



Electronic Portfolio White Paper

VERSION 1.0

<http://eportconsortium.org>

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Version 1.0, Released Nov. 3, 2003

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OVERVIEW

At the April 22, 2003, ePortConsortium meeting hosted by eCollegeSM in Denver, ePortConsortium members and representatives from electronic portfolio projects met to discuss and plan a joint effort to develop an electronic portfolio white paper. The group continued its collaboration and held a second meeting, hosted by Blackboard, Inc. in Washington, D.C., on July 25, 2003. Additional contributors have joined the white paper collaboration, working virtually via e-mail and videoconferencing. The project shared the first version of the electronic portfolio white paper in November 2003 at the EDUCAUSE 2003 Annual Conference in Anaheim, California. This white paper and future versions will be available on the ePortConsortium Web site (<http://eportconsortium.org>).

The primary purposes for developing this white paper are:

- To create a comprehensive review of electronic portfolios, from a conceptual understanding of applications to identifying technical and interoperability requirements.
- To provide a conceptual overview exploring potential opportunities and challenges to electronic portfolio adopters and developers.
- To broadly distribute the white paper for further comment and participation from the growing community of electronic portfolio scholars, researchers, developers and vendors.

The ePortConsortium will continue to coordinate the evolution of this white paper, supplementing it with contributions and comments for the next version by the summer of 2004. The final form of this work is expected to be a book, with each section focusing on a particular aspect of electronic portfolios composed of contributions from the community of electronic portfolio experts, scholars and visionary thinkers.

The ePortConsortium invites adopters, scholars, researchers, developers and vendors to contribute to this effort to better understand and document the evolution of electronic portfolio applications and software environments. Comments and contributions should be sent to ePortConsortium@yahoo.com. Questions or suggestions regarding this white paper or the ePortConsortium should be forwarded to jafari@iupui.edu.

INTRODUCTION

Today's electronic portfolio, or ePortfolio, is much like the Course Management System (CMS) of 1997 - there is not yet a coherent understanding of functional requirements, design specifications, or how and to what extent an electronic portfolio might benefit teaching and learning. CMS software did not receive wide acceptance until its usefulness and functionality could be justified and until it became easy-to-use and offered services unavailable from existing systems. Until the ePortfolio software environments can similarly demonstrate their effectiveness, ease-of-use, and transparent integration, they will not reach the level of acceptance that the CMS has received in the past few years.

Because ePortfolio software is still in the early stages of development, it is important that developers understand the functional and technical requirements of ePortfolios. With commercial software companies and educational institutions developing their own systems, defining and accepting interoperability and portability requirements must be recognized now. The ePortConsortium has brought together experts from educational institutions and commercial software companies that are active in conceptualizing and designing electronic portfolio systems in a cooperative effort to better understand system and functional requirements and identify interoperability concerns.

The first three sections of this white paper focus on the user perspective and provide a conceptual overview, describe possible scenarios and consider potential benefits. Sections four, five and six focus on the technical aspects of ePortfolios and include discussions on system infrastructure, interoperability and standards, and deployment challenges. Sections seven and eight provide overviews of commercial offerings and a summary of academic electronic portfolio projects. Details from the survey of electronic portfolio projects used for Section eight are in the Appendix. Depending on interest and expertise, a reader can select the sections that are most relevant.

This white paper is the result of collaboration and contribution from experts within the following software institutions: Blackboard, Community of Science, eCollege, ePortaro, Ja-SIG, Nuventive and SCT; the educational institutions of California State University - Monterey Bay, New York University, Northwestern University, IUPUI, Pennsylvania State University, University of Denver and University of Washington; as well as Carnegie Foundation Knowledge Media Lab, American Association for Higher Education (AAHE) and EDUCAUSE.

We invite conceptual thinkers and technical experts to join the initial collaboration by submitting comments and knowledge that might be included in future versions of this white paper.

1. CONCEPTUAL OVERVIEW

Electronic Portfolios

Portfolios have long been used in some disciplines to organize and present work; to provide a context for discussion, review and feedback from instructors, mentors, colleagues and friends; and to demonstrate progress and accomplishments over time. With work becoming increasingly digital, providing a common format for text, graphics, sound and video, the portfolio model can be extended to more disciplines and purposes. Network storage can remove the limitations of local disk space on file size. Network access can greatly expand opportunities for input and interaction beyond the physical limitations of traditional portfolios. With the practical issues of storage, bandwidth, access and security being resolved, the essential elements of a traditional portfolio are being amplified through electronic portfolio projects.

Types of Portfolios

Portfolios can be used for many different purposes and audiences. Personal portfolios, designed for self-reflection, can be used to journal experiences, organize materials from classes and activities, and help students recognize skills and make decisions. Learning portfolios can be used to showcase student learning, provide a framework for assessing academic progress, and demonstrate how skills have developed over time. Professional portfolios can be used to help make career decisions, demonstrate that one has met program or certification requirements, present skills and accomplishments for employment, and review professional development for career advancement. Faculty, too, can use portfolios to collect and organize student work from classes and course materials they prepare, as well as personal credentials including research data and reports.

Owner-Centric

Unlike a Course Management System (CMS), which is teacher/course-centric, an electronic portfolio is student/owner-centric. In a CMS, the teacher owns and manages the course and receives student work for assessment. When the course is over, what remains are course materials that the instructor can reuse or revise and student grades. An electronic portfolio, on the other hand, is owned and managed by the student/owner. Work evolves in the student's personal workspace(s) where it can be kept beyond the limits of a course for future reference and reflection.

Interaction

Like a traditional portfolio, teachers, mentors, colleagues and friends can be invited to review and comment on work. Unlike traditional portfolios, participation is not limited to who can be physically present at any time or place. By organizing work to meet specific needs and managing access, the author can control the nature of the interaction. Teachers and mentors might exchange comments privately with the student/author about work in progress, colleagues and classmates might discuss their work with each other, the author might request feedback about specific issues and concerns, and students/authors can

reflect on their learning experiences. In addition, work also can be made public for viewing and comments.

Personal Learning Spaces

By facilitating and capturing the evolution of concepts and ideas through revisions of work and interactions with instructors, mentors, classmates and friends, electronic portfolios can be much more than a Web site that simply organizes and presents final projects. They can foster learning spaces where the author can gain insights and a better understanding of him/herself as a learner.

