# Radical Learning Technology
Happening Now

Web services, probably the most important technological
step forward since the advent of the Web, will forever alter
learning technology, content, and services.

There's no turning back.

By Sam S. Adkins

Peter Drucker once said, "I never predict. I just
look out the window and see what is visible but
not yet seen." Several new learning technology
innovation patterns are just beginning to be
seen. These patterns are highly intertwined, yet
some distinct aspects can be isolated.

Eight Primary Patterns of Learning Technology Innovation
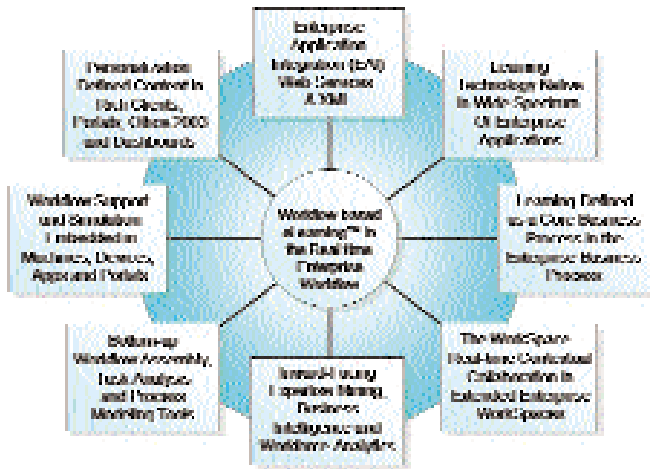
Eight primary innovation patterns are spurring the growth of a wide range of new learning products; EAI (enterprise application integration) is the most profound and is permeating the breadth of innovation in technology. Web services, which have become the de facto EAI standard, are the most important innovation pattern in learning technology. EAI is now assimilating a wide range of corporate business processes and applications, including learning processes and applications.

Grant Clark said in a May 2003 *XML.com* article, "Much of the value of Web services will come from their ability to be combined in novel, complex ways." It is these "novel, complex" combinations that have changed learning technology forever. The radical change is the migration away from courses or learning objects that are "taken" or "accessed," to learning services that are experienced as a by-product of the real-time workflow. Mark Resmer, CTO of eCollege says, "Web services are probably the most important technological step forward since the advent of the Web." Web services are important because they're used to assemble composite applications.

Enterprise learning applications, like all other enterprise applications, are now being deconstructed into small transactional services, or applets. These granular learning services are then re-assembled, along with a wide variety of other transactional applets, into composite applications. A learning service is a small granular burst of highly contextualized learning that is completely fused with the workflow assembled into the composite application.
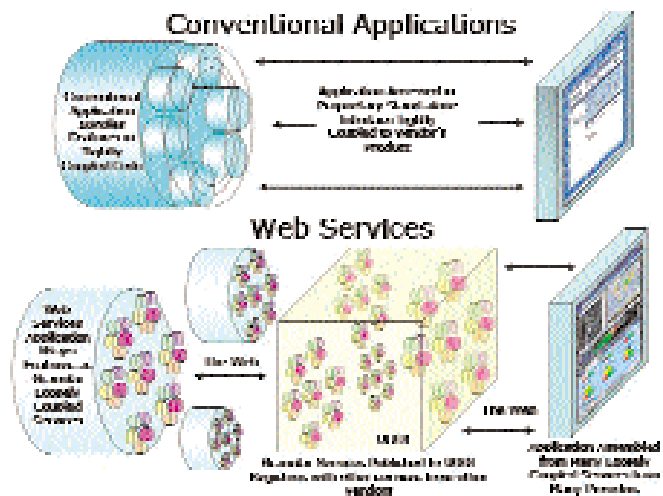
Element K and VCampus, early adopters of Web services, have deconstructed the feature sets of their products into granular services. Learning is

no longer taken or accessed; it is experienced as a by-product of work. The learning is now completely embedded in the real-time workflow experience. Finn Grønbæk from IBM said in an April 2003 presentation at FLUID (the Danish Association of Flexible Learning), "The intent is to leverage Web services to embed e-learning functionality into business applications such as CRM and ERP. With the foundation of an open architecture in place, the door is opening to Web services and the related capability to surface e-learning as events within other applications."

