Journal of International Technology and Information Management

Volume 22 | Issue 3 Article 2

11-4-2013

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Recommended Citation
Ganesan, Nanda (2013) "Migration of an E-Learning Model to the Cloud N. Ganesan ©," *Journal of International Technology and Information Management*: Vol. 22: Iss. 3, Article 2.
DOI: https://doi.org/10.58729/1941-6679.1013
Available at: https://scholarworks.lib.csusb.edu/jitim/vol22/iss3/2

Migration of an E-Learning Model to the Cloud

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ABSTRACT

An e-learning model consisting of a course website and multimedia learning modules was developed and implemented initially on a traditional computing platform at a higher learning institution. With the emerging concept of cloud computing, the possibility of using cloud computing resources such as Google Apps, YouTube and SkyDrive to redesign and deploy the e-learning model in the cloud was explored. It was found that the cloud computing resources offered unprecedented opportunity and flexibility to migrate the course website to the cloud and to expand the outreach of the multimedia modules. This paper discusses the migration of the e-learning portal from a traditional hosting platform to a cloud computing platform. In particular, the design of the course website using Google Apps and the hosting of multimedia modules using SkyDrive and YouTube are discussed.

INTRODUCTION

In recent times, e-learning has made major strides in becoming one of the fastest growing modes of instruction (Allen & Seaman, 2013). At the beginning, e-learning implementations were mostly centered on hosting course material and course related information on websites. Such material generally included the syllabus, course notes, PowerPoint slides, quizzes, references etc. The course material represented only one of four major components of learning in a typical classroom environment. The other three components are the in-class lectures, the quizzes and examinations, and the collaborative activities that occur in the classroom. Depending on the field of study, there can be other components of learning as well such as, for example, lab work and field training. For the most part, these four components are common to most in-class learning environments.

Today, the technology has progressed to the extent that all four components of in-class learning can be adopted and incorporated into an e-learning model. They are also the most commonly found components in online courses offered by the providers of Massive Open Online Courses (MOOCs) such as Coursera. A specific example in this case is the Human-Computer Interaction course offered by UC San Diego on Coursera (Klemmer, 2013). The increase in bandwidth of the Internet and the advancement in audio and video technologies have contributed to in-class lectures being recorded and streamed over the Internet as the web technology progressed to facilitate two-way communications between the users and the website, it became possible to conduct online quizzes and also to engage in collaborative work over the Internet.

A self-standing e-learning model will deploy all four components of learning listed above. A blended e-learning environment, on the other hand, may only employ the first two components of learning, the components being the dissemination of course material from a website and the streaming of in-class lectures. The collaboration and the testing of knowledge in a blended

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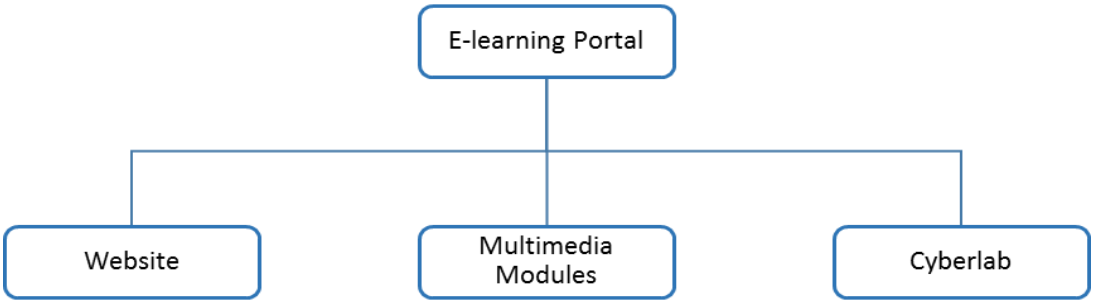
learning environment would normally occur in a classroom setting. All four components are still present, but in a blended format.

The e-learning model presented in this paper is geared towards a blended learning environment. Its major components are a website for the dissemination of information and a collection of multimedia instructional modules for the delivery of in-class lectures. A virtual lab accessible over the Internet was added and used briefly at the beginning. It is now pending further exploration and development. The components of the e-learning model discussed are depicted in Figure 1.

Figure 1: Components of the E-learning Model.



The origin of the model shown in Figure 1 can be traced to the development of a collection of multimedia instructional modules. The modules were designed to teach undergraduate and graduate courses in Information Technology. They were initially distributed on CD-ROMs to meet the learning needs of a diverse population of students who commuted to classes after a day at work. The multimedia modules offered the students a flexible learning environment that transcended temporal and spatial constraints imposed by a traditional classroom environment. The addition of the course website to the e-learning model enhanced the learning experience of the students by offering a sense of direction and cohesiveness to the e-learning process. The cyber lab that was subsequently added to the e-learning model was intended to provide the students with the ability to complete their lab assignments from any computer connected to the Internet. The cyber lab component was not pursued further for reasons explained later.

Until its migration to the cloud, the local computing resources available on the campus were used for implementing the e-learning model. For the most part, the e-learning systems deployed in higher-learning institutions have generally been built upon a Learning Management System (LMS) such as Moodle or based on a custom built e-learning platform. An exception to these two approaches is the recent use of MOOCs to deliver the courses by some institutions. From the user's perspective, the advantage of hosting the e-learning system using local resources is that the overheads of hosting and managing the system are largely borne by the institution. The disadvantage is that the users are subjected to the restrictions and limitations imposed by the institution and the LMS. By hosting the e-learning system on the cloud, as in the case of the e-learning model discussed in this paper, the designers of e-learning systems can have greater flexibility to explore and incorporate new and innovative features in the systems.

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Cloud computing, in general, offers many avenues for creativity in designing an e-learning system. It provides an extensive collection of resources to help in the development of the system. The resources can be used to tailor an e-learning system to serve the specific needs of a targeted population of students. Also, e-learning systems hosted on the cloud are relatively easy to develop and manage. These are some of the reasons that motivated the migration of the e-learning model to the public cloud.