The Academic Enterprise

For electronic portfolios to be truly useful, they must participate in the emerging academic enterprise. This will require interoperability and/or document exchange with course management systems so students can submit course work maintained in the student's portfolio for review and assessment. Grades and assessments for student work will need to be certified and maintained through the Student Enterprise System. More problematic, but equally important, electronic portfolios will have to be portable so students can take their work with them if they transfer to other institutions, move on to graduate school, or continue their education throughout their careers.

Opportunities

Because electronic portfolios are persistent, owner-controlled and work-centric, they offer new opportunities for assessing achievement and learning outcomes over time. In place of a final product submitted on a due date, an electronic portfolio can present the evolution of work in response to interactions with instructors, mentors and classmates. This student-centered, outcome-oriented approach should provide new models for improving student learning and achievement. More broadly, electronic portfolios will be challenged to provide the flexibility needed to carry an individual through the continuum of learning and achievement from K-12 to undergraduate/graduate education, continuing education, career/professional work and life-long learning.

2. USAGE SCENARIOS

The following scenarios are intended to illustrate some of the many possible uses of ePortfolios. Some of the features and processes described below have already been implemented, and some are speculative. These examples are by no means exhaustive, but should contribute to an understanding of how ePortfolios might be used and their potential benefit.

Student Scenarios

This scenario illustrates the very plausible story of a college student who may transfer to another college or university before completing his/her undergraduate education, who may continue his/her education in graduate school, and who, after entering the job market, may make career moves every few years.

John Smith begins his college life¹

John Smith is excited to begin his college life at the University of SomeWhere in the fall of 2005. During the New Student Orientation Program, he receives a one-page information sheet outlining campus IT services and his student account, which includes the following details:

Your Username: jsmith7

Your Password: js2772wz

Your Campus Portal Address: <http://www.usw.edu>

Your E-mail Address: jsmith7@usw.edu

Your Personal Portfolios Address: <http://jsmith7.with.usw.edu>

John easily memorizes this information when he realizes that he only needs to remember his username (jsmith7), password, and, of course, his campus abbreviation (usw.edu). Thus, his e-mail address is his username placed before “@usw.edu” (jsmith7@usw.edu), and his personal portfolios address is his username placed before “.with.usw.edu” (<http://jsmith7.with.usw.edu>). To access his courses or his e-mail account, he knows he simply has to go to the campus Web site (<http://www.usw.edu>) and enter his username and password to gain entry into the USW campus portal.

John sets up his portfolio page

The portfolios management system offered by John’s university automatically and dynamically creates and maintains a personal portfolios site for each member of the university based on the student’s user ID. Public information, including e-mail address,

¹ The method, navigation scheme, and user interface design of the conceptual Electronic Portfolios Management System described in this scenario is based on the design principles of Epsilon Portfolios as developed by the CyberLab School of Engineering and Technology of IUPUI. Some methods described in this paper, such as the Dynamic Personal Portfolios (DPP), are protected by several patent-pending claims owned by Indiana University. This scenario represents only the author’s conceptual design perspective of creating and maintaining personal portfolios applications. Other software environments may use different methods of design principles.

major, links to one's department, etc., is available to the public in accordance with the Family Educational Rights and Privacy Act (FERPA).

John can quickly and easily create and update his personal portfolios site. He can add personal information such as a cell phone number and non-university e-mail addresses, and upload digital pictures. He can insert brief statements introducing himself and describing his academic goals. His basic knowledge of, and experience with, the Internet is sufficient to allow him to easily generate and publish his personal portfolios Web site. John can send his personal portfolios Web site address, or URL, to his parents, friends and high school classmates.

John's personal portfolios site also includes sections for his resumé and bookmarks, as well as a showcase to highlight accomplishments, and a learning matrix that he will use to track and manage his learning outcome requirements. Over time, personal portfolios are replacing personal Web site homepages.

John learns about campus principles of undergraduate learning

John's school recently developed and adopted six Principles of Undergraduate Learning with the goal of enabling each student to demonstrate learning outcomes with proficiency in all six principles. The Principles of Undergraduate Learning consist of Core Communication and Quantitative Skills; Critical Thinking; Integration and Application of Knowledge; Intellectual Depth, Breadth, and Adaptiveness; Understanding Society and Culture; and Values and Ethics. These are presented in John's ePortfolio as a Learning Matrix, which presents how his courses, projects and experiences apply to the six Principles of Undergraduate Learning. The Learning Matrix includes the courses that John is expected to take to complete his major.

John begins collecting and reflecting his learning accomplishments

As John writes papers and develops projects, he saves and stores them in the electronic portfolio management system. As he saves each file, John elects to provide reflection notes to indicate what he has learned or how he has progressed by completing the assignment. Each document stored in the portfolio management system becomes associated with metatag information, including student reflection, the date created, course association, project grade, course instructor, correlating the Principles of Undergraduate Learning and learning outcomes.

In addition to John's manual collection of documents, the portfolio management system dynamically imports major projects submitted and assessed through the course management system. For example, a paper submitted for John's history class via the course management system is automatically imported into his portfolio and includes metadata information such as the grade, the assessor, evaluation comments, and the grade rank for the course. Once such a document is automatically imported from the course management system, it is locked and cannot be modified. This feature offers the certification and verification that the imported document is the one submitted by John to his professor.

John meets his academic advisor

John decides he should meet his academic advisor to review his coursework and make sure he is progressing effectively. When John meets with his academic advisor, he mentions his minor interest is in business administration, and both agree that a new course selection could better meet John's learning requirements and career objectives. The academic advisor then logs into the electronic portfolio management system to authorize substitutions for two of the required courses in John's Learning Matrix. He can also review John's learning outcomes to verify that his academic advancement is in accordance with the university's Principles of Undergraduate Learning.

John beefs up his resumé

John's personal portfolios site currently includes only his contact information, digital picture, and brief statements describing himself and his academic goals. John realizes he must look for a part-time job to help pay his school expenses, so he determines that now is the time to create his resumé and include links to relevant papers, projects and past work experiences. Potential employers can easily access John's resumé and review examples of his work by visiting John's personal portfolio.