Wide-ranging learning technology
The large and small enterprise application vendors have released new learning technologies designed to be tightly integrated into EA suites. These vendors are marketing a variety of enterprise application products known by a bewildering array of three-letter acronyms. Yet, EA suites can be categorized by functionality.

The REE (real-time extended enterprise) taxonomy, developed in the *Simulation in the Enterprise* series published by Internet Time Group, delineates these major functional categories of enterprise applications: resource management, collaboration management, process manage-

Conventional Applications

Web Services

ment, and product management. The taxonomy can be subsumed under the rubric, "Resources (people and systems) collaborate in a process to produce goods and services."

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The Real-time Extended Enterprise Taxonomy
"People and Systems Collaborate in a Process to Produce Goods and Services"

Each of those categories has dozens of subcategories of applications. There are best-of-breed vendors that specialize in one category or one subcategory, such as pure-play LMS vendors. The large enterprise application suite suppliers market products in all of the categories.

Vendors in all of the categories and several subcategories are innovating and integrating new learning technologies. Expertise mining vendors such as AskMe and Tacit Knowledge market products that actively dig for organizational expertise and display these experts in expertise maps. Business process management vendors such as Ultimus and Lombardi Software are embedding process coaches and workflow assistants directly into real-time workflows. BAM (business activity monitoring) vendors sell products that prompt mobile workers to perform tasks at specific times and guide them through work processes. Each vendor brings a unique core expertise into the equation, and innovation is widespread across the categories. It's important to note that few of

these suppliers label their innovations as learning technology; they tend to market them as business process improvement technology. They view learning as a business process, and treat it like any other business process.

1-2-3 punch

Learning has been defined by the enterprise application vendors as a core business process that must be modeled, managed, and measured as a KPI (key performance indicator). The large enterprise vendors—such as IBM, Oracle, Sun, SAP, PeopleSoft, and Siebel—have explicitly redefined learning as a core business process that needs to be automated just like any other business process. As a core business process, learning is measured as a key performance indicator like other business processes. Best-of-breed vendors such as Saba, Docent, Maritz, TEDS, and KnowledgePlanet have implicitly defined learning as a core business process as well. All of these suppliers are innovating new types of workforce analytics that require learning to be defined as a KPI. Docent has been more explicit. In mid-2003, Docent said that it was "addressing a growing desire among corporations and government agencies to establish training as a core business

process that directly influences key performance indicators associated with revenue and profit."

On the surface, this expression of learning as a core business process appears to be just a market positioning tactic. In reality, it is the opening gambit in a strategic move to integrate learning processes with the other enterprise business processes. Learning processes are now modeled, managed, measured, and modified by a range of enterprise technologies.

The vendors deliver a powerful 1-2-3 punch message when they tell customers that 1) learning is a core business process in the enterprise; 2) like any other core business process, it should be automated; and 3) like any other automated business process, it should be assimilated with existing integrated enterprise application suites. Once integrated with the other business processes, learning becomes just one of many key performance indicators used in continuous process improvement frameworks such as Six Sigma or a balanced scorecard. It changes the equation from isolated training analytics to integrated business performance analytics.
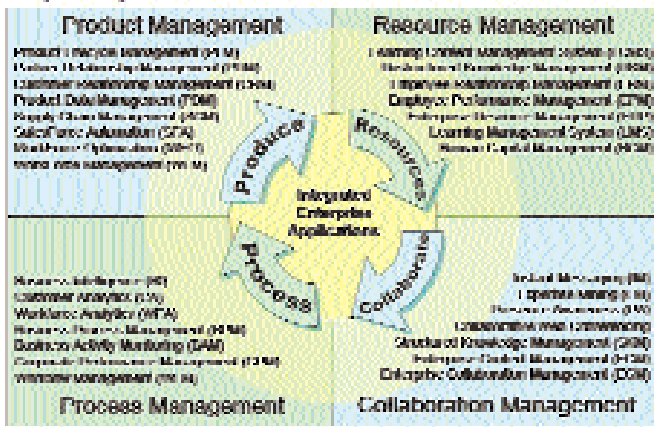
Native to the platform

A new type of contextual collaboration management technology has emerged. All of the major platform vendors—IBM, Sun, Oracle, Microsoft—have integrated contextual collaboration technology into their product lines. Collaboration is now a native feature in all of the major platforms.

