Multichannel Distributed Learning with Microsoft SharePoint

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Most new technologies are extensions of ideas and concepts of the past. e-Learning using the World Wide Web is no exception, as early versions imitated either the page turning of books, or the instructor controlled classrooms of modern schooling. Only now, a decade and half after the invention of the Web have new forms of learning and teaching emerged that use the unique possibilities of networked communications, sharing and collaboration. These new forms of education and training are possible *because* of the qualities of the network, and are likely to change teaching and learning forever.

Microsoft SharePoint is software developed for business environments that excels in the management of communications, sharing and collaboration. Because of that, it has great potential as the core technology for new ways of learning. This paper explores these possibilities, and shows how SharePoint, in conjunction with a robust learning management system, can be a "whole product" in regards to the changes that are now occurring in the field of education and training.

From "Page Turner" to Complexity

The Internet started as a way for messages to be transferred from one computer at a university or research lab to another computer in the network. E-mail and file transfer were the original educational applications as academics learned that they could distribute their digital documents to others without using paper. Rudimentary discussion forums and list servers were based on early e-mail protocols.

The idea of computer-based education first emerged in the late 1950s with proposals for building "teaching machines". In the 1960s, Donald L. Bitzer started the PLATO system (Programmed Logic for Automatic Teaching Operation), which was expanded and developed between 1976 and 1986 by Control Data Corporation. With desktop computers becoming common in the 1980s, stand-alone educational applications were developed for individual learners on their own computers. By the late 1980s, *client-server* architecture became common, whereby applications and data could be held on a server and used by many client programs on individual computers.

The invention of the World Wide Web protocols in 1991 allowed text strings or graphical objects to be linked through a "universal resource locator" (URL) to online resources from any server that was accessible to the network. Various browsers were developed as "thin clients" with most of the functionality of applications and the data that they needed residing on designated web servers.

Early versions of educational web-based applications were either "page turners" that presented lots of text and graphics or they were imitations of software applications that had previously been built to run on individual desktops. The problem with this approach is that web-based educational software has often been a simulation of the worst kind of university or high-school class – a presentation on material is given, followed by a test. As Woodill (2004) noted previously, "the principal reason why most people have trouble suffering through an e-learning course is that there is usually nothing to do but read, look and take a multiple choice test. There are usually no instructional activities that deeply engage the mind of the learners, and “interactivity” mostly consists of turning from one screen to another. This is especially problematic for the under-40 generation, which has grown up with fast-paced videogames, movies, and television programs. Reading a lot of text on a screen simply doesn’t cut it for them.”

We need to recognize that learning is multidimensional, with multiple sensory inputs and many different sources of experience. Learning is dynamic and complex, as humans, individually and collectively are “complex adaptive systems” who learn in individual ways. The adaptive nature of human learning is the result of feedback loops and external cognitive aids that influence what and how we learn.

The field of e-learning is now starting to build online educational experiences and tasks that begin to take the complexity of human cognition into account. “Distributed and interconnected systems have become the norm for new development efforts to the extent that the word ‘application’ itself might have to be redefined,” says Hohpe (2005).

The Move to Multi-Channel Distributed Learning

Although it is not surprising, the first generation of online learning technologies and content are generally too simplistic to fit the complexities of human learning. This has generally been recognized by thought leaders in the field who speak of moving to Web 2.0 or eLearning 2.0. In this new view, the “online learning landscape” needs to be highly varied, dynamic, collaborative, responsive and personalized. Given the many interesting ways to connect people with learning materials and with each other, there is really no reason to continue with the dominant “page-turning” presentation model of e-learning. As Davis, Sumara and Luce-Kapler (2000) point out:

> “… [electronic] media operate at a low information level - one that has been deliberately adjusted to suit what consciousness is able to accommodate. And so, while these technologies give access to immense stores of data, they operate at a very low level of stimulation. Human sense organs, however, function at a capacity that is about one million times greater than conscious perception. As such, abundant use of the so-called "information technologies" may actually result in a starvation of the senses, and information poverty. Traditional teaching strategies might also be criticized on the basis of such information poverty. These practices tend to be adjusted to the limitations of consciousness, but often failed to consider the breadth of human sensation” (Davis, Sumara, and Luce-Kapler, 2000, pp. 8-9).