John generates his showcase page

While John's resumé page provides an all-inclusive listing of his academic and work experiences, its presentation is mainly based on text files designed for print application. John also decides to develop a more comprehensive showcase page where he can present his most significant accomplishments in multimedia format. This might include streaming video demonstrating class projects or PowerPoint presentations with short descriptions and personal reflections. John's showcase page offers a comprehensive representation of his well-rounded abilities that go far beyond what can be presented in a traditional text-based resumé or curriculum vita.

John transfers to another college

Like many undergraduate students, John finishes his undergraduate education at a second university. He transfers his courses to the new university, which fortunately has an electronic portfolio system. When John logs into the new portfolio management system he can import his materials from his previous portfolio, including profile information, coursework and personal files, resumé, showcase and Learning Matrix. John now is ready to meet with his new academic advisor to review his academic program and determine which courses he must pass to complete the requirements of the degree program at his new university.

John is graduating

John is about to complete the last 10 courses for his degree. He knows that in addition to completing the requirements for his major and minor, he must demonstrate learning outcomes in the six Principles of Undergraduate Learning of his university. He schedules a meeting with his academic advisor to review his accomplishments. After reviewing John's electronic portfolio, including courses, papers, projects and internship experiences, John's academic advisor realizes that John does not meet the minimum

requirement for Values and Ethics. He recommends that John meet with his Sociology teacher to make sure his term paper will fulfill this learning requirement.

John goes to graduate school

Feeling he is unlikely to locate the position he desires due to the current job market, John chooses to continue his education and pursue a Master's degree. John has a good collection of accomplishments in various electronic formats saved in his electronic portfolios system, including selected papers and projects with personal reflections, assessment notes from instructors and grades. John revises his resumé and showcase pages to better represent his credentials as he applies to graduate school. John's personal portfolios site displays examples of his achievements in an easy-to-use, certified fashion that graduate school admissions committees can easily access and review using an access code provided by John.

John finishes graduate school and interviews for jobs

Preparing a career portfolio is one of the most important tasks that every graduating student must do. John has done his research and has narrowed down the list of firms where he believes he may want to begin his professional career. He understands that different companies and jobs require different credentials. John uses his portfolio management system to fashion four alternative career portfolio profile packages, each optimized to offer supporting credentials corresponding to the requirements of a particular job.

John can authorize potential employers to access restricted, employer-specific material by entering a unique access code. Using that access code, the employer can review the various credentials John thought would strengthen his application for a particular position. While John impatiently waits to hear from a future employer for a job interview, he regularly checks his site to review the access log to see if any potential employers have visited his career portfolio.

John begins his professional career

John begins his first job in a position for which he is well prepared, as demonstrated through the electronic portfolio he developed over many years. As one of the new university initiatives, each graduate is offered a lifetime e-mail address, lifetime portfolio site and lifetime membership to the university alumni association. John will continue to maintain his personal portfolios site, using it as his personal homepage. This will enable John to maintain his electronic portfolio to reflect his evolving professional career, providing a place where schoolmates, professors, friends and colleagues can always view. Upon graduation, John changes the title of his personal portfolios site from "John Smith, Graduate Student, School of Business" to "John Smith, Branch Manager, First Bank of SomeWhere." John is very proud to see that his personal homepage Web address (URL) continues to bear the name of University of ElseWhere (uew.edu), one of the most respected brand universities in the country.

John makes career moves

Like many other professionals in the business world, John changes jobs every few years. Each time he makes a career move, John can log into his personal portfolios Web site, which is maintained by his University (or possibly its third-party hosting service), and enters his current contact information. As John advances in his career, gaining more experience and receiving additional training certifications, he returns to his personal portfolio and quickly revises the information to reflect those changes.

Faculty Member

Professor Byrne teaches a course on Labor Law as a simulation where legal rules and cases must be used to achieve the goals of a common student enterprise. In the simulation, he is the employer and his students are the employees. Over the semester, his students will need to protest, organize, hold a union election and file documents as they would in real labor negotiations. Professor Byrne is particularly interested to see if his students gain a deeper understanding of concepts and content, and attain a higher level of critical thinking skills, when legal subject matter is presented in the form of a simulation.

Professor investigates the effectiveness of his pedagogy

At the end of the semester, Professor Byrne wanted to examine the effectiveness of his teaching as well as his students' learning processes. He had various kinds of materials and artifacts on his course Web site: a syllabus, course materials, students' work, online group discussions, etc. By using an electronic portfolio tool, which is embedded in the course management system, Professor Byrne was able to select some of the key materials and artifacts that helped him illustrate the key issues concerning teaching and learning in this particular course. The tool also enabled him to annotate and index these materials and artifacts for later use.

Professor creates teaching portfolios for peer-review

In order to share his findings and self-reflections with his faculty colleagues, Professor Byrne decided to create an electronic portfolio. The system provided him with a list of pre-designed ePortfolio templates and examples of how each template previously was used by other faculty members. Among these ePortfolio templates, he selected the one called "action research," which allows him to best organize and represent his inquiries and findings. In a few hours, by "dragging-and-dropping" the selected materials and artifacts onto the template, Professor Byrne was able to post his teaching portfolio on his course Web site. The system automatically sent e-mail notification to some of his peers in a selected mailing list to solicit their comments on the portfolio.

Professor uses electronic portfolios for tenure review

During the following semester, based on the comments provided by his colleagues, Professor Byrne made some changes to his teaching method, course materials and student activities to improve the course. This time, he used another portfolio template called "course transformation" to document the course transformation effort. At the end of the semester, he found that the average student performance was significantly improved from the previous semester. Professor Byrne decided to use the course transformation

portfolio, the teaching portfolio that documented his action teaching research last semester, as well as research papers and articles written for his tenure review next year.

Department Chair

Professor James currently is serving as the Chair of the Physics Department. Besides maintaining a personal portfolio, like all faculty members, she has found the portfolios to be helpful in solving a number of common problems experienced by Department Chairs.

Professor James prepares for an upcoming accreditation exercise

The entire Physics Department has been bracing itself for next month's accreditation committee visit. Professor James will be utilizing the ePortfolios of faculty, staff and students to display the department's excellent standard of work. The plan is to allow the accreditation committee to access portfolios to review ongoing faculty research projects, sample tests, student problem sets, etc. Every member of the Physics Department recently was asked to update their portfolio, and this collection of information, which is a portion of the "departmental portfolio," will surely impress the accreditation committee.