A January 2003 *Network World Fusion* article indicated that "a revolution is brewing in the world of collaborative software that promises to take network executives away from monolithic collaboration platforms and into a world of reusable components that can be embedded in any application." That revolution is contextual collaboration. Instant messaging, application sharing, Web-conferencing,

presence awareness, and multi-user team spaces are integrated directly into composite enterprise applications.

Contextual collaboration technology is converging on an interface metaphor and technology now called the WorkSpace. The original idea of Wenger's "communities of practice" has evolved into the conceptual location called WorkSpace. Vendors who sell products in that category tend to combine metaphors for space, time, and collaboration into their product interfaces. In these new interfaces, work is now conducted in the redefined WorkSpace.

Saba and Hyperwave are examples of e-learning companies that have integrated collaboration into their product suites. Hyperwave calls its collaboration module, Team Workspace. EDT Learning, Hyperwave, and Click2learn have native collaboration technology in their product suites. Many e-learning vendors that don't develop native collaboration technologies have licensed technology from specialist companies such as WebEx, Centra, PlaceWare (now Microsoft Office Live Meeting), and Interwise.

Within two years, collaboration technology will be widespread and seamlessly integrated into both front- and back-office platforms. The impact of Microsoft embedding a range of rich contextual collaboration technology into its Office 2003 System suite will be a primary catalyst accelerating the use of collaboration products for learning. Contextual collaboration is now native to the workflow.

Business intelligence

The best-of-breeds from the e-learning industry have released product upgrades that now include business process modeling tools and workforce analytics. In tandem with that product trend, best-of-breed BI (business intelligence) firms have released new inward-looking tools that now focus on workflow and work-

Workflow, Workforce and Workspace Analytics

force performance. These trends are interconnected. Saba uses the Cognos BI engine as the core of its workforce analytics product.

Saba, Docent, TEDS, Maritz, and KnowledgePlanet are leading innovators in a new type of system-wide analytics called workforce analytics. In order to accomplish this kind of system-wide analysis, the workforce analytics applications must have access to data in ERP, SCM, CRM, and the vast spectrum of all of the other enterprise applications. The technology automates continuous performance analysis and positions learning as the newest member among the most important key performance indicators.

Enterprise application integration is an absolute requirement for workforce analytics. The technology cannot function properly without deep and wide integration with other enterprise applications. It can't measure workforce performance in isolation. EAI, BI, BPM, and BAM tools are now used to model, manage, monitor, and modify performance across these integrated enterprise business processes. That includes workforce performance. These tools model and monitor tasks and can isolate granular performance problems.

The acronyms

Business intelligence (BI), business process modeling (BPM), and business activity monitoring (BAM) products were almost exclusively focused on outward-looking customer analytics as recently as a year ago. All of these technologies are now looking inward at internal workforce performance. The following primary forms of performance are modeled, automated, simulated, measured, and modified in the workflow-enabled enterprise: 1) discrete task performance (workflow), 2) organizational process performance (workforce), and 3) enterprise ecosystem performance (WorkSpace).

Once the performance analytics have been performed on the workflow, workforce, and WorkSpace, modifications can be made to all three to compensate for performance gaps. Those modifications are input into the business process modeling, workflow modeling, and simulation tools that were used to create the original workflow. Those modifications are also beginning to be done in a new type of bottom-up technology.

Bottom-up for true learning

New bottom-up task analysis and task modeling tools are enabling the capture

of true organizational learning and informal learning. The task analysis concept inherent in these tools is identical to traditional task analysis as defined by systematic instructional design. Bottom-up task modeling and analysis tools are designed for people who do the actual job tasks being modeled. Unlike traditional task analysis, in which consultants or instructional designers do a top-down analysis, the actual people who perform the tasks use these tools to model their own workflows. As each worker adds to the combined workflow of the organization, organizational learning is captured. The concept of bottom-up workflow, knowledge management, and project management is taking hold in enterprises. Instead of traditional top-down task analysis, the tasks are modeled by the people that actually do the tasks. The benefits include speed of analysis, fidelity of task modeling, and ability to rapidly change processes as work changes.

Entopia is a pioneer in bottom-up knowledge management. According to the company, its product, Entopia Quantum, creates intellectual capital "as a natural by-product of personal and workgroup activity." Entopia maintains that its bottom-up approach generates much higher end-user participation than top-down knowledge management systems.