There are many different types of learning, depending on what is being learned, the learning environment, and the characteristics of the learner. Part of the reason we tend to misunderstand the complexity of learning is because we see the results of learning as “knowledge” - which we tend to think of as a commodity that can vary in quantity from one person to the next. Because we tend to view knowledge as a *thing*, our ideas about learning center on metaphors of acquisition, processing, absorbing, building, or flowing. But knowledge is usually *situated*, and is often shared and collectively produced (Davis, et al., 2000).

While the first generation of e-learning practices and technologies is being swept away by an explosion of new forms of online educational experiences, *e-learning* is morphing into multi-channel distributed *learning*. It is not a case of e-learning simply being mixed with "face-to-face" learning to form blended learning. Rather, *all* learning will be multi-channel learning. The "e" in e-learning will gradually disappear, as electronic support for learning by any means becomes invisible, ubiquitous and taken for granted (Norman, 1999).

E-learning in the workplace and, to a lesser extent, in schools and universities, has moved from early text-based CBT systems to full scale multimedia presentations. It is about to change again into a highly fragmented "learning landscape" where online presentations will be only one option in a myriad of choices for learners and instructors. Multi-channel distributed learning combines many forms of face-to-face learning with dozens of learning technologies and data sources to produce a rich learning experience that is dynamic, personalized and relevant to each person's learning needs and goals. In recent research, Woodill (2005) has identified over 50 different content formats, 70 online technologies and 35 services being used in e-learning offerings today.

For the most part, this developing multi-channel distributed learning environment is a "self-organizing" complex adaptive system, and, because of that, it is difficult to exactly predict how it is all going to turn out in the next five years. But, there is no question that a major shift is taking place – a turn from instructor-centric curricula toward learner-centric searching for relevant resources for learning as needed. While the shift has sometimes been characterized as changing from "push" to "pull" technologies, the change is actually from instructor-controlled classroom learning and instructor-controlled e-learning to a *mix* of approaches that includes instructor control when appropriate (for specific certifications, for example), along with a variety of dynamic multi-directional channels of resources and requirements from which learners can explore, select and "pull" content. This mix will be different for each person.

Multi-channel distributed learning and its support technologies are developing rapidly, and e-learning is at the beginning of a new technology innovation curve. Much of the pioneering work in this area is being carried out at various universities and research labs around the world (Downes, 2005), and is a mix of open source and protected source initiatives.

e-Learning 2.0: the "whole product" for a market of one

Instead of moving among discrete applications in courses, learners in the near future will be accessing "composite applications" or "mashups" in which data will be mixed together from many different sources, in a unique blend for that learner at that moment. The "content" for educational experiences will be based on distributed applications and data sources. This is all possible because of an explosion of innovation in information and communications technologies (ICT) applied to helping individuals and collectivities to learn.

It is, according to Downes (2005), “A shift from the idea of the web as *medium* to the idea of the web as *platform*.” The unique traits of this emerging e-learning platform include the following:

- *Increasing speed of computers*: photonic, genetic and quantum computing will make today’s computers seem like dinosaurs in five years.
- *Interactivity beyond clicking on links*: As we develop computer interfaces that involve all the senses and programs that truly allow individuals to make differences in their own learning landscape and to contribute to the learning of others, interactivity will morph into real engagement and involvement in the networked world.
- *Dynamic learning*: With new forms of interactivity and innovative uses of the possibilities inherent in this new platform, content will shift from something that is static information to absorb to the creation of dynamic educational experiences that will involve all the senses and engaged thinking minds. Much, but not all, of the available content will be generated by users interacting with each other, and posting their content to networked repositories. Distributed content will be “loosely coupled” so that it can be reconfigured in a myriad of ways depending on the context and the personal profile of each learner.
- *Aggregated content*: The use of content “feeds” (such as RSS) will increase, and to manage the huge amount of content that will be available, content aggregators will gather what each learner needs on an individualized basis.
- *High-speed networking to anywhere in the world*: Countries that have traditionally been unable to afford the level of computer technologies enjoyed in North America and Europe will be brought online with the laying of fibre optic cable, wireless wide area networks, and inexpensive computers (under $100).
- *Real-time collaboration*: All of the above changes will allow people to organize and work together via computer networks, whether they are in the local area or halfway around the world.
- *Digital representations/transformations*: As more and more of the world’s assets are digitized, they will be available in new flexible formats.
- *Increasingly sophisticated algorithms*: Algorithms, or repeatable computer procedures, are the key to innovation. Thousands of companies and research organizations around the world are engaged in a frenzy of research and development activities.
- *Huge storage and retrieval capacity*: Storage of digital information has become massive, and extremely cheap. Keeping everything that is produced on the world’s computers is now possible.
- *Individualization/customization/flexibility/adaptibilty/personalization*: With new personalization software able to make recommendations for what learners need next, a dynamic learning profile for each person in the world based on their learning preferences, interests and abilities will influence search results and learning experiences offered to the learner
- *Constant availability*: Ubiquitous embedded computing is already here. Cars, roads, homes, businesses, etc., all have computing capacities that are always available, and which are often embedded in the environment. The computer is truly becoming invisible and mobile.