Professor James uses the ePortfolios to select student nominees for various projects and awards

Later in the year, in response to the University-wide call for nominees for the "Chancellor's Award" – the top academic award given out to a graduate student – Professor James reviews ePortfolios of Physics graduate students. Student Sally Strong's ePortfolio, which truly highlights her ongoing research project, excellent academic scores and leadership of a local volunteer tutoring organization, impresses Professor James. Professor James decides to nominate Sally and sends the Chancellor an e-mail containing the link to Sally's portfolio.

Dean of College

The current Dean of the Engineering College at the University of SomeWhere, Dean Thomas, has been using the ePortfolio system to quickly aggregate important information on two projects.

Collecting publication information for faculty and graduate students

As part of an ongoing fundraising exercise, the College of Engineering has been working closely with the University's Development Office on a mailing that will demonstrate the breadth of recent research being done at the College. A Development Office staff member suggests including a list of recent faculty and graduate student publications, which are available through their ePortfolios. After reminding faculty and graduate students to refresh their electronic CV's and ePortfolios, Dean Thomas is happy to see how easy it is to generate the report for the Development Office.

Assessing the impact in the recent changes in the Engineering Curriculum

Two years ago, the College of Engineering rewrote their requirements to mandate both a writing course and a verbal skills course for all engineering majors. At the time, there was great concern from within the Engineering Faculty that these new requirements would come at the expense of students taking fewer optional courses within Engineering.

These changes are up for review, and Dean Thomas is reviewing information provided by the Registrar's Office. But most interestingly, he also has spent some time reviewing the ePortfolios of students who have completed these newly required classes, and can see, from their class work, presentation artifacts and personal summaries, that the new classes have helped the students to improve their written and verbal skills. Dean Thomas decides to continue his support of the recent changes, and will show his dissenting colleagues some of the better ePortfolio excerpts at an upcoming meeting.

Dean of Research

The Dean of Research, Dean Wallace, is finding new ways to leverage the data stored in the university's ePortfolio system. For the past year, all faculty, staff and students involved in research activities have been asked to maintain an ePortfolio in order to streamline a number of processes, including grant applications and the tracking of new intellectual property. For example, the Research Office now can identify new publications resulting from research activities, focus on researchers who could be teamed for multi-disciplinary projects, and gauge the success of student research in improving academic performance within the classroom. As the benefits of the ePortfolios become clearer, synchronizing it with the grant management systems will be very important. Otherwise, faculty will have to enter the same information in both systems.

Dean Wallace examines the impact of ePortfolios on grant applications

Dean Wallace receives news from the Director of Sponsored Projects that the use of ePortfolio data is making automated alerting services more efficient at matching faculty with new grant opportunities. The system uses third-party software to index terms in faculty ePortfolios and searches a database of grants for likely matches. Faculty members receive e-mail informing them of new grant opportunities in their fields.

Dean Wallace looks to publicize his university's research efforts

Towards the end of the day, the Dean of Research receives a list from the University's Public Affairs office identifying faculty members who could be spotlighted in upcoming articles in the alumni magazine. Using the ePortfolio system, the Public Affairs office can select faculty whose cutting-edge research will best portray the University in a positive light. In past years, the Dean had to provide this information, but this year the Public Affairs office could perform the selection process itself. Dean Wallace is excited to hear that the article will provide the URL for the faculty ePortfolios, enabling readers to learn more about ongoing university research.

Career Services Officer

The Career Services Office has been revolutionized by the advent of ePortfolios, and the Office's Director, Carl Crenshaw, has been doing his best to stay on top of recent developments. Needless to say, his office's ability to assist students with career guidance and in post-graduation job placement has been greatly enhanced.

Mr. Crenshaw meets with an undergraduate

Carl's 9:30 a.m. meeting is with Wanda Warren, an English major seeking a career in advertising. In the minutes before Wanda arrives for her career counseling session, Carl

reviews her extensive ePortfolio. He quickly looks over some of her recent papers and faculty comments and then focuses on the resumé section. By the time Wanda arrives, he has jotted down several ideas that should improve her chances of landing her dream job. After listening to Wanda describe her interests, and asking her a few probing questions, Carl advises her on which papers and class work she should highlight in the version of her ePortfolio she will show to employers. Additionally, Carl tells Wanda about a new Web site that will automatically match her with possible summer internships based on the skills and interests mentioned in her ePortfolio.

Mr. Crenshaw contemplates the upcoming job fair

After lunch, Carl works on the planning document for next month's job fair targeting the life sciences students. Employer attendance will be higher than last year, but this year many of the recruiters do not desire a traditional booth space, preferring to use conference rooms in which to hold preliminary interviews. Carl realizes that the ePortfolios are accelerating the recruitment process.

In the previous weeks, as each company registered for the upcoming job fair, that company's recruiters were given special access to a version of the university's ePortfolio system. As a result, many of these companies have already been in "virtual contact" with the candidates, sending them promotional e-mails, holding online chat sessions, and, for those candidates with the correct credentials, already offering preliminary interviews. Importantly, a new enhancement to the system asks each recruiter to submit resumé critiques anonymously, and this feedback is then relayed to the students.

3. POTENTIAL BENEFITS

Evaluating Student Performance

To fully understand the potential impact of ePortfolios on education, institutions need to take into account the current environment within higher education. Evaluating student performance always has been an important issue for academe. Institutions have traditionally tried to address it through assessments and transcripts, but these methods are shallow and one-dimensional. Today, there is increasing recognition that institutions need a new approach to student assessment. According to Charles M. Cook, the director of the New England Association of Schools and Colleges' Commission on Institutions of Higher Education, "The higher-education community continues to be challenged by the assessment of student outcomes."²

For many years, portfolios have been put forward as an alternative method of assessment. In the paper world, portfolios have been used in both academic settings as well as for hiring decisions in some industries. Professionals in visual art typically begin developing their portfolios for assessment purposes while in design school as part of coursework and then continue to maintain and use them throughout their careers. The pedagogy surrounding portfolios changes the focus from course- and faculty-driven to student-centered.

Despite their obvious value and potential for solving issues involving student assessment, paper-based portfolios never achieved widespread adoption. Portfolio proponents quickly ran up against significant cost and logistical barriers that prohibited scalable assembly and distribution of paper-based portfolios. In addition, the paper-based portfolio still is limited in that it typically only captures the final outcome of a student's work – the final diagram or the final project paper. It does not effectively capture the interactions between the student and instructor as work undergoes revision and rethinking.

Electronic Portfolio Adoption

For a number of reasons, many now believe that significant advances already made in eLearning have paved the way to enable widespread adoption of ePortfolios.

First, there is a network in place that allows portfolio creators to distribute their portfolios at near zero-cost to other users for assessment and review. Similar to the hugely popular "Evite" service, portfolio creators can invite anyone to view and comment on their ePortfolio. The portfolio user simply needs to have access to the Internet, a URL and a password.

Second, there is the power of database-driven course management systems. These systems capture significant amounts of intra-course data and artifacts that can more easily be assembled and repurposed for evaluation by instructors or potential employers. As

²Carnevale, Dan, *Assessment Takes Center Stage in Online Learning*, The Chronicle of Higher Education, April 13, 2001.

students and faculty have become more comfortable with the mediated online learning environment, exciting pedagogical innovations have been introduced into course management systems such as threaded discussions, shared white boards, collaborative workspaces and other educational strategies and tools. Thus, materials collected during a course usually contain not only a student's test scores and papers, but also a sense of the interactions that occurred between student and faculty. Integrating appropriate parts of this information into an ePortfolio should then be a simple matter of a few clicks.

In addition to the technological and pedagogical advances in eLearning, the public policy environment has become significantly more focused on accountability. Certification of K-12 teachers now is focused on holding teachers accountable for developing and maintaining certain sets of capabilities. As the Higher Education Act comes up for reauthorization, policy makers are working to define specific metrics to measure student outcomes. These metrics will be used as the basis for allocating federal funding to institutions.

More Authentic Assessments

The theory and value of portfolios has been more fully developed. Unlike paper-based portfolios, ePortfolios can more effectively provide both an authentic assessment of learning as well as significantly more information about the learning experience. The aim of the ePortfolio is to present and document the work and the process that the student and faculty member have used to get to a certain point. There is an ease of annotation that encourages dialogue. This evidence can then be saved and organized and reorganized to meet specific needs, such as relating the advising process to the student's strengths and weaknesses, in order to make future learning experiences more relevant. Clearly, this is of great benefit to the academic dialogue that goes on throughout the student's participation in the academy. It is then, that the true power of ePortfolio thinking begins to emerge.

ePortfolios also can make it possible to include information, artifacts and reflection on more than just the courses that a student takes. They can be used to capture learning experiences that usually fall between the cracks — that do not result from a specific class, but are gained from social interactions, extracurricular activities, internships and other less formal learning opportunities. The desired outcome is that when a student finally uses the portfolio as a tool to seek employment or advance study opportunities, the whole will be greater than the sum of the parts.

Workspaces for Teaching and Learning

ePortfolios also change the resources available to the student, teacher and learning community, as well as change the information access and flow that are at the heart of education. Working in a common space where faculty and students can selectively control who can view and comment makes learning a much more interactive process. Linking and hyperlinking to databases and other information also brings a new dimension to teaching and learning. Finally, the ePortfolio itself allows external evaluators, such as those who are responsible for teacher credentialing, to link to databases that allow rubrics and standards to be easily searched and associated with student work. The benefit is that

there are more clearly articulated expectations and each student can be judged based on a more complete body of evidence.

Career Development

In addition to the benefits outlined above, there is significant opportunity for ePortfolios to impact career development. The world of work has drastically changed — a person is no longer hired for life. The large company with the large HR department no longer exists to keep track of certifications and job skills. That responsibility now rests with each individual. An ePortfolio makes it possible to showcase skills and accomplishments, to customize a portfolio for a specific employer and to easily update information. In teacher education, many institutions currently offer their alumni ongoing placement services. They maintain a file on the alumni's teaching credentials and provide opportunities for alumni and recruiters to connect. The opportunity for higher education institutions to expand on this concept and to build a strong and ongoing relationship with all their graduates now emerges as a fertile area for development. A graduate might be offered e-mail privileges and a place to store and update his or her ePortfolio, as well as immediate validation of educational background.

4. SYSTEM INFRASTRUCTURE

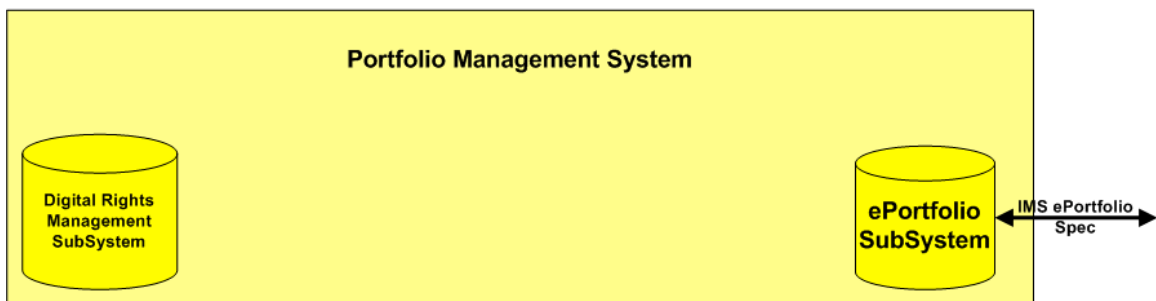
As discussed in previous sections, ePortfolios have a wide number of uses. This section explores possible relationships between ePortfolio deployments and campus enterprise systems. On any given campus or institution, one might find a single ePortfolio system in a department, an ePortfolio system integrated with a campus Course Management System, or an ePortfolio system fully integrated into the entire institutional infrastructure. In the future, these systems might also connect peer-to-peer with personal electronic portfolio management systems managed by portfolio authors themselves.

Single Departmental ePortfolio System

In a single implementation of an ePortfolio system, the portfolio management system can stand alone or possibly be integrated with the Student Information System (SIS). This is typically an early implementation scenario in which one department or a select group is researching usage for a limited roll out of the system. This type of limited integration allows for the publishing and viewing of electronic portfolios, but does not take advantage of other learning and content systems on campus in which the content is developed and stored.

Content for a departmental ePortfolio system will need to be developed and harvested elsewhere, then imported into the ePortfolio system. This means content will be duplicated within the ePortfolio system, which might not be integrated with a common institutional authentication system. However, because it can avoid the need to be integrated into the institutional infrastructure, the departmental ePortfolio system can be deployed rapidly. The diagram below suggests how the single ePortfolio system might be deployed on a campus.

Department ePortfolio System

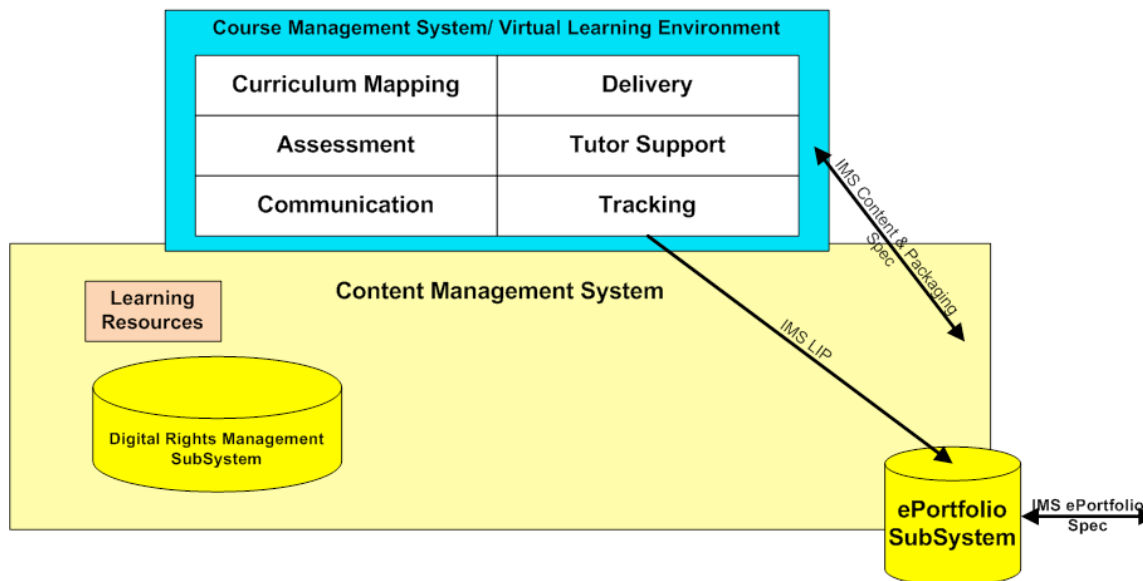


ePortfolio System Integrated with a Campus Content Management System

On most campuses today, one can find a Course Management System that has been in place for one to five years. Because of the existing investment, widespread adoption, and increasing usage of the Course Management System to support teaching and learning, it

is important that an ePortfolio System be integrated with the existing infrastructure. In the example diagram below, the ePortfolio system has been deployed on top of the campus Content Management System, which is storing learning objects and artifacts for the Course Management System. So, in the creation of one's electronic portfolio, authors would search the Course Management System for their work and then either copy the artifacts into their ePortfolio or link to them.

Course Management System and with ePortfolio System



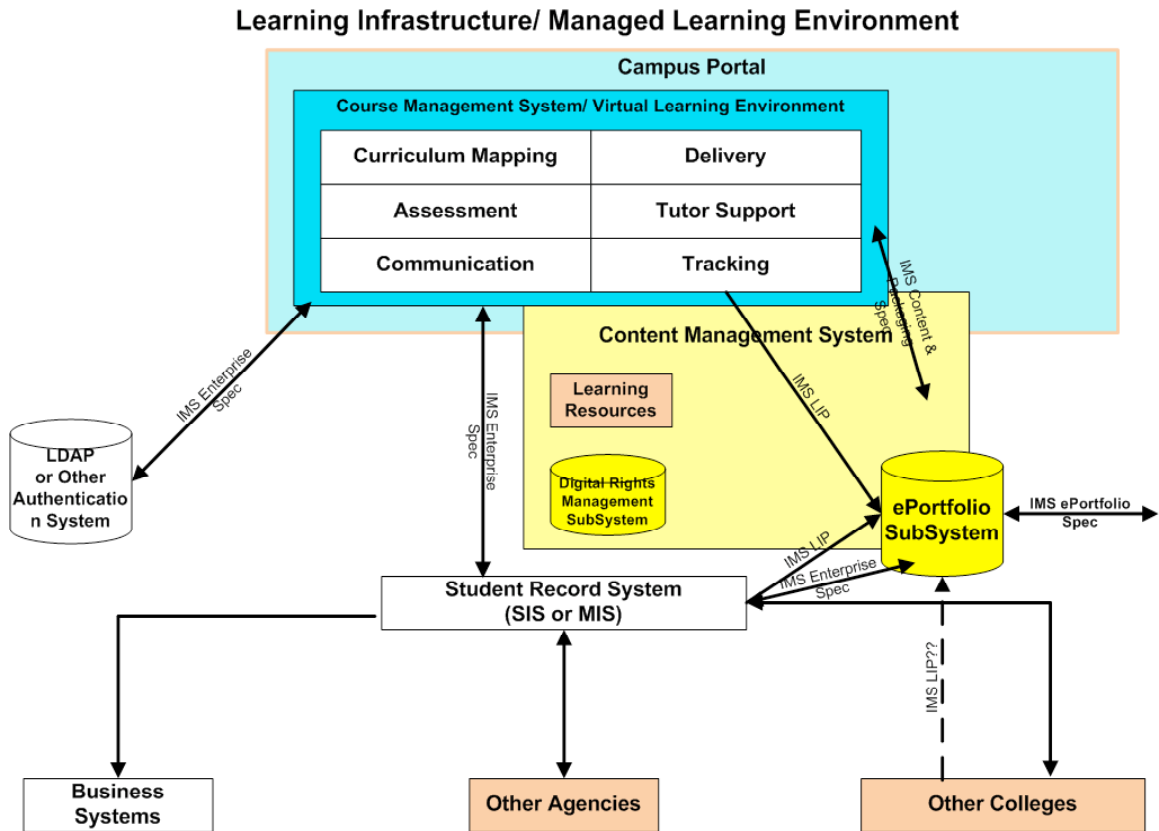
ePortfolio System Fully Integrated with the Campus Enterprise Systems

For early adopters who have Course Management Systems deployed and in heavy use, it is common to also have deployed other enterprise systems, including a common authentication system, a Student Information System (SIS), a campus portal, and perhaps other systems that might tie into the ePortfolio system, such as a content management system, a grant management system, or a proprietary learning system.

As discussed in the next chapter, the standards world is just beginning to develop specifications for the nascent ePortfolio space. For early adopter institutions, the IMS specifications provide the greatest promise of allowing the necessary interoperability and management. Early indications suggest the following specifications from the IMS will assist in the ePortfolio space.

- The IMS Content and Packaging specification for packaging and moving artifacts into and out of ePortfolios
- The IMS Enterprise specification for moving user and enrollment information
- The IMS Learner Information Package (LIP) specification for moving data about learning performance and planning

The following diagram shows the role that some of these emerging standards might play in ePortfolios achieving enterprise integration:



While the complexity may seem daunting, the work is manageable because the other systems that the ePortfolio system needs to interoperate with, many of which may already be deployed, all have clear definitions and boundaries in terms of the data they own and hold as well as their communication methods.

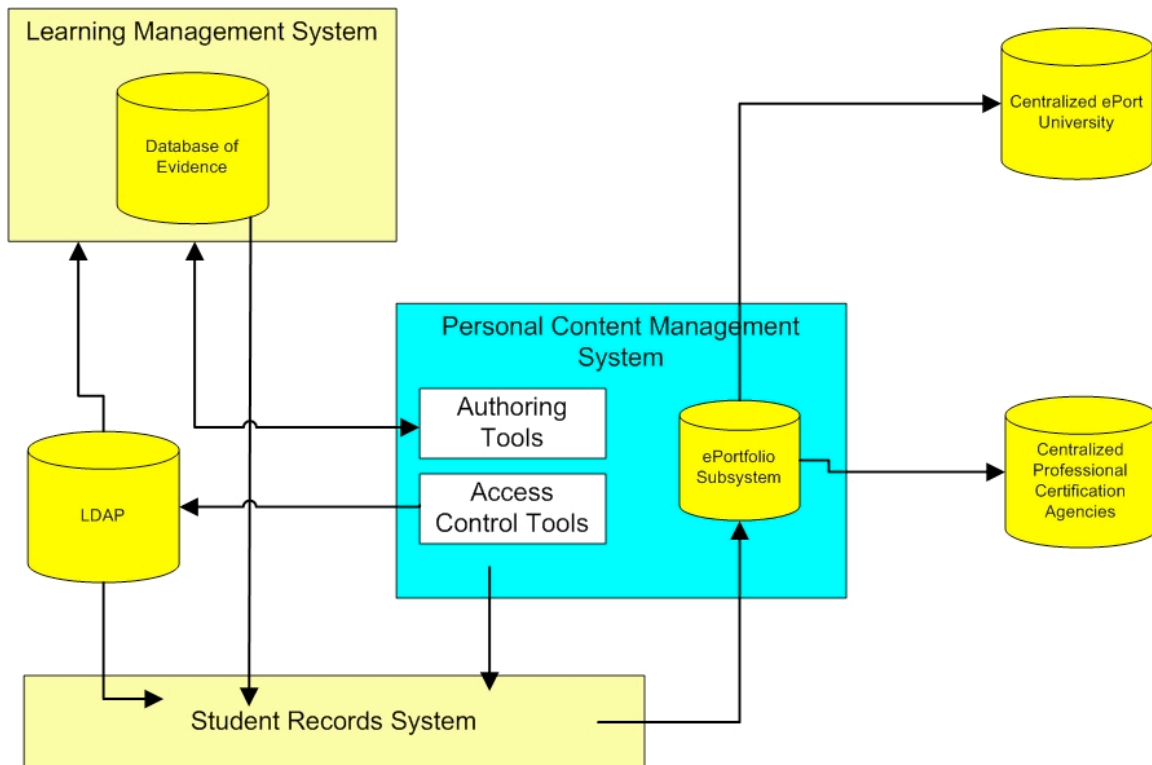
System Communication and Certification

Perhaps more important than the data is the ability for the systems to communicate. While the IMS specifications (Content and Packaging, Enterprise and LIP) provide the method of moving the data, these XML files still need to move over secure networks either via VPN, SSL or a central authentication system that provides the secure authentication integration for all systems. Examples of central authentication systems include LDAP, Kerberos, Active Directory, and Internet2 Shibboleth. However, protection of the data from outsiders is not nearly as important for ePortfolio systems as it is with Course Management Systems – for ePortfolio systems it is the certification of artifacts that is important. Those that view the portfolio, prospective employers, admission officers, etc. need to know that the portfolio they have been granted access to is genuine so that they can make hiring and admission decisions based on it. The IMS Digital Repositories group, as well as other digital signature methods, will ensure this; however, it will require ongoing work via trial and deployment to develop best practices.

Peer-to-Peer Portfolio Systems

Emerging peer-to-peer (P2P) architectures offer a powerful complement to the institutionally based enterprise architectures that might address concerns for how to maintain ePortfolio content and provide owner control over a lifetime. A P2P architecture allows the individual to select and present various views of their academic, professional or personal abilities to many communities at the same time without needing to store their entire personal ePortfolio archive in multiple locations or to give any of the communities unrestricted access to their information. Like enterprise ePortfolio systems, P2P ePortfolio systems could connect to repositories of official personal information (i.e., teaching records or student transcripts) using the same data standards as discussed above. However, rather than being tightly coupled within an institutional information infrastructure, the transactions between the systems would be carried out over the Internet through Web Services protocols. Individuals would assign rights to individuals, groups or institutional systems to access a customized view of their ePortfolio appropriate to the relationship between the ePortfolio author and audience. In some cases, the user may instruct the P2P application to connect to and deposit views of their comprehensive personal ePortfolio on a centralized ePortfolio management system similar to those mentioned elsewhere in this section. In other cases, the individual could authorize the centralized system to pull information from the personal ePortfolio when needed. In the following diagram, the personal ePortfolio management system is part of a personal content management system.

Peer-to-Peer ePortfolio Integration



Future ePortfolio System Integration

The LionShare project (<http://p2p.libraries.psu.edu>) provides model hybrid client-server/P2P architecture that may be appropriate for future ePortfolio systems. The architecture includes peer ePortfolio applications and a PeerServer. The PeerServer functions as a persistent aggregator of personal evidence and has authentication controls for access to centralized repositories of official evidence. It allows users to publish their ePortfolios so that they remain shared even when the users are without network connectivity. However, because the ePortfolios are still stored on the systems running the peer applications, the PeerServer does not need to keep a copy in perpetuity. As appropriate for institutional needs, the PeerServer could provide remote backup services for ePortfolios and publish them to the Web. The Peers communicate with each other and with the PeerServer using a modified version of the Gnutella protocol that utilizes centralized authentication and authorization services. UltraPeers, special high bandwidth peer applications, route network traffic to nodes with slower connections, alleviating many of the performance problems that plagued early P2P architectures. All queries hit the PeerServer and all available Peers in the network. ePortfolios could be passed in the format defined by the IMS ePortfolio specification, a profile of all the IMS specifications discussed above.

5. INTEROPERABILITY AND STANDARDS

Introduction

Like other new product spaces of the recent past, the first attempts at ePortfolio systems have not always employed existing industry-wide standards. Whether ePortfolio systems are built in-house by an educational institution or are developed and maintained by consortia or for-profit companies, standards are the key to ensuring that these fledgling systems meet user expectations and the ever-increasing requirements of the Academic Enterprise. Standards ease educational and technical transitions, increase manageability, and leverage existing resources and activities.

The most compelling argument for employing standards may be the fact that a growing number of students begin and end their higher educational experiences at different institutions. Unless users are to be expected to re-enter their portfolios every time they change institutions, ePortfolio portability will be a crucial feature, and this portability can most easily be achieved through the use of industry-wide standards. Students may also wish to keep ePortfolios across levels of education and to continue to use them after they enter the workplace. Similarly, the use of standards will have the result of allowing institutions to freely move from one ePortfolio system to another, as new features and new entrants to the market appear.

The use of standards, and the follow-on benefit of interoperability, will also address issues dealing with content and manageability (including administrative concerns such as enterprise interoperability). Given the possibility that ePortfolio systems could be built on the base of various other systems – a so-called “factored application,” with information constantly being shared back and forth – an ePortfolio system not utilizing standards will likely be cobbled together and dependent on custom software. Standards will allow ePortfolio systems to exchange information with other enterprise systems, such as Course Management Systems. Additionally, the use of standards will allow ePortfolios to benefit from a host of other work being done in adjacent areas such as security, identity management and content accessibility.

Interoperability Requirements

In order to meet user expectations, electronic portfolio management systems will almost surely need to interact with numerous diverse systems found at a typical institution of higher education. These may include course management systems, student information systems, authentication and authorization systems, certification systems and other ePortfolio systems. ePortfolio systems will need to exchange information about learners and other users, data the user has created, relationships between components of a portfolio, and information about the process of creating and using the portfolio.

Important interoperability considerations include:

- Access to information about users across systems
- Access to data created by users across systems

- Standardization of data structures describing objects within a portfolio, the structure of ePortfolio components, views of the portfolio, and the whole portfolio
- Sharing common authentication and authorization services with other systems
- Mapping data between educational communities
- Enforcing verifiability, non-revocability, and IP rights across systems
- Managing workflow across systems

Access to information about users

ePortfolio systems will need access to learners' personal information (such as demographics, directory information and accessibility requirements), transcripts and other official records of educational progress, and group memberships (such as classes and clubs). This information may be stored in student information systems, HR systems, and other enterprise systems, some of which may be external to an institution.

Access to data created by users

ePortfolio systems will need to be able to utilize content created within other learning systems, such as documents (which may be in a variety of formats), reflections, links, feedback, views of a portfolio and complete portfolios. It is important that this information be passed in its entirety and that all significant internal structure be preserved.

Standardization of data structures

In order for data to be meaningfully shared and represented across systems, the systems will need to support common data structures for each type of content listed above. Elements of the structure of the portfolio itself — whether or not it includes a goals section and what the structure of a goal is defined to be, for example — need to be agreed upon and supported by interoperating systems to make full use of the data being shared.

Common authentication and authorization services

There needs to be a consistent strategy for authenticating access to ePortfolios and providing access control between different ePortfolio systems. This enables the verification of a common identity across systems and maintains user-defined access control to portfolios and the content within them across systems.

Mapping data between educational communities

Different standards for representing learner information and portfolio content are accepted within different educational communities, such as K-12, higher education, continuing education and corporate training. It will be important to develop a standard way of mapping one standard to another in order to provide data integrity and usability.

Verification and rights management

In some cases, data within a portfolio may need to be verifiable with an external authority, such as professional certification organization, and it may need to be non-revocable by the user. In addition, portfolios may contain intellectual property, which belongs to the user or one or more third parties, the rights to which need to be controlled.

Information about these constraints and dependencies should be preserved as data is moved and systems should support the resolution of the constraints in a consistent way.

Managing workflow

The processes of creating, editing, sharing, evaluating and scoring portfolios may be performed using multiple applications and may be specified by someone other than the learner, such as in the context of a course. There should be a standard way to represent the workflow of these processes and mechanisms for applications to pass both the description of the process and messages about the status of individual portfolios within them.

Related Standards Activities

Existing eLearning standards and specifications will play an increasingly important role in defining the ePortfolio space. As existing and new ePortfolio products are released to the market, their usage of standards will be scrutinized, studied and tuned to provide widespread interoperability and to speed adoption of Portfolio Management Systems as a standard for the learning environment. Much tuning work will occur as vendors realize that what-were-optional fields in a specification need to be validated and mandated to allow for interoperability. This validation will largely occur within the standards working groups and vendor interoperability trials.

Specifically, most of the standards and specification work will fall into five categories:

- 1) Content reuse
- 2) Data integration
- 3) Authentication and Authorization integration
- 4) Usability and accessibility
- 5) Document standards

Content reuse

The easiest specification to see playing a role in the ePortfolio space is the IMS Content and Packaging specification. It is the workhorse of all specifications because of its widespread adoption and usage, which spans the eLearning ecosystem and vendor product offerings. Since most of the content in Learning Systems can be imported and exported utilizing the IMS Content and Packaging specification, it makes sense to use this specification in moving learner content product into the ePortfolio and in moving a portfolio from one academic environment to another or from one ePortfolio system to another. