

# Advanced *Distance Learning Systems*. A technical approach using *MS SharePoint™* Portal Server

Tharrenos Bratitsis  
Electrical Engineer- Computer  
Scientist, Postgraduate Student,  
University of the Aegean, Rhodes,  
Greece  
[bratitsis@aegean.gr](mailto:bratitsis@aegean.gr)

George Henry Hlapanis  
Informatics Teacher, Computer Scientist,  
Postgraduate Student,  
University of the Aegean, Rhodes,  
Greece  
[hlapanis@rhodes.aegean.gr](mailto:hlapanis@rhodes.aegean.gr)

Angelique Dimitracopoulou  
Associate Professor,  
Learning Technology and Educational  
Engineering Laboratory, University of  
the Aegean, Rhodes, Greece  
[adimitr@rhodes.aegean.gr](mailto:adimitr@rhodes.aegean.gr)

## ABSTRACT

An inspection of existing *Distance Learning Systems (DLS)* is firstly attempted within this paper in order to point out drawbacks arising when implementing sophisticated learning models. Thereafter a *DLS* based on the *MS Sharepoint™ Portal Server (SPS)* software is proposed, which provides several means in order to overcome such drawbacks. Certain key technical aspects of this platform are also analyzed.

## KEY WORDS

Distance Learning, Information and Communication Technologies, e-Learning.

## 1. INTRODUCTION

Due to the uninterrupted increasing competition in every field of our modern society, especially the economic one, continuous education and self-improvement has become a necessity. Fortunately, today, information resources are available to everyone and obtainable by everybody, provided *Information and Communication Technologies (ICT)* are in hand.

There is a plethora of available applications suitable to use in order to accomplish Distance Education programs. Within this paper, only *Distance Learning Systems (DLS)*, shall be dealt with. These are systems implemented completely via the Internet, which embed services of construction, administration and management of educational resources as well as communication services (synchronous or asynchronous) and collaborative activities.

Whenever sophisticated scenarios, based on modern pedagogical principles, are required to be implemented on *Distance Learning Systems*, several drawbacks usually appear.

We propose a *DLS* based on the *MS Sharepoint™ Portal Server* platform. This is a software, recently presented and mostly designed to provide solutions for building corporate web portals. We believe that many elements and services integrated within this platform could provide us with solutions to the above-mentioned problems, related to an educational context of use.

## 2. STATE OF THE ART

There are many acronyms describing *Distance Learning Systems*, depending on the pedagogical approach they implement or the target group they apply to. Bibliographical research may provide us with terms like *VLE (Virtual Learning Environments [2])*, *Learning Communities [17]*, *CMS (Course Management Systems [1])*, *C3MS (Community, Content and Collaboration Management Systems, [17])*. All of them refer to the same basic software construction. That is a web portal, which implements additional services and facilities that can be categorized as follows:

- System administrative tasks (user or resource administration, security tasks)
- Course administrative tasks (moderation, grade book, assignment supervision and observation, calendar, bulletin boards, etc)
- Communication (email, chat, ftp, conference, etc)
- Knowledge Management (existence of a knowledge base, content management, indexing and search tools, etc)

Existing Distance Learning Systems are mostly based on traditional platforms such as *WebCT*. Some worth mentioning examples of such systems are: *PostNuke<sup>1</sup>*, *CityofNews<sup>2</sup>*, *PhPWebSite<sup>3</sup>*, *TappedIn<sup>4</sup>*, *Weblogs<sup>5</sup>*, *Wikis*, *CoWebs<sup>6</sup>*, [2], [17].

They are designed according to a traditional view of education that is based on course delivery, traditional evaluation approaches and an inflexible management structure.

