increasingly become the primary source of wealth creation (Clarke, 2001; Cole, 1999; Organization for Economic Cooperation and Development, 1996; U.S. Federal Reserve, 2001). As a result, knowledge has become a strategically important resource and learning has become a strategic capability (Clarke, 2001; Iles & Yolles, 2002). Organizations have been challenged to leverage learning because knowledge creation and continuous learning at the individual, team, and organizational levels may be the only source of sustainable competitive advantage (deGues, 1988, 1997; Nonaka, 1991; Nonaka & Takeuchi, 1995; Stata, 1989). Therefore, the concept of JIT learning is not an invention of workplace educators and performance specialists within the human resource development field, but rather it is conceptualized as an evolutionary response to the demands of a knowledge-driven and speed-oriented marketplace. As Welch (2001) has articulated, “Know that the ultimate, sustainable competitive advantage lies in the ability to learn, to transfer that learning across components, and to act on it quickly. . . . The opportunities open and close weekly, even daily” (p. 21).

**JIT learning is enabled by IT.** Benson, Johnson, and Kuchinke (2002) suggested that the convergence of the information age and the technology revolution has resulted in an evolving and increasing set of IT tools that HRD professionals have at their disposal in the digital workplace.

Ardichvili (2002, p. 455) outlines key IT tools that are critical to supporting JIT learning:

- Internet and extranet—groupware technology plus access to Web, use of open standards;
- tools for virtual community collaboration—informal systems for sharing tacit knowledge, promote virtual communities of practice, Web conferencing, interactive chat tools, and Voiceover IP (Internet protocol);
- data warehouses—data analysis tools, case-based reasoning, inference modeling that allow for increased efficiency by automating diagnosis, scheduling, and design with applications including customer support, quality assurance, aircraft maintenance, process planning, and decision support;
- Business intelligence systems—agent-based search for synchronous and asynchronous search on Internet with capabilities to match to internal data and integrate with online; and,
tools for generating new knowledge—neural networks, genetic algorithms (experimenting with several simultaneous solutions) fuzzy logic systems.

Whereas much of the work on IT has emanated from information management perspectives, an effective knowledge management process must have a focus on learning. Without a focus on learning, “knowledge management is really only information management or management of potential knowledge” (Carlisle, 2002, p. 39). These technologies are conceived as the means to achieving a goal for a systematic process of acquiring, creating, capturing, synthesizing, learning, and using information, insights, and experiences to enable performance (Gersting et al., 2000, cited in Ardichvili, 2002).

New generations of tools are more responsive to business needs by being able to integrate real-time information sharing among employee groups, knowledge sharing for individuals, teams, and communities, and access to databases of various kinds including employee competency profiles, product and service catalogs, and external resources. However, the resources and power of these tools has yet to be integrated systematically for the support of employee learning applications. One particular trend in the IT field, Enterprise Resource Planning (ERP), though, appears to be moving in this direction with the integration of typical e-learning components into an expanded version of ERP systems, termed Enterprise Application Integration (EAI). The human capital component of these new integrated systems Employee Resource Management (Adkins, 2002a) includes the following terms: human performance optimization, workflow-based personalization, skill-based routing, and workforce optimization. These terms were taken from EAI examples from companies including SAP, PeopleSoft, Siebel Systems, Oracle, IBM, and Sun Microsystems. This integration of IT applications has attributes that are “front line focused, end-to-end best practice processes, collaboration, real-time enterprise, seamless desktop, integrated suite of employee applications” (Adkins, 2002a).

One result of this integration is that the concept of JIT learning is not simply associated with knowledge management tools that lead to knowledge generation and sharing in collaborative work platforms but embeds the tools into the actual work processes.

Case Studies

Three scenarios have been selected to better situate the concept of JIT learning. The three “cases” illustrate three approaches to facilitating and supporting JIT learning within three different organizational contexts.

Brigham and Women’s Hospital. At Brigham and Women’s Hospital in Boston (Davenport & Glaser, 2002), physicians are using a custom-designed
system to improve both hospital and professional practice. The hospital faces issues similar to those found elsewhere—finding means to reduce the number of errors, primarily deaths, that result from misdiagnosis and inappropriate treatment.

This JIT solution was designed to make knowledge readily accessible and embed it into the technology that physicians use on the job. The goals are to make the physician’s job easier by helping avoid mistakes, to learn from other employees’ experiences, and to access information when needed to make decisions. It also provides a convenient means to retrieve up-to-date information on diseases, symptoms, medications, and laboratory tests where relevant information is both massive and in constant flux. In short, it is a real-time knowledge-based order entry, referral, computerized medical record, and event detection system. The technology consists of a knowledge base and logic modules with integrated patient record system, an event management system, and an intranet portal. Results tracked by hospital administrators show that serious medical errors have been reduced by 55%, there are better quality prescriptions, and it saves money by using cheaper and more effective drugs.

Although technical aspects of this JIT solution were important, hospital management views several nontechnical success factors:

- acceptance of the system that resulted in changing work behavior,
- final authority residing with physicians to create a hybrid human computer knowledge system,
- establishment of a culture of measurement, and
- functionality components developed by medical informatics experts and not by information technologists.

The system is dynamic because information entering the system changes the way it performs for the next user, thus not only does the physician learn something from a particular diagnosis or treatment recommendation, the system captures this knowledge for subsequent users. Anticipatory knowledge requirements were built into the system over time through refinements and links to relevant databases for support of improved decision making. Quality and effectiveness of both the new information entered by physicians and its impact on organizational performance is reviewed regularly, with information quality assured by expert review panels and the results tracked for impact on patient care and costs.

*Caterpillar, Inc.* “Communities of knowledge-sharing” is the second generation of a knowledge management effort begun by Caterpillar, Inc. in 1997 (documented by Ardichvili, Page, & Wentling, 2002). More than 600 such communities containing more than 16,000 worldwide Caterpillar employees are involved, varying in size from just a handful of members to more than 1,000 individuals.
volunteer recognized expert in the area supported by one or more “delegates” manages each community.

The impetus for the development of the system was to increase the company’s competitive advantage by leveraging the expertise and professional knowledge of its engineers and technical and other staff. In contrast to other systems, most of the communities in Caterpillar were formed through employee initiatives and not to solve particular business issues. The system provides geographically dispersed business units with a common forum to work and communicate best practice information and access to lessons learned. It is viewed by the users as more efficient because all the information is available through one location, and the information can be regarded as credible because it is generated by company experts. Less frequent uses include a means for generating new knowledge and creating solutions to current problems.

In their analysis of the organizational context and key elements for success and barriers to effectiveness, Ardichvili et al. (2002) point out some issues related to organizational culture. An important conclusion for HRD professionals was that these communities of practice do not experience barriers due to capturing and distributing knowledge or encountering technological constraints but do need assistance in creating appropriate conditions for knowledge generation and dissemination (Ardichvili et al., 2002).

**IBM Global Services.** According to Weintraub and Martineau (2002), IBM Global Services has used JIT learning strategies since 2000. Because Linux is becoming more and more integral in IBM’s business strategies, knowledge about the software and its use was captured from subject matter experts for the early learning of software developers. The knowledge was structured onto virtual reference “cards.” The cards are categorized into “overview,” “more detail,” and “all the details” sections, which make it easier to select a learning path through the material. Various resources are included, such as subject matter expert lists, useful links, a glossary of terms, technical resources, and a quick skills guide for developers. Subsequently, the knowledge that was captured was restructured for Web presentations on IBM Learning Services’ Online Presentation System.

What normally required 3 days in a classroom for e-business consultants now requires “just enough” time, at the right time, on the Web. These practitioners access a Web site that allows them to take just the training they need or access JIT information or case studies from which the training is built. Furthermore, they can collaborate to gain knowledge that is more specific to their situations. The system permits practitioners to gauge the breadth and depth of knowledge required for their jobs.

In summary, these three organizational scenarios embed several important aspects of JIT learning. The Brigham’s and Women’s Hospital case represents an integrated and dynamic system that enables physicians to access
current information, anticipate future knowledge requirements by linking them with databases that can support their decision making, and allows their learning to be captured and shared with other physicians. The Caterpillar, Inc. case is an excellent example of how communities of practice can be used to leverage knowledge and expertise to support JIT learning needs and also points to the roles that HRD professionals may assume as learning counselors. Last, the IBM Global Services case points to how market needs were anticipated by HRD professionals and how capturing that knowledge and structuring it in various formats facilitated JIT learning for employees.

**JIT: Extending the Trend**

The focus of this article has been a reflection on the demand side of the time value of learning, both knowledge and skills needed in today’s workplace but required for tomorrow’s workplace. As Brown and Duguid (2000) acknowledge,

> Learning is usually treated as a supply-side matter, thought to follow teaching, training, or information delivery. But learning is much more demand driven. People learn in response to need. When people cannot see the need for what is being taught, they ignore it, reject it, or fail to assimilate it in any meaningful way. Conversely, when they have a need, then, if the resources for learning are available, people learn effectively and quickly. (p. 136)

In a knowledge economy, it is apparent that the expectation for JIT learning will continue to be imperative in the future. It appears that technology will also continue to play a major role in JIT learning. The trends associated with e-learning may be a vantage point for considering the future for JIT learning from a technology perspective. The e-learning marketplace has been characterized as somewhat chaotic where numerous vendors have suffered from poor business models or have been subject to mergers and acquisitions. Although the overall e-learning industry is still in an initial growth phase, e-learning in several environments has become profitable (Adkins, 2002b) and larger software companies are entering the marketplace. The entrance of larger vendors to the general corporate learning marketplace will likely have future impacts in two areas: stabilization and increased access to tools. Stabilization may result in the acceptance of a smaller set of standards, which will increase the portability of systems that support JIT learning and may result in increased market acceptance and thus reduce the business risk of implementation. Increased access is partially the result of embedding learning components and modules into enterprise or e-commerce tools (becoming the default installation). But perhaps more important, such access will open JIT learning markets to the small and midsize companies, the vast underserved population of businesses.

Additionally, although the development and implementation of JIT learning is often technology enabled, the agenda for JIT learning may be confused with the technology itself. This may pose continuing dilemmas for
HRD professionals in the characterization of JIT learning as a training innovation or as an IT innovation. The potential for this apparent schizophrenia for JIT learning applications is somewhat fortified by a recent training industry survey showing that upward of 39% of all technology-based training is controlled by the IT department, not the training or human resources unit (Galvin, 2002). However, as the cases illustrate, facilitating and supporting a JIT learning infrastructure is highly dependent on the integration of multiple interdisciplinary perspectives including technology, human resource management, HRD, leadership, and organizational theory. Whereas technology is considered an extremely important enabler, it may not be necessarily sufficient to result in JIT learning. Therefore, how the development and implementation are formulated for JIT learning may lead to potential conflicts among various organizational units regarding the conceptual foundations and ownership of JIT learning services.

Last, although we foresee demand-driven need for JIT learning in the marketplace, we are not inferring that traditional classroom training will be replaced. Clearly, although the percentage of training time delivered through learning technologies has remained steady with slight increases and the percentage of classroom-delivered training time has declined slightly (Thompson, Koon, Woodwell, & Beauvais, 2002), classroom training will not disappear. The point has been made that JIT learning will not replace the need for traditional training or education, especially in the context of individual needs for specific skill acquisition, but it may lead to the expansion of options for the acquisition of knowledge and learning and a closer examination of what is needed when. The current direction seems to indicate JIT learning will never be part of the classroom domain but is much more a part of the trend toward the merging of learning and work (Brandenburg & Binder, 1999) that calls for increased flexibility in the workplace and new models for organizing and performing work.

Implications for HRD

This article sought to examine the expectation for JIT learning as it was expressed at the future search conference. Therefore, a description of JIT learning and characteristics associated with it, the drivers and enablers of JIT, and some case illustrations of how JIT learning is being facilitated and supported within three organizational settings were presented. This article, however, would be incomplete without a discussion of how JIT learning relates to the core values of HRD as exemplified by the common ground statements that also emerged at the future search conference.

Leveraging available technology, without losing the human touch and social component of learning. The availability and utility of technology has been viewed in this article as belonging to the infrastructure for enabling JIT learning.
However, as Pfau and Kay (2002) state, “Perhaps surprisingly, technology has only increased the importance of the human contribution. Far from diminishing the role of people at work, technology has become a great enabler of human creativity” (p. xxxi). With this recognition of the importance of integrating technology and human beings, JIT learning needs to be linked to supportive organizational policies and cultures with HRD professionals intimately involved with the development and deployment of such systems so that innovative and purposeful knowledge creation, learning, and performance is facilitated and nurtured and not simply engineered by highly integrated technology infrastructures. In particular, organizational culture becomes critical in promoting the sharing of knowledge and forging effective working relationships among learners (Bollinger & Smith, 2001).

**Intellectual capital as the life blood of the organization.** A major driving force behind the emergence of JIT learning is the increasing importance that knowledge creation, dissemination, and learning have in today’s knowledge economy. JIT learning is predicated on an anticipatory framework to identify knowledge requirements so that intellectual capital can be effectively deployed across the organization. Therefore, it is conceivable that HRD professionals will need to become more proactive in influencing the time-to-market knowledge cycle by continually anticipating knowledge requirements as opposed to responding to them. The notion is for HRD professionals to become anticipatory, not reactionary, in the time-to-market knowledge cycle and aligned with identifying emerging ideas, trends, methods, and technologies. Weintraub and Martineau (2002) have acknowledged that workplace educators’ roles will change to knowledge structuring and learning facilitation and support.

**Effective management of knowledge and learning.** JIT learning is viewed as a means to get the right knowledge to the right people in the right way at the right time. However, to facilitate this process, HRD professionals will need to challenge some of the current models and tools at their disposal (e.g., see Forman’s [2003] call for new models and systems). The anticipatory focus of JIT learning requires some fundamental rethinking of the ways in which we have historically designed, developed, and delivered learning and performance solutions. Carlisle (2002) has acknowledged that HRD professionals and knowledge management professionals have often underutilized their respective capabilities despite having the same goal. Whereas knowledge management professionals may emphasize the provision of valuable information, but without the focus on learning, HRD professionals may focus on learning but lack the original sources of intellectual capital. Carlisle suggests that HRD professionals can enhance the effectiveness of knowledge management by leveraging their expertise with learning sequencing, adult learning, learning styles, and matching of methods to learning outcomes.
References


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