Sterling Commerce sells a product called Workflow Manager that enables bottom-up workflow modeling by end users. According to Sterling, "As a transaction-based workflow engine, Sterling Workflow Manager provides bottom-up graphical process modeling, focusing on localized opportunities of improving specific efficiencies. Ultimately, Sterling Workflow Manager is a productivity tool to improve human asset management." Artemis sells a project management product called ViewPoint that enables workers to map and man-

age tasks based on their job roles. View-Point defines these roles: knowledge worker, project manager, resource manager, and program manager. Each role type has access to different views and editing permissions. Depending on their role, users are permitted to alter the parameters of task and processes. The new InfoPath tool in Microsoft's Office 2003 System suite lets users alter and update tasks and processes as business processes evolve and pass from user to user. Each user who interacts in the process can add to or modify the process.

Fused within the workflow

New simulation-based embedded workflow task support tools have come on the market. These tools allow workflow task content to be embedded directly in the interfaces of integrated composite applications: Learning is fused directly into real-time work experience. This is a fundamental new type of learning technology that has been christened "workflow-based e-learning" in the research series *Simulation in the Enterprise* published by Internet Time Group.

Several vendors are now selling products that embed workflow-based e-learning directly into live workflows. These vendors come from many pedigrees, including conventional performance support (EPSS) and business process management. The most compelling products are from suppliers that have adopted Web services. Companies such as Knowledge Products, AWD, XStream, Epiance, DreamFactory, Envision, Ultimus, Quintic, Lombardi, and Nobilis all sell products that fuse learning with real-time task support. Service-oriented companies such as Insight Experience and Navowave develop highly customized workflow-based e-learning for clients. These providers create content and simulation that is embedded directly into integrated enterprise applications. Embedded performance support in

stand-alone applications isn't new. Workflow task support embedded, indeed fused, in live workflow *is* new.

These systems are honing in and beginning to integrate precise and targeted intervention and remediation at specific performance nodes—the points in a workflow diagram that represent the tasks performed by humans, called task nodes, work nodes, or activity nodes. They're precise places in time and in the process when humans interact with the workflow. These nodes indicate precisely where the fused content is embedded.

Your own personal workflow

Web services have created a new kind of tool category and a new kind of computer interface. These new tools are used to assemble granular services into a single business process interface. They're also used to assemble and choreograph functionality into a single interface personalized for particular workers based on their job roles.

Work is now being accessed in personalized composite applications called by a variety of names such as transactional portals, rich Internet clients, composite applications, dashboards, or rich Office clients. The content in this new business process interface is collaborative, transactional, and defined by individual job roles governed by business-rule engines. These tools are designed to be used by subject matter experts, not IT people. The tools allow a business process expert to assemble granular Web Services into workflows in the single interface. Companies that are selling application assembly tools include DreamFactory, Vultus (now owned by SCO), Curl, Nexaweb Technologies, Kenamea, InfoPower Systems, and Versalent. Versalent fuses learning and knowledge management in the custom workflows it assembles for clients.

The user interface layer, or presentation layer, is now an aggregation of Web services "published" by the underlying applications. It's beyond a dedicated appli-

cation portal, beyond a browser, and beyond a single application interface. It is a highly transactional composite interface that assembles dozens of services into a seamless presentation. This new presentation layer technology will eclipse and replace dedicated learning content interfaces and training portals. E-learning vendors that provide a stand-alone interface or a training portal interface will be forced to integrate with the new composite application interface.

Kenamea calls its products "composite application suites" and contends they "combine the power and productivity of client-server applications with the zero-client and cross-platform benefits of the Web. Composite application suites allow these applications to be developed and deployed quickly and easily with minimal or no custom programming."

Enterprise content management vendors are advocating "content-based applications." They want their applications to be both the front- and back-end of the enterprise interface.

IBM, Oracle, BEA, and Sun are pitching the "enterprise portal"; SAP, Siebel, and PeopleSoft are advocating the "transactional portal" as the aggregator of all workflow. BPM, workflow, EAI, and BI vendors are advocating the single dashboard interface for managers. Macromedia is promoting Flash as the core business process technology in its rich Internet application strategy. Adobe refers to its new XML-enabled PDF product as the "Universal Client."

The innovation vector

The intersection of these eight patterns has created a convergent innovation vector. The most significant consequence of this eight-pronged innovation pattern relative to the learning industry is the emergence of workflow-based e-learning, characterized by

- deep integration with workflow
- task, knowledge, and affective learning

content embedded in the dynamics of the real-time workflow

- collaboration with people and systems
- design and modification achieved by modeling and simulation
- short, granular bursts of learning and performance support embedded at specific nodes of a business task
- dynamic generation of on-the-fly tasks as work evolves
- continuous performance improvement and performance measurement
- delivery of performance support at precise nodes of performance.

The economic imperative to define and optimize precise workflows for particular workers is being driven by the need to increase productivity. In the presence of a finite work week and a shrinking workforce, productivity is the only metric that can be modified to increase profits. Optimizing workflow is the only way to increase productivity. Workflow is not a passing trend.

Here are the ways that workflow-based e-learning optimizes productivity:

- optimizing, automating task analysis
- targeting the 80/20 performance ratios
- capturing informal and organizational performance
- reducing the lag time in business process flows
- increasing the workforce alignment with enterprise technology and strategy.

Due to the presence of bottom-up task modeling tools, it's now possible to rapidly optimize and automate the task analysis phase of any continuous performance improvement process. These tools are designed for process specialists and

Workflow Accessed In Personalized WorkSpaces
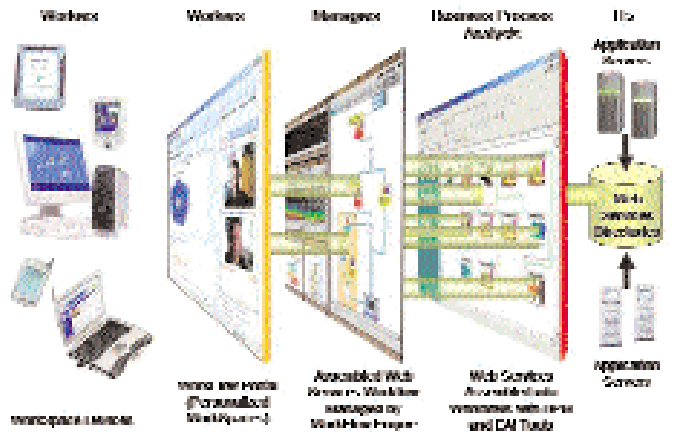
workers participating in the business process. They're also designed for subject matter experts.

The 80/20 rule states that 80 percent of productivity problems are caused by just 20 percent of the performance behavior in the workflow. In contrast, 80 percent of productivity increases can be attributed to 20 percent of that performance behavior. Business process modeling and simulation can readily identify both kinds of behavior. Behavior that reduces productivity can be removed; behavior that increases productivity can be enhanced.

Formal education and training are already being reduced by the use of these products. Customers of workflow-based performance technology all cite the reduction in the need for training once these technologies are deployed. Teamplate's customers routinely cite the dramatic reduction of developer training time and costs by virtue of using the Teamplate Integrated Development Environment. Formal training is seen as an expense and as an offline secondary activity that decreases immediate productivity and increases lag time. One way these technologies reduce lag time is by dramatically shrinking the training time needed to get up-to-speed on tasks. The

AWD/Knowledge Enabler is a task management modeling tool that "automatically guides a user through a series of predefined steps necessary to process an item of work, reducing keystrokes and training requirements."

Another way lag time is reduced is by sophisticated task routing, workload balancing, exception handling, and embedded task support. According to Ultimus, it's believed that 90 percent of the time required to do work is lag time; only 10 percent is actual task time. Also according to Ultimus, productivity application software reduces the task time and workflow automation, and optimization software reduces the lag time. Business activity monitoring products do that by issuing "performance triggers" to workers. If a particular worker can't be found, the technology finds another worker to perform the task. Processes don't stall while waiting for performance.

Workforce alignment is a major productivity problem in enterprises. Large studies by Franklin Covey and *Gallup Management Journal* have identified large segments of the workforce that are confused about the business goals of their companies. Many employees are unaware or actively disinterested in the corporate strategy. Corresponding again to the 80/20 phenomenon, about 20 percent of workers are fully engaged and on board with the corporate vision; about 20 percent are actively disengaged. Those figures are reflected in productivity metrics now being analyzed in executive dashboards. A new type of emotional assessment is being deployed in enterprises to mitigate that problem.

The so-called Big Five personality tests are now routinely used to screen candidates before they get into the workplace. Some major vendors of the Big Five inventories—DDI, Recruitsoft, and ePredix, to name a few—have developed an assessment XML standard sponsored by the XML-HR organization. Whole inventories or single items from those inventories can now be embedded directly in the workflow.

Workflow-based e-learning is fused with workflow. As workflow applications are extended out into the field, learning follows. Workers across vertical industries who don't sit at a computer all day are now being connected to enterprise workflow via wireless handheld technology. These field workers are being provided with real-time workflow task support in the form of augmented reality, collaboration with experts, and automated contextual coaching.

Mobile-ware, everywhere

Workflow extends to any worker who interacts with computer technology. At first glance, that may seem to exclude a large percentage of the U.S. workforce. Yet, technology now pervades every vertical industry and every aspect of modern work. The average Caterpillar tractor has five IP addresses. Farmers and miners operate machinery that is increasingly computerized. Even truckers in the United States have computer technology in the cabs of their trucks or embedded in their cargo. Factory workers now operate in an environment where assembly lines are programmed and simulated prior to retooling. Predictive maintenance is embedded in machinery. Machines alert workers when maintenance is required or when abnormal operating conditions require human intervention.

Specialized computer devices such as handhelds, RFID (radio frequency identification), barcode readers, smart phones, and tablet devices are now in use by workers in the field, on the factory floor, and in the remote workplace. Dock workers point handheld RFID readers at containers and are prompted with appropriate handling instructions or hazardous material precautions. Barcode devices that read patient wristbands prompt nurses to provide the exact dosage of the right medicines to the right patients at the right time, and prompt nurses to provide explanations if medications aren't delivered on time.

Shrinkage is a term retailers use to refer to inventory losses due to theft. The shrinkage in retail is being mitigated by "smart shelves" stocked with products that have embedded RFID chips known as smart tags. Employees are alerted when shelves need restocking and notified the exact moment high-theft products are removed from the shelves. As in BAM technology, these are called performance triggers. Extraordinary workflow-based tasks, skills, and affective learning support products are now on the market. A growing number of companies—Scion, Telispark, Microsoft, Oxford—are developing workflow management products for mobile workers.

For example, Oxford Technologies sells a mobile workflow product called Remote Technical Assistance Support System, developed with the U.S. Navy's Naval Undersea Warfare Center as a "telecollaboration" solution. It not only provides digital workflow support, but also links remote experts with workers in the field. A new technology sector known as Field Force Automation has become the central software nomenclature for extended workflow to field personnel. Companies such as Xora, Nexterna, EveryPath, FieldCentrix, Questa, and ClickSoftware are leading in this new sector.

Honda has purchased 3800 Nomad Expert Technician Systems from Microvision. Beginning in January 2004, Honda will distribute these systems to its Honda and Acura dealers and independent repair shops in North America. The product is a wireless, wearable computer system with a head-mounted display device that beams an image directly onto the retinas of technicians. The system provides access to test data, mentor, and

repair information while service techni-
cians work on cars. "The information is
superimposed directly on their vision at
the point of task, head-up and hands-
free," says Honda.

Another product is Wireless Peripher-
al's SightLink. Billed as a form of "tel-
epresence," the product provides "visual
communication between an activity
point and a consultation point." Accord-
ing to the company, the SightLink visual
connection "reduces or eliminates the
need for specialized personnel to be
physically on site to accomplish a task re-
quiring their expertise. With SightLink,
field personnel have immediate access
to an expert for assistance, without incur-
ring the delay or expenses of business
travel. We call that working at the
speed-of-sight."

The rapid proliferation of wireless
Wi-Fi hot spots; cellular Internet access
(with camera-enabled smart phones);
and satellite connectivity has extended
the workflow everywhere. Desktop e-
learning technology is now being re-
placed with workflow-based e-learning in
the pervasive and ubiquitous redefined
WorkSpace. Web services are used to fuse
workflow-based learning in the work-
flows of workers in real and virtual work-
spaces.   **The Web (January & June *T+D*)**

As Web services proliferate and trans-
form enterprise technology, they are also
changing learning technology, content,
and services. The advent of Web Services
has altered the learning technology land-
scape completely, and there's no turning
back. Long the Holy Grail of prescient pi-
oneers such as Geary Rummler and Glo-
ria Gery, learning is now fused directly in
the work experience. **TD**

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vergence of E-Learning, Simulation, and Enter-
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