Nowadays, there is an increasing effort to design *DLS* systems based on currently established theory and research in human learning [6]. Consequently, recent theories derived from the socio-constructivism paradigm, such as *Distributed Cognition* theory [5], [14], [16], or

<sup>1</sup> <http://www.postnuke.com>

<sup>2</sup> <http://ali.www.media.mit.edu/~flavia/CityOfNews.html>

<sup>3</sup> <http://phpwebsite.appstate.edu/index.php>

<sup>4</sup> <http://www.tappedin.org>

<sup>5</sup> <http://radio.weblogs.com>

<sup>6</sup> <http://coweb.cc.gatech.edu/csl.24>

Activity theory [3] have started to influence requirements on *DLS*. In fact, there is a paradigm shift from teacher directed instruction to learner management learning, from subject centered design to learning-centered design, from individualistic learning to learning communities. Most importantly, there is a shift from a vision of students as more or less passive learners to students as apprentices knowledge workers. Subsequently, *the technology must not be just a means to deliver information/knowledge but an aid to the production of knowledge objects* [4]. On the whole, there is a tendency for such systems to nest Mason's *Integrated Model* [7]. According to this model, e-learning can be accomplished through numerous online collaboration activities, given the appropriate educational resources and communication services. The content of each lesson can be dynamically and radically changed according to the students' needs and the progress of the activities assigned. During each lesson there is a contribution to the mutual knowledge base from every party (teachers, students, even guests). Unfortunately, such a learning model is seldom achieved because the existing *DLS* appear to have several drawbacks when used according to such principles. Some encountered drawbacks, deriving mostly from technical inefficiency, appear to be:

- Lack of provision for integration between applications which are required for more complex learning scenarios.
- Usually there is no common interface for every service provided, due to the fact that most of the platforms use proprietary technical modules. Thus the appearance of every module may be different from each other and most importantly their functionality might differ as well.
- Proprietary solution building leads to inefficient embodiment of any new or innovative facility (web oriented an implemented service or technology) in such systems. Even so, embodiment may occur relatively unhurriedly.
- There are practically no native fully-automated procedures or processes within such systems.
- Lack of document management and exchange.
- Non-transparent and often considerably complex administrative tasks.
- System configuration requires technical knowledge or constant cooperation with experts.
- Poor moderation of educational activities and inadequate communication coordination.
- Poor knowledge management. The generated knowledge, such as the results of the educational activities is not managed well; therefore it can not be easily reused.
- Inefficient Security.

Systems that provide solutions to some of the above mention drawbacks seem to exist, yet they are specific purpose oriented, for example *Belvedere*<sup>7</sup>, *Modelling-Space*<sup>8</sup>, the *Seed*<sup>9</sup> project, etc. Moreover, there is a trend to use technologies or techniques such as *Portlets*<sup>10</sup> or *Cocoon*<sup>11</sup> architecture in order to implement more complex functionality [17]. The *DLS* that we propose is based on the *MS Sharepoint™ Portal Server (SPS)* software, which provides several means in order to overcome such problems and difficulties.

### 3. DESCRIPTION OF THE PROPOSED *DLS*

#### 3.1. Architecture

According to Microsoft [10], *SharePoint™ Portal Server 2001 extends the capabilities of Microsoft Windows and Microsoft Office by offering knowledge workers a powerful new way to organize, find, and share information. For system architects and developers, SharePoint Portal Server is a solution that delivers dramatic new value by combining the ability to easily create corporate Web portals with document management, enterprise content indexing, and team collaboration features.*