- *Improved simulations and visualization of complex data*: The most startling change for learning in the near future will be the simulation and visualization of very complex phenomena, in order to understand and change the world.
- *Support for collective human endeavours through digital technologies:* This means an increase in the practice of "collaborative cognition" (Bearison and Dorval, 2002) and a sense of "collective intelligence," a topic that will be increasingly important as the world faces difficult environmental and political problems.

While some individual learners will want to find their way through the maze of information, educational materials and experiences available to them in the new "learning landscape", many other will want (or may be required) to be guided in their online learning. Learning experiences will be multi-channel, sometimes in one direction, and other times in two or more directions. The term "learning workflow" captures this notion of a variety of educational processes. Wilson (2005) identifies the following as some possible learning workflows:

- Chains
- Loops
- Isolated versus transactional workflows
- Subordinate processes
- Parallel processes
- Multiple parallel processes with grouping
- Multiple parallel processes with monitoring and intervention
- Combined business and learning workflows ("Workflow learning")

With all the possible variation in content, there will be a need to coordinate workflows in e-learning and to produce a unique personalized multi-channel mix of both push and pull educational experiences for each learner. With configurable platforms such as SharePoint each user can, in effect, have a "private label" application that serves up the optimal educational material for his or her needs.

eLearning 2.0 requires flexible, configurable software that can manage and track learning while coordinating and delivering a wide range of information resources and educational experiences. While advocates for eLearning 2.0 are trying to piece together such a system from a wide variety of open source initiatives, such as virtual learning environments, personal learning environments, wikis, blogs, and learning object repositories, the possibility exists today to create such a dynamic educational environment using the collaborative strengths of SharePoint and LiveCommunications Server from Microsoft supported by the features of a configurable Learning Management System (LMS).

While the "Learning Gateway" solution from Microsoft uses Windows SharePoint Services (WSS) for its base portal layer, it needs a set of educationally relevant Web Parts from a vendor to provide a complete educational solution for online learning. This basic learning solution uses Web Parts from Microsoft Class Server, Microsoft Exchange Server, Microsoft SQL Server, Microsoft Office Live Communications Server, and Microsoft Office. As is shown in Figure 1, this environment from Microsoft is serves up most of the infrastructure needed for the learner-centric functions of eLearning 2.0.

Learning Supports	SharePoint 2.0
Connected Workspaces	Four levels of connected workspaces – individual, team, division, and enterprise – hub and aggregator for all four levels
Collaboration	Facilities for meeting workspaces; blogs, with comments; wikis; calendars; surveys; discussions; and email integration; offline collaboration using Outlook and Groove
Content Management	Integrated facilities for document, records and content management; support for spell check, tables, and stylesheets; recycle bin for deleted items; Library/list content types will control metadata, views, workflows and events; information rights management; version control for major and minor revisions with eneorced checkout; extensible file format support; content templates; content can be associated with workflows and/or events; imaging service to create and maintain a picture library
Content Syndication	Content can be syndicated via RSS on a per-site or per-list basis
File Format Conversion	Easy file format conversion; rendering of spreadsheets as HTML; Access will treat SharePoint site data as data sources; easy, no-coding creation of dashboards from Excel spreadsheets; PowerPoint "Slide Library"; Outlook integration
Workflow Development	FrontPage wizard for workflow development; workflow templates; digital signature integration
Web site Development	Facilities to make it easier to build/manage sophisticated internet/intranet sites
Integration	Much easier to integrate enterprise applications, custom databases and Web services
Forms Creation	Ability to create forms with ASP.NET controls
Lists and Data Management	List creation tool; multiple list views; version history for all list and library, showing what changes were made; project task list; Gantt chart view of any list; e-mail to a list for posting; cross-list web views
Formatting	Ability to send SharePoint lists to mobile devices
Feature Selection	Selected deployment of major features
Search	Search features include "Best Bets" and alternate suggestions
Personalization	Enhanced *MySites* with aggregation, personalization and social networking
Authoring Tools Used	Extensive use of Front Page for site design; publish InfoPath forms as SharePoint sites; Front Page-based Template Designer for content management
User Interface Management	Easy global change of UI via master pages
Languages	Out-of-the-box support for multi-lingual deployments
Security	Item-level permissions in all libraries and lists
Connectivity	Uses Web Services and SOAP protocals; Web Parts
Messaging	Email alerts, with filters; submit postings to WSS discussion boards via email; e-mail archiving
Classroom Management	Templates available include one for Classroom Management
Application Launching	Connectable Web Parts; Web Services; connections to APIs of external applications
Communications	Site level: Instant messaging, discussion forums, messaging and alerts. Connects to Live Communications Server for chat
Polls and surveys	Surveys built-in
Administrative Controls	Tools to create and manage lists

Figure 1 – Learning supports" from SharePoint 2.0. (SharePoint information adapted from Miller, 2006).

Integration of SharePoint with a Learning Management System

One of the strengths of Microsoft SharePoint is the use of Web Parts by external vendors to add functionality. In the educational arena, our experience in a number of projects is that adding Web Parts from a configurable learning management system, such as LearnFlex from Operitel Corporation, greatly enhances the educational power of SharePoint. What an LMS can add is functionality that relates to learner registration, course catalogues, assessment, and tracking and reporting.

Some functions that a system such as LearnFlex can supply as Web Parts include the following:

- Individual Learning Plans; personal profiles that can be used to change languages, course offerings, look and feel and business rules
- Email alerts with filters; internal messaging for courses
- Completely configurable registration workflow; different registration workflow possible for each organizational unit; registration for all types of classes, including face-to-face, blended and online courses
- Tracking and reporting of classroom assessment results
- Resources management module
- Launching of courses and educational events from each individual learning plan
- e-Commerce - built-in and completely integrated with LMS
- Conference and workshop management module, including e-commerce for conference fees
- Tracking requirements for diplomas or certificates, including optional and mandatory requirements; issues customized diploma on completion
- Full tracking and reporting of competencies, based on job position or individual profile
- Assessment engine with over 20 question types; insertion of performance data and external assessment results; reporting and descriptive statistics
- Virtual classroom with communications, notetaking tools and course libraries
- Instant messaging, discussion forums, chat, messaging and alerts at the course level
- Built-in surveys and quick polls within the virtual classroom
- Achievement records for each learner
- Built in report builder plus a selection of standard reports
- Administrative module that allows all aspects of LearnFlex to be changed by those with appropriate security clearances.

SharePoint is both a very useful collaboration environment and a configurable connectivity platform using Web Parts and Web Services. Paired with a capable LMS, SharePoint can be up and running in learning environments in a relatively short period of time. This combination has huge potential in education and training markets.

Conclusions

Given the explosion of the variety of online educational supports, no single product on the market can cover all the possibilities as we move into a world of distributed multi-channel learning. The wide variety of open source initiatives to support eLearning 2.0 are not yet integrated with each other, and are still in the development stage, for the most part. However, much of the functionality of the projected applications and benefits from eLearning 2.0 can be realized through Microsoft tools such as SharePoint and Live Communication Server, with rapid configuration for specific educational settings using LearnFlex Web Parts. Once this has been accomplished, enterprises will have a very powerful learning platform that can support the complexities and dynamics of learning.

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