EVOLUTION OF THE E-LEARNING MODEL

As the e-leaning model shown in Figure 1 evolved over time, the course websites and the multimedia modules became an integral and essential part of the learning process. Although the value and benefit of the cyber lab to the students became evident following its initial implementation, the initiative was not pursued further due to security restrictions enforced on the access to the campus network. As such, only the course website and the multimedia modules were developed further and eventually migrated to the cloud. The cyber lab is currently being revisited following the emergence of cloud services such as the Amazon Elastic Compute Cloud, better known as Amazon EC2. The evolution of the e-learning model that underwent various stages of development prior to its migration to the cloud is documented elsewhere in some detail (Ganesan, 2002, 2002, 2003, 2007 & 2007) and summarized in Figures 2, 3 and 4. The stages of evolution mapped in these figures are intended to provide a holistic background to the migration effort discussed in this paper.

Figure 2: Evolution of Web Hosting Platform and Development Tools.

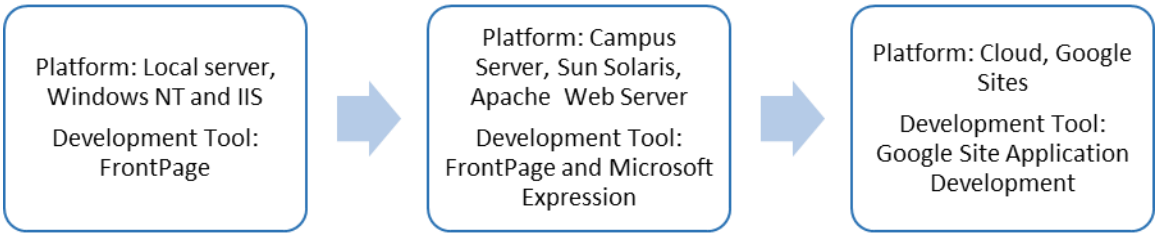


Figure 3: Evolution of Multimedia Modules Development Tools and Distribution Channel.

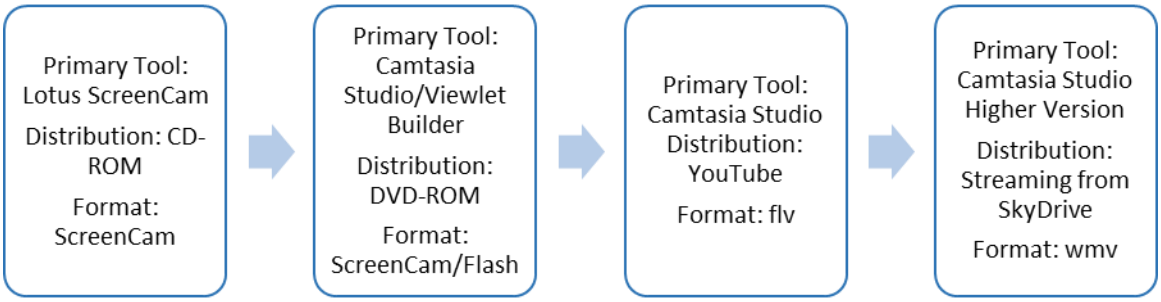
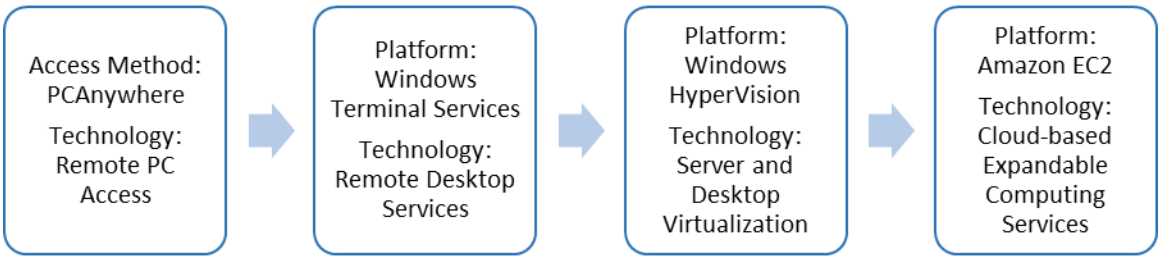


Figure 4: Evolution of Cyber Lab Implementation.



The e-learning model was initially implemented in the cloud using resources available in the public cloud such as Google Sites, Google Docs and YouTube (Ganesan, 2009). A few changes were subsequently made to capitalize on the newly emerging and expanding cloud services. The changes in part amounted to the replacement of Google Docs with Office 365 for document processing. SkyDrive was later added for cohosting the multimedia modules along with YouTube. Being an integral part of Office 365, SkyDrive eventually became the natural choice for storing various course related documents such as Word files, PowerPoint slides etc.

MIGRATION TO CLOUD COMPUTING

With each revision of the course website, the contents of the site were progressively condensed to include only the frequently accessed information. The website contents that were found to be most useful in this respect are listed in Table 1. Each row in the table corresponds to a separate webpage on the website. Many course websites hosted elsewhere also contain similar types of course related information (Grankowska & Heines, 2002). A sample web page containing the hyperlinks to the pages listed in Table 1 is shown in Figure 5.

Table 1: Contents of the Course Website.

Page	**Contents**
Home Page	Announcements, contact information and office hours
Overview	Course description, objectives, outcome and textbook
Lectures	PowerPoint slides and weekly plan
Multimedia	Questions relating to the multimedia modules and a guide to the sequencing of multimedia modules for learning
Tutorial	Examination review questions and homework in audio streamed format
Workshop	Details and schedule of hands-on computing workshops
References	Web references with a few captured and posted in pdf format
Project Details	Project description and details of presentation and report format
Project Groups	Presentation schedule and email addresses of students
Examination	Examination details and grading practice
Summary	Summary of important points covered in the above categories of information

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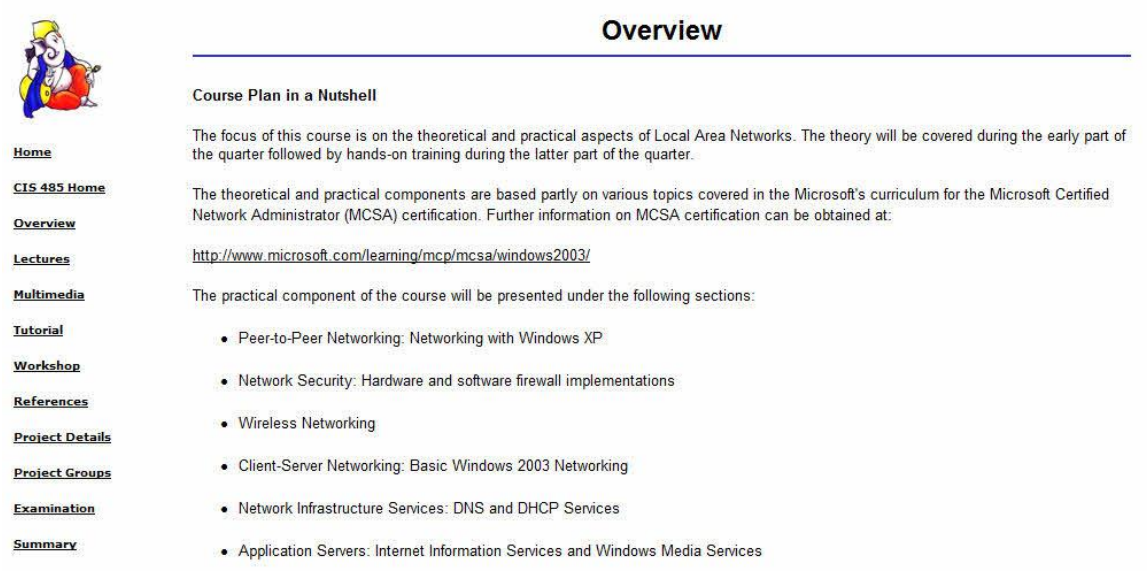
Figure 5: Sample Web Page from the Course Website.



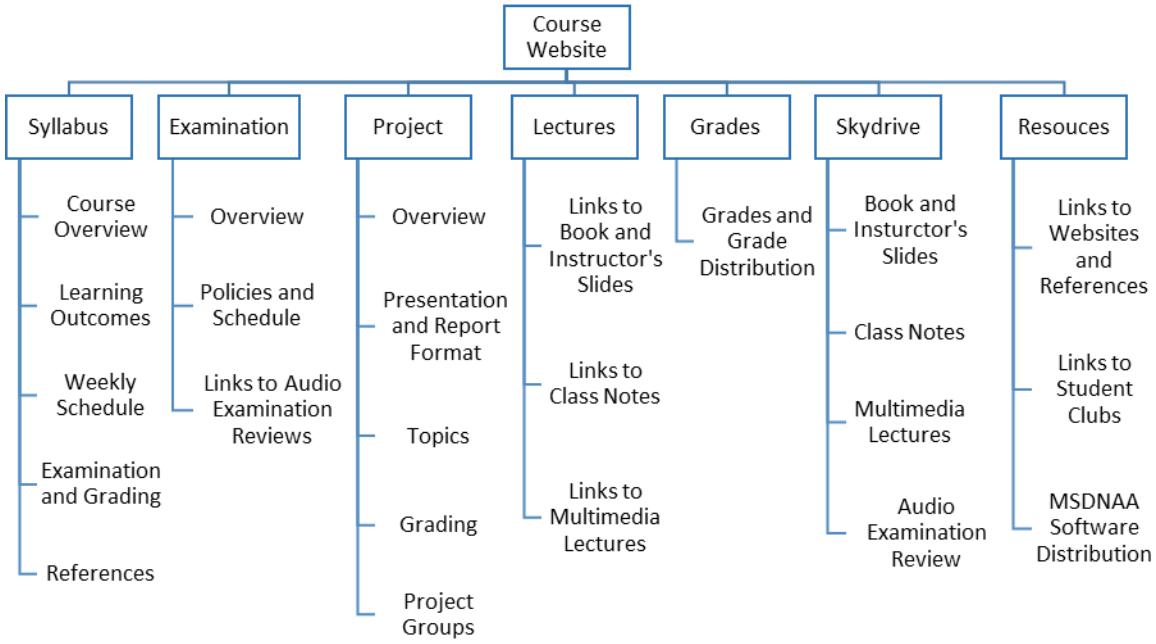
The web pages, in general, were designed with a well-defined set of guidelines in mind. These guidelines applied to the design of the user interface. The guidelines taken into consideration were concise wording, quick page downloads, appropriate target screen resolution, simple page design, few and small supporting graphics, discriminating use of large graphics, jargon-free language and searching ability (Fisher, 2000-2001). Another suggestion considered was the use of Gestalt Theory as a foundation for instructional screen design (Smith-Gratto & Fisher, 1998-1999). The theory advocates simplicity, proximity, similarity, symmetry and closure to be given due consideration when designing the user interface. In addition to applying the guidelines to the pages, the website as a whole was also subjected to further refinements. Some of the refinements made to the website are as follows:

- The overall number of navigation links in the site was reduced. For example, the information pertaining to student projects was now consolidated into one web page instead of displaying it on different web pages with multiple links. In other words, the number of web pages was reduced by consolidating multiple smaller pages onto a single but longer web page.
- The earlier website had a number of web links that were more than two levels deep. In the newer website, the depth of the navigation links was limited to two levels at most. Each time a link is clicked, the related information is displayed on a single web page accessed by the link. A second click was necessary only when the course materials such as the multimedia modules were to be retrieved from the cloud.
- Navigation links were transposed from the sidebar to the top of the page. The uncluttering of the pages free of navigation links resulted in better readability and printability of the page.

The e-learning site that reflects the changes listed above is mapped in Figure 6. The ability to frequently update the cloud hosted website in real-time contributed to the rapid redesign of this website. Unlike the web server on the campus that was based on Web 1.0 technology, cloud

based services are built on Web 2.0 technology. One of the distinguishing features of Web 2.0 is that it supports two-way retrieval and storage of information in real-time. This means a web designer can connect directly to the website, make changes and store the changes immediately on the cloud server by clicking the save button. In comparison, when the website was hosted locally on the campus webserver, a FTP client was needed for uploading the contents of the website to the server. In this case, a stand-alone computer had to be configured and utilized for the purpose of developing and updating the website.

Figure 6: Site Map of the E-learning Model.



CLOUD COMPUTING RESOURCES

In order to select an appropriate platform for redesigning and hosting the e-learning system in the cloud, the literature on cloud services such as Google Apps, Zoho, Office Live and YouTube was surveyed (Lynn, 2009). Comparison studies of other cloud resources including the packaged cloud services offered by major software vendors such as Microsoft, Google and Salesforce.com were also included in the literature survey (Dominic & Francis, 2012 and Alshwaier, Youssef and Emma, 2012). Office 365 and SkyDrive that were later added to the study were explored by experimenting with these services on a trial basis.

Following the survey of the cloud services, Google Apps was selected as the primary cloud computing platform for hosting the website while SkyDrive and YouTube were selected for cohosting the multimedia modules. The selection was based on factors such as user-friendly interfaces for website development, ease of use and reliability. Others have also identified Google Apps and SkyDrive to be two of the most valuable cloud resources for developing e-learning portals (Thomas, 2011).

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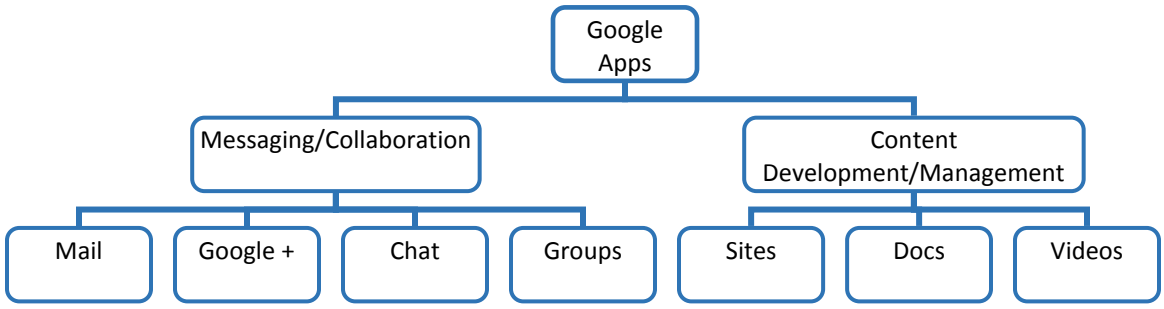
Google Apps is best understood by grouping the services it offers into two major functional categories. These categories are Messaging/Collaboration and Content Development/Management as shown in Figure 7. The two functional categories are further subdivided into services such as Mail, Google +, Chat, Groups, Sites, Docs and Videos. Each of these components are based on the Software as a Service (SaaS) concept of cloud computing.

Figure 7: Google Apps Components.



Although all of the services listed in Figure 7 could, in theory, be used in the development of an elaborate e-learning site, only three of the services were initially chosen for the design and implementation of the e-learning system. The services chosen were the Sites, Videos and Docs. Among them, Google Sites figured and continues to figure prominently in the design of the course website. Google Video that was tested earlier for streaming the multimedia modules was dropped from further consideration in favor of YouTube. Google Docs, on the other hand, was used for creating and storing course material such as text files, presentations and spreadsheets. Forms were created and used occasionally using Google Docs as well.

An example use of forms was to obtain information from the students for registering them to receive free software under a license agreement with Microsoft. In order to receive the software, the students had to provide their email addresses and confirm that they are majoring in Information Systems. A simple form creation tool in Google Docs was used for designing and hosting the data entry form. The data collected by the form was stored and presented in a spreadsheet for easy processing. For administrative convenience, the form finally gave way to obtaining the required information directly from the students in the classroom.

As for hosting of the multimedia instructional modules, YouTube was initially chosen due to its features and accessibility. For reasons cited later in this paper, YouTube was eventually replaced by SkyDrive as the cloud service for streaming the multimedia modules over the Internet. Likewise, Office 365 replaced Google Docs as the de facto content management system for the course materials. In effect, these resources collectively enabled a course website consisting of audio, video and textual learning material to be developed and hosted rapidly and affordably.

GOOGLE SITES

The cloud service, Google Sites, offers four major web templates for designing a course website. They are known as the Web Page, Announcement, File Cabinet and List templates. The purpose and functions of each of the templates are outlined in Table 2. All four templates were used for creating various web pages of the course website. The use of these templates eliminated the need

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to write any computer code to develop the website as would become evident in the following sections.

Table 2: Templates and their Usages.

Template	Creative Usage
Web Page	Simple web pages for displaying textual information.
Announcement	Announcement pages for entering announcements and comments. An announcement page could also be created to function as an effective blog.
File Cabinet	File cabinets for uploading and sharing files.
List	Pages containing list of items that could be sorted and displayed based on the information entered in fields.

Web Page

Among the four templates listed, the most frequently used template was the Web Page template. Many of the pages from the earlier website were easily migrated to the new website using this template. During migration, the web pages listed in Table 1 were consolidated and abridged to yield fewer pages on the new cloud hosted website. The end result was the creation of a new and reduced set of pages that are listed and described in Table 3. The Syllabus page listed in Table 3 is shown in Figure 8 as an example.

Table 3: Consolidated Web Pages on the Cloud Hosted Website.

Web Page	Contents
Home Page	General description of the course and a blog.
Syllabus	Brief course description, weekly plan, learning outcomes, and course policies and procedures.
Lectures/Labs	PowerPoint slides, class notes, audio/video lectures and possibly references.
Projects	Sample topics, project presentation format, grading and a list of members of the project groups.
Examinations	Structure and composition of the examinations, audio/video examination reviews, grading practice and grades.

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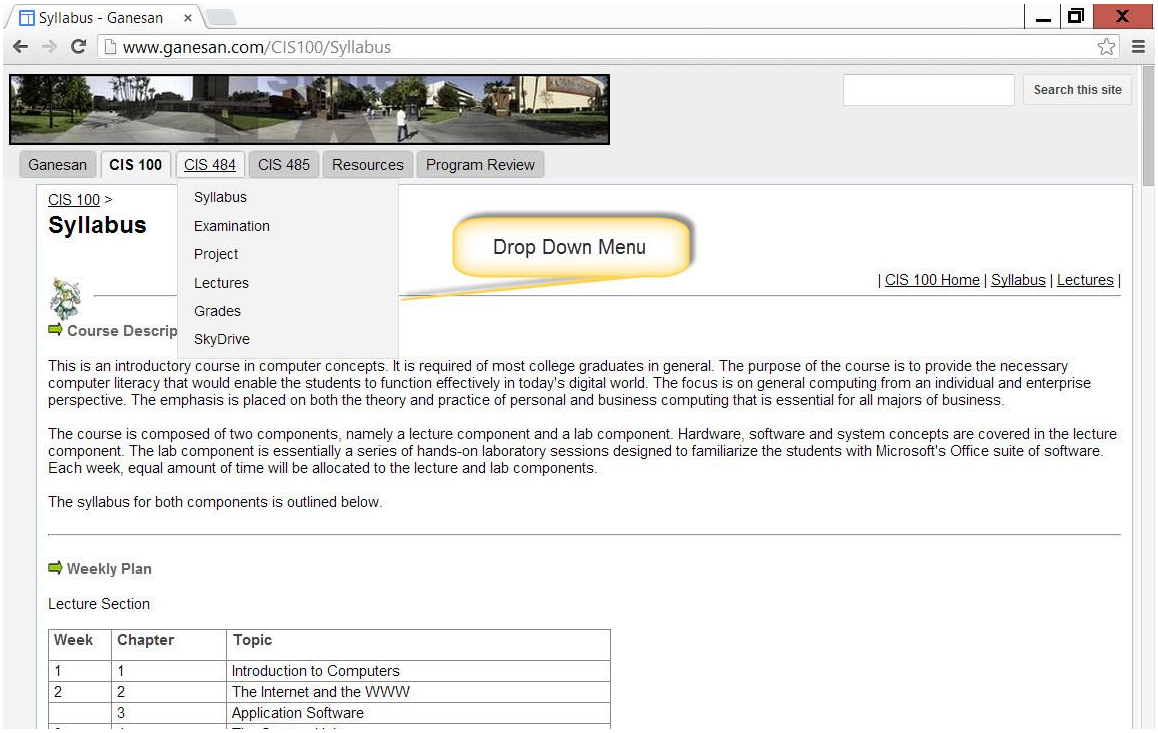
The web pages designed using the Web Page template allowed documents to be uploaded and attached to the pages in real-time. Comments could also be posted online at the end of each page. The ability to attach documents and post comments provided a degree of interactivity with the web pages that was not previously available. Another benefit of using Google Sites was that the web contents could be searched using keywords entered in the "Search this Site" window that appears at the top of each web page as shown in Figure 8.

Figure 8: A Sample Web Page on Syllabus.



Announcement

The second template available for the design of the web pages was the Announcement template. Using this template, date and time stamped announcements can be posted on the website. This feature was useful in creating a blog. The blog can be displayed as an independent web page, or it can be embedded within the home page of the website. Using an already available gadget in the Google library, the blog was embedded within the home page of the website as shown in Figure 9. The blog enabled messages to be displayed in a timely manner. If desired, the pages created using this template can be linked to a student's mobile device as an RSS feed so that students can be notified immediately after a page is updated. There are a number of gadgets available in the Google library such as Google Calendar that could further add to the functionality of the website. These gadgets are often made available by third-party developers and not necessarily by Google. The gadgets are easily integrated within the websites developed using Google sites. This, however, is not the case with the website hosted on the local a server where some form of coding would be needed to include the gadgets in the site.

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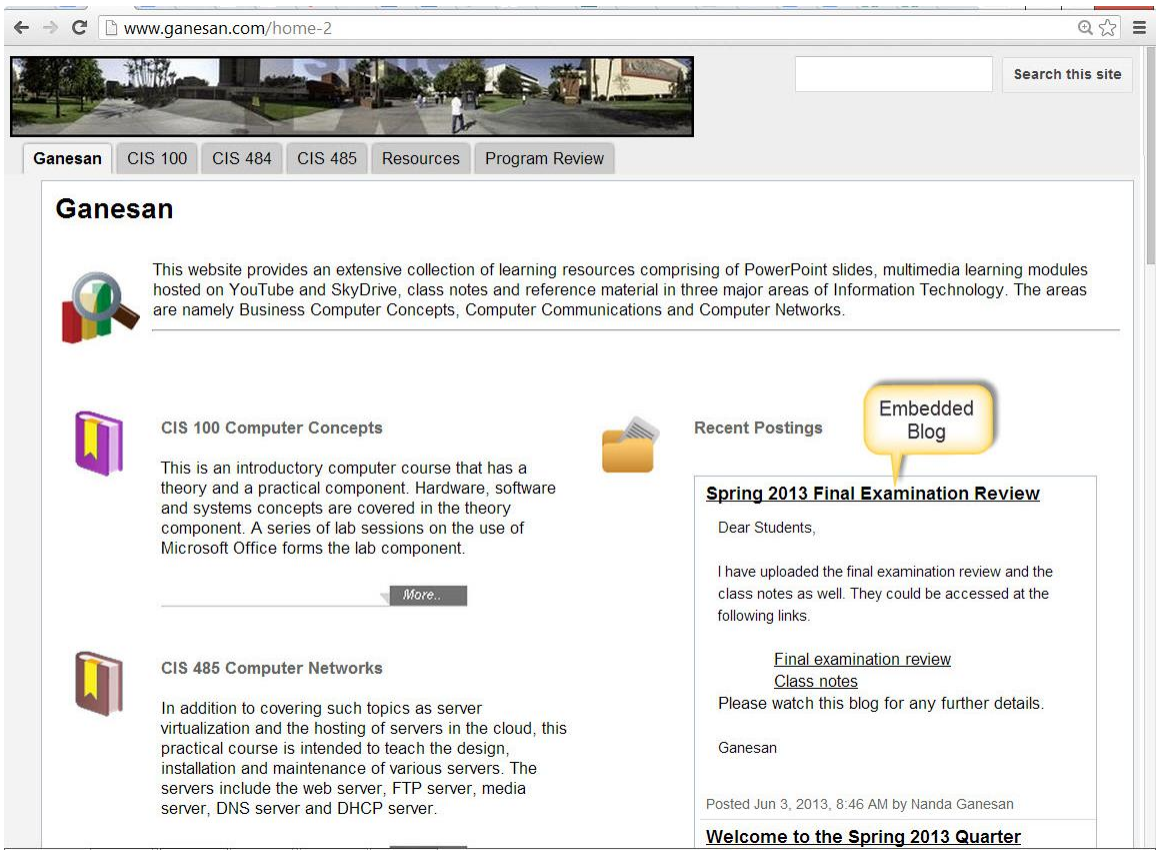
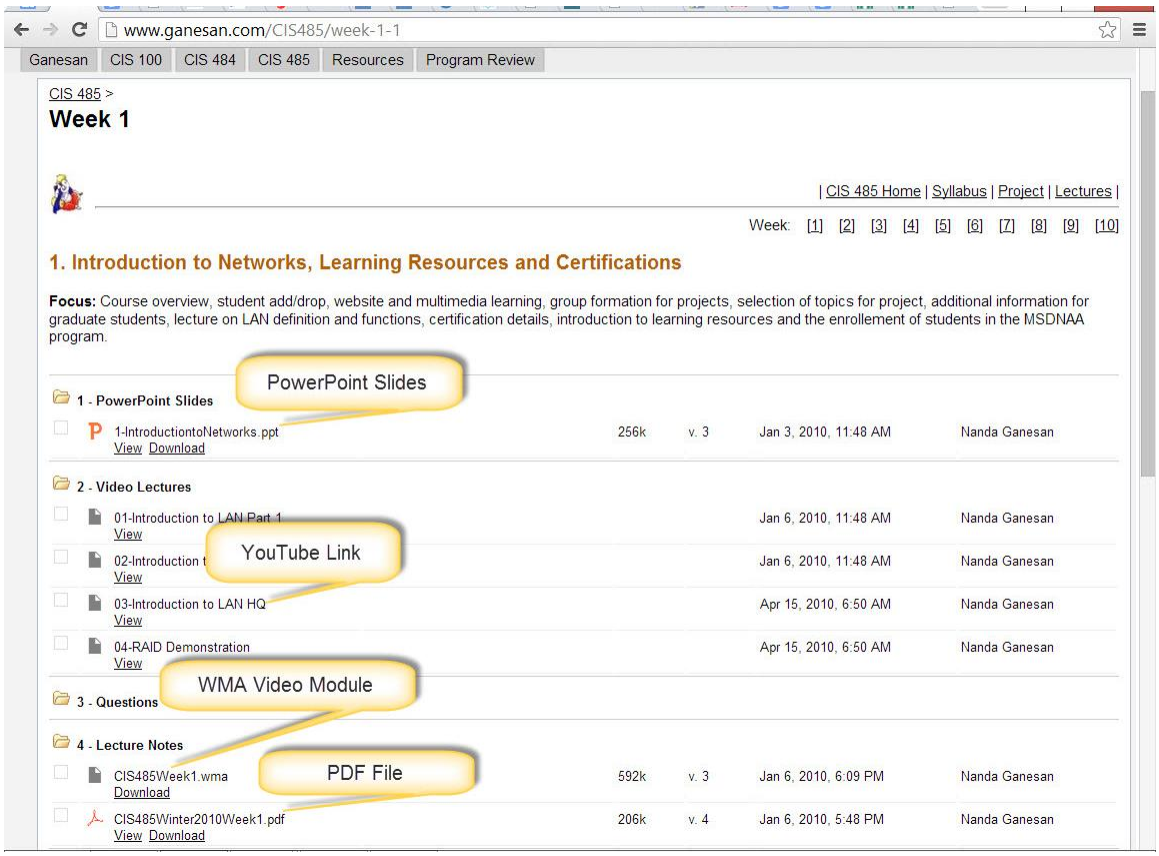
Figure 9: Home Page with Embedded Blog.



File Cabinet

The third template supported in Google Apps is the File Cabinet template. Web pages designed as file cabinets allowed different types of files to be uploaded and stored for viewing and downloading by the students. The file cabinet was used as an online storage for course material. The material stored included PowerPoint slides, Word documents, Google documents, streamed audio reviews and pdf documents. An example of a file cabinet created for the course website is shown in Figure 10. It contains the entire set of learning material for the first week of instruction.

Figure 10: Course Material Stored in File Cabinet.



One of the entries in the file cabinet is a hyperlink pointing to a video lecture hosted on YouTube. In addition to uploading and storing files in the cabinet, links to files hosted elsewhere can also be stored in the cabinet. Another positive aspect of the file cabinet is that instructors and students can work collaboratively on the documents in the cabinet provided the documents are stored on Google Drive. The term Google Drive refers to the online storage space allocated for Google Docs.

Overall, the file cabinet was a useful feature of Google Sites that enabled the timely distribution of course material. The only disadvantage was that the course materials that were created using Microsoft Office such as Word documents or PowerPoint presentations could not readily be edited when stored on Google Drive. They could, however, be easily edited online using Microsoft Office if the documents were stored on SkyDrive. The tight integration of Office 365 with SkyDrive provided a compelling reason for transferring the documents from Google Drive to SkyDrive. Another advantage of SkyDrive is that it supports high fidelity streaming of video modules over the Internet as long as the modules are stored in Microsoft's streaming format known as wmv.

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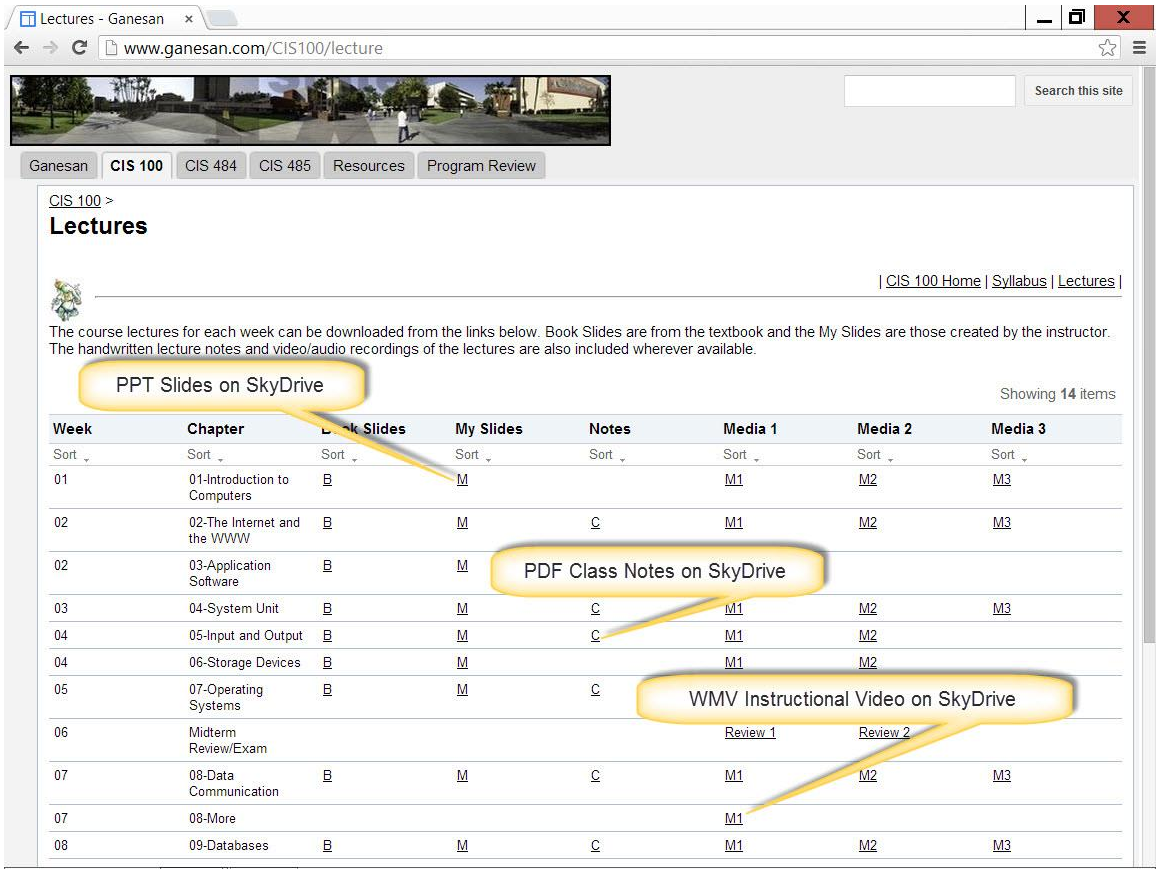
List

To facilitate indexed access to the course material stored on SkyDrive, a contents list was created using the List template. The purpose of the List template is to create web pages for storing a list of records composed of a collection of fields. A field, in this case, can be one of five types: check boxes, date entries, dropdown menus, text entries and URLs. The list can be sorted based on any field. An example of a web page created using the List template is shown in Figure 11. Indexed access to the course material is provided through URLs stored in one of the fields. In Figure 11, the entries under the field entitled My Slides contain hyperlinks to the presentations stored on SkyDrive. Likewise, the hyperlinks under Notes point to the locations of handwritten lecture notes stored in pdf format on SkyDrive. The links under Media 1 point to the locations of multimedia modules stored in wmv format on SkyDrive.

Figure 11: List of References to Course Material.



COLLABORATION ON SKYDRIVE

As more and more course materials were moved to SkyDrive from Google Drive, the List page gradually replaced the File cabinet as the preferred location indicator for the course materials stored on SkyDrive. An Office document such as a PowerPoint presentation stored on SkyDrive can be opened directly from the List page for online editing and updating. This means changes made to a presentation during the course of a lecture can be made available immediately to the

students for viewing. Online editing also eliminated the need to maintain and update a local copy of the presentation.

In SkyDrive, permissions can be granted to multiple users for sharing and editing stored documents. The students can work collaboratively on the documents from any computer connected to the Internet. The types of documents that could be created, edited and shared are presentations, spreadsheets and text documents. The same can be achieved with Google Docs if the course materials were stored on Google Drive. In comparison to Google Docs, however, Office 365 has far more editing and document processing features. In addition, the subscribers to Office 365 have the option to stream a full featured version of the Office suite to any computer on the Internet even though the computer may not have Office 365 installed. Once streamed, the full version of Office will be available for document processing on the local computer.

The extensive document processing capabilities of Office 365, its seamless integration with SkyDrive, and the familiarity and popularity of the Office suite of software resulted in the choice of Office 365 over Google Docs for document processing and collaboration. Yet a further advantage of Office 365 and SkyDrive, especially in the case of Windows 8 computers, is their integration with the Windows 8 operating system. Examples of integration include the ability to easily map the SkyDrive as a local drive on the computer and the single sign-on feature that logs the users into both the local computer and SkyDrive.

HOSTING MULTIMEDIA MODULES ON YOUTUBE

Another cloud computing service that was part of the e-learning model at the beginning was YouTube. The multimedia modules hosted on YouTube were produced primarily using Camtasia, the popular multimedia authoring software (TechSmith, 2012). The modules were uploaded directly to YouTube without performing any type of file conversion. YouTube automatically converted the modules to its native video format for streaming over the Internet. The audio and video qualities of the multimedia modules streamed from YouTube were visually assessed to be good. Until recently, videos on YouTube depicting software demonstrations were somewhat blurry when viewed in full-screen mode.

One of the advantages of using YouTube was that it displayed a list of related videos on the sidebar when a particular instructional module was viewed by a student. It was the equivalent of performing a library search for video tutorials on the subject discussed in the instructional module. Assigning an appropriate title to each multimedia module was therefore an important consideration to ensure that the best matched and the most relevant videos are retrieved and displayed by YouTube. By being able to view the instructional modules produced by others on the same subject, the students were given the opportunity to obtain a broader perspective of the topics discussed in the modules. A further advantage of YouTube was that it offered an online video editor for incorporating a degree of interactivity in the modules. The editor can be used to add annotations and hot-spots on the screen for viewers to interact with the videos in real-time (Scheidies, 2013).

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In spite of the above listed advantages of YouTube, the modules that are currently being produced are not hosted on YouTube. Instead, they are hosted on SkyDrive. The following are some of the reasons for having chosen SkyDrive over YouTube for hosting the modules:

- Drag and drop uploading of files
- Easy streaming of multimedia modules stored in wmv format
- Good streaming fidelity that was visually detectible
- Easy management of access control on the folder

Although SkyDrive was chosen to host the multimedia modules in this particular case, YouTube will continue to remain an important hosting platform for instructional videos given its vast outreach and its ability to perform a library search for similar videos on the topic (Burke, Snyder, & Rager, 2009; Campus Technology, 2009).

DISCUSSION

This discussion will focus on the lessons for practice that are specific to the implementation of the e-learning model described in the previous sections. There are many best practices, or lessons for practice, listed by others that apply equally well to the model (Berge, Collins, & Dougherty, 2000; McGee & Reis, 2012). The lessons learnt in this particular case are discussed as they relate to the course material, instructors and students.

Course Material

- Including the visual presence of the instructor in the multimedia modules alongside the textual material projected on the screen is helpful in establishing a virtual presence of the instructor in the modules. Also, incorporating chalk-and-talk type of lectures along with PowerPoint based lectures in the modules is conducive to emulating, to some extent, the in-class delivery of lectures.

- Redundant or excess information on the website or in the instructional modules is counterproductive to learning. Only the frequently accessed information should be stored on the website in an easily retrievable format. In the case of the video modules, reviewing each module following its initial production and eliminating redundant information from the module can often result in shortening the length of the module by a third of its original length.

Instructors

- To motivate the instructors to become involved in e-learning initiatives and to facilitate the updating of the course material in a timely manner, the cloud resources for the development of e-learning systems should be chosen based on the potential for rapid application development and ease of use.

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- Surveying the format of popular courses in MOOCs, including a review of the contents of the discussion boards, can often yield helpful hints on improving the structure and format of the e-learning model. Following one or more courses on a subject of interest in MOOCs is yet another avenue for obtaining valuable insight into the design of effective e-learning models.

Students

- Time management is not a forte of students particularly in an e-learning environment where the learning process is largely entrusted in the hands of the students. More often than not, the students will procrastinate until the approach of the examinations to review the course material. Accumulation of unwatched video modules spanning several hours of footage is unproductive given that the videos can only be reviewed linearly. Students should therefore be constantly reminded to review the course material possibly by administering frequent quizzes and examinations.

- Although the e-learning model presented here is meant for a blended learning environment where collaborative activities take place during face-to-face meetings, it is still advantageous to create discussion threads and spaces on twitter and social media for collaboration. Creating e-space for collaboration is a planned future addition to the current e-learning model.

Other than the specific issues discussed above, there were four important lessons learnt from a wider perspective of implementing the e-learning model. One is that blended learning is best suited for a commuter campus as it combines the strengths of face-to-face learning with technology mediated learning. There is no better evidence to underscore the importance of face-to-face interactions in learning than to point out that a majority of conferences on e-learning are held face-to-face. The second lesson learnt was that the e-learning model should emulate, to the extent possible, the in-class learning experience. The third lesson learnt was that by hosting the e-learning model in the cloud, issues related to technology were minimized thereby freeing the instructor and the students to focus on teaching and learning respectively. The fourth lesson learned was that cloud hosting can help isolate the development and implementation process from layers of local administrative impositions that often stymie timely changes from occurring in academia. The third and fourth lessons exemplify the benefits of porting the e-learning model to the cloud.

CONCLUSIONS

This paper highlights only a few of the possible uses and benefits of cloud computing in the migration of an e-learning portal. The fact that an e-learning website was developed rapidly and affordably with only a few cloud resources is worth mentioning. The manageability of the website developed using Google Apps and the streaming quality of SkyDrive stand out as distinct advantages in moving the course website to the cloud. Preprogrammed gadgets and web modules that are now available in the cloud are yet another reason for porting the e-learning system to the cloud. A good example of a web module that could be incorporated in the e-learning model is Engrade, a popular online grade management system. Another advantage of

ISSN: 1543-5962-Printed Copy ISSN: 1941-6679-On-line Copy

cloud based e-learning model is that it could be readily extended into the mobile-learning and MOOCs environments.

The above discussion outlines some of the advantages of a cloud-based centralized e-learning portal. Other benefits include reduced infrastructure investments, universal document access and device independence (Rao, Sasidhar, & Satyendra, 2010). The need to establish and maintain a persistent Internet connection to access the e-learning portal may be viewed by some as a disadvantage. This is no longer a major concern as Internet connections have become very reliable. Another concern with cloud computing is the possible loss of data in the cloud. In this case, a safeguard against data loss would be to back up the data periodically. For the most part, these concerns are nominal in nature. Ever since the e-learning model presented in the paper was ported to the cloud, there has never been an interruption in service nor any loss of data. The same cannot be said about the earlier versions of the course website hosted on the local server on campus.

As the e-learning model continues to evolve, a few potential areas of future research that would be of benefit are as follows. A comparative study of the advantages and disadvantages of hosting the multimedia modules on SkyDrive as opposed to hosting them on YouTube can be useful. A second study of interest would be the exploration of Amazon's cloud based computing services to configure the cyber lab. Yet a third useful study would be to survey various MOOCs courses to identify the mostly popular course delivery format. The e-learning model could benefit from adopting some of the features found in the popular format.

There are many advantages in using cloud computing that relies on hardware and software offered as services when compared to traditional computing that uses actual hardware and software located on the premises. The paradigm shift in the availability of software as a service was a compelling reason for migrating the e-learning model to the cloud. In this case, only a low powered computer or a terminal with access to the Internet is all that is needed to be able to design, develop, host, share and maintain a rather elaborate e-learning model. Given the myriad of advantages, it is only appropriate to conclude that cloud computing will continue to yield a significant influence on the design and development of e-learning systems in the foreseeable future.

ISSN: 1543-5962-Printed Copy ISSN: 1941-6679-On-line Copy

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  ISSN: 1543-5962-Printed Copy ISSN: 1941-6679-On-line Copy