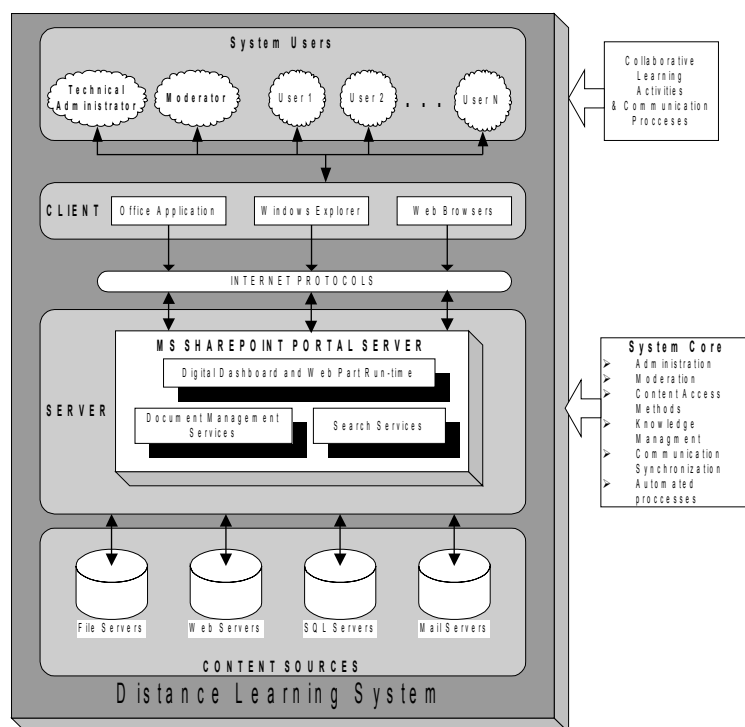


Figure 1: Proposed *DLS* Architecture

<sup>7</sup> <http://advlearn.lrdc.pitt.edu/belvedere>

<sup>8</sup> <http://www.modellingspace.net>

<sup>9</sup> <http://ilios.cti.gr/seed>

<sup>10</sup> <http://www.portlet.net>

<sup>11</sup> <http://xml.apache.org/cocoon/index.html>

In order to cope with the commonly shown up problems in existing *DLS* (mostly deriving from technical inefficiency) a professional, robust and efficient platform must be used.

In the core of our proposed system, *SPS* (originally designed for corporate use) can link many different content sources to the user allowing the accomplishment of sophisticated tasks such as *Administration of users and resources*, *Moderation of educational activities*, *Synchronization of user communication*, efficient *Security*, *Knowledge Management*.

The availability of such functionality, can lead us to the effective implementation of any desired learning model, even Mason's *Integrated Model* [7], and any desired pedagogical approach. Our consideration regards a flexible system which concerns not only secondary or higher education students, but "learners" in general: *From learners that follow formal educational programs to learners-adults (such as teachers or professionals in general) that are implicated to professional development programs or act in a voluntary manner in virtual communities of practices* [15].

As shown in the figure above, *SPS* consists of three operational modules. *Document Management Services* and *Search Services* are used for accessing information drawn from a wide variety of content sources while maintaining the security of the documents. The *Digital Dashboard* and *Web Part Run-time module* is used to present the portal content to a user through a web browser (or other office applications - *clients*) by using internet communication protocols (TCP/IP).

### 3.2. Characteristics

Our *DLS* shall rely on the following features of *SPS* [8], [9], [10], [11], [12], [13]:

- Virtual workspace: An organized collection of documents, content sources, management folders, categories, document profiles, subscriptions, and discussions. It provides a central location to organize, manage, and publish content.
- Web Storage: Built-in services providing a virtual storage area accessed via the Web as if it was a local disk, which is also used for building Web-based collaborative applications.
- Dashboard site: It is a specialized Web site that is created automatically at the same time as the associated workspace. The dashboard site provides a Web view of the workspace and enables users assigned to appropriate roles to search for, view, and manage documents in the workspace and to search for and view content

from other sources. The dashboard site contains a number of pages, or *Digital Dashboards*, and includes customization pages.

- Advanced document Management and Publishing Services
- Built-in Integration with common office applications and Web Application Building Protocols (*ASP*, *CDO*, *ADO*, *XML*, *CSS*, *WebDAV*).
- Advanced Security Options

These features provide us with the ability to develop distance learning courses which can comply with any pedagogy desired. Moreover they supply us with easily automated procedures, making the system more functional and operable.

### 3.3 Technical Aspects

Some technical aspects that we consider *SPS* key features are analyzed as follows [8], [9], [10], [11], [12], [13]:

- Integration

*SPS* innovative integration features have two distinct components.

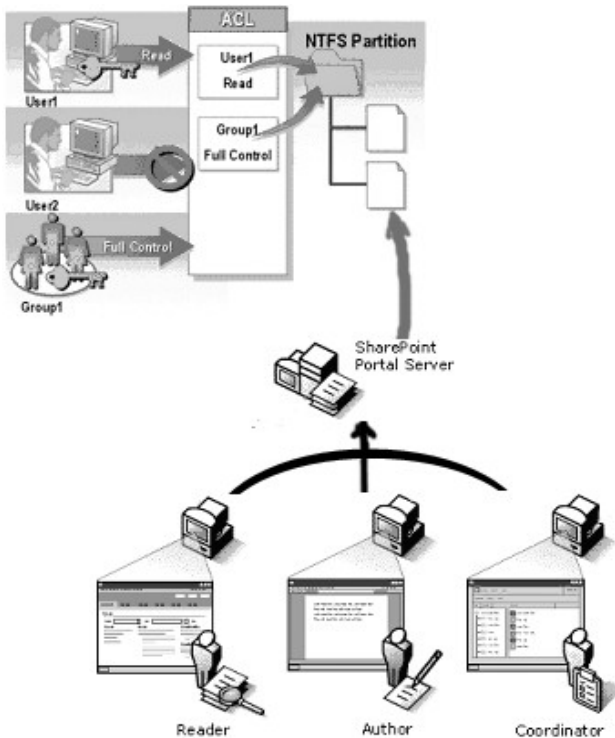
- *SPS* integration with applications used every day by common users, such as Office applications and browsers. This contributes to the *DLS* usability enhancement by making content accessible through these applications. So that one can use a web browser, as well as Outlook for that matter, gaining access to:
  - Automated announcements services.
  - Automated calendar service, ideal for making arrangements between users during a Distance course.
  - Simplified procedures for publishing material (like excel tables, word documents, html pages) as easy as saving them to a local disc (using the *save as* or the *copy – paste* function).
- Full integration with other server platforms. Thereby, a user entering the *DLS* is authenticated using *Windows 2000 Active Directory* user management and authentication features. The System recognizes the user through his *SID (User System Identifier* number) and manages his access rights to content sources, such as:
  - Mailboxes
  - Fora
  - Chat and discussion servers
  - Database content query and retrieval.

- Security

In existing *DLS*, security is often implemented on the *IIS* level. Due to the opacity of content placement, file-level

permission settings are not easily applicable (if they are at all). *SPS* complies with the *IIS Security model* but also extends permission planning by taking advantage of the *Distributed Security model* supported by Windows 2000, while simplifying content management, introducing a Role-based Security model.

Windows 2000 security relies on *Access Control Lists (ACLs)* to control access to resources. Windows 2000 stores an *ACL* with every file and folder on a content source. The *ACL* contains a list of all user accounts, groups, and computers that are granted access for a file or folder, and the type of access that they have been granted. On the other hand, the *SPS Role-based Security model* uses a fixed set of three roles to offer a flexible and secure method for controlling user access to content. Permissions associated with a specific role cannot be modified. Roles both at the individual folder level and on the workspace node, which is the top level of the workspace, can be assigned. In addition, access to a specific document can be completely denied to a user (or users). Role-based security is used to control access to content, regardless of whether the user is accessing content using a Web browser, Web folders, or Office. The three discrete roles are:



**Figure 2:** Security schema in SPS according to Microsoft [8]

### Reader

A reader can search for and read documents but cannot add them to the workspace. By default, all folder users have *Read* permissions. In an enhanced folder, readers can only view folders and

published versions of documents. Enhanced folders provide increased document management functions, including approval routing and version control. A reader cannot *check out* (function described later on), edit, or delete documents, and cannot view draft document versions.

### Author

An author can add new documents to a folder, edit all documents in the folder, delete any document or subfolder from the folder, and read all documents in the folder. An author can also delete the folder itself. In an enhanced folder, authors can also submit any document for publishing.

An author can create, rename, and delete folders. However, the author cannot change the roles or the approval policy on folders that are created by him.

### Coordinator

A workspace coordinator manages content in the top-level folder and performs a set of administration tasks that pertain to the entire workspace. These tasks include managing content sources, document profiles, categories, discussions and subscriptions, and customizing the dashboard site. In fact the moderator of educational collaborative activities within our *DLS* should be an *SPS Coordinator*.

Moreover, *SPS* provides the Deny Access security option on documents only.

Access to a document can be denied for a specific user or group if that user or group should not be permitted to view that document. When access to a document is denied, it is no longer visible to the denied user or group. *SPS* honours all the various types of authentication by accepting the appropriate access token based on a *SID (User System Identifier)* number). It allows coordinators to control the access to a document for both reading and viewing. Someone who does not have access to a document or folder cannot discover its existence by any means (through search or folder browsing).

- Digital Dashboard technology

A *Digital Dashboard* is basically a Web page containing numerous modules called *Web Parts*. A *Web Part* is a customizable, reusable, autonomous component used to display specific information of any kind. A *Web Part* is dynamically connected to the content source allowing use of automated updating procedures. Therefore:

- Any changes made in the content of the information source are automatically displayed to all users through the associated *Web Part*. This functionality provides us with efficient announcement publication, for instance.
- Any user can modify the content of the information source through a *Web Part*, provided proper access rights are given by

the *SPS* WorkSpace Coordinator (or *DLS* Moderator). Thus allowing automated and easily manageable source contribution.

- Any user can modify the arrangement and appearance of the *Web Parts* being displayed in his browser (or other access application), enhancing personalization features. The *SPS* WorkSpace Coordinator has authority on Web Part modification rights and visibility.

- Document Management

Within a typical *DLS*, large and complex information sources, such as a collection of file shares, can be difficult to navigate and use because there is little or no organizational framework to direct users. File shares, for instance, provide only a hierarchical directory structure as a means of organizing content (due to ftp protocol usage). There is only one navigation path to any given document, and users must know the name of the server that the document is stored on, in addition to the directory structure of folders on the server. It may be difficult to control access to documents, and publish them within the *DLS*. Important documents can also be lost, overwritten, or hard to find. A *DLS* based on *SPS* offers a number of document management options such as:

- Version tracking to record the history of documents and avoid accidental overwriting by other users. Documents are being *checked out* in order to be processed and *checked in* when finished processing.
- Application of identifying any document by using descriptive, searchable and customizable information (metadata) pertaining to the document.
- Document publishing control through automated approval routes for documents to be sent to reviewers, thus preventing access to semifinished assignments by unauthorized users.
- Web discussions for online comments by multiple document reviewers as part of the document's metadata without modifying the document's content. Instead of using e-mail to discuss about a document or trying to extract information about a document deriving from a relative conversation, authors and reviewers can now communicate with each other through Web discussions. Simultaneous discussions about a document can occur even if one person has the document checked out. Comments are stored as threaded conversations, grouping comments and replies together.
- Control of document access based on *Roles* as well as *Access Control Lists*.

## 4. CONCLUSION

The existing *DLS* appear to have several drawbacks when used to implement complex models of education. We believe that our proposal, taking advantage of *MS Sharepoint* features (especially its full integration with commonly used tools and servers), could provide several means in order to overcome such problems and difficulties; thus giving us the opportunity to build sophisticated courses, according to any learning approach we please considering "learners" in general. In this paper we particularly described technical aspects of features such as *Security*, *User Management*, *Document Management*, *Web Storage Capabilities* and *Digital Dashboard techniques*.

The fact is that *SPS* platform has not yet been widely used for educational or academic purposes. This might be due to financial (expensive user licenses) as well as technical reasons (non open-source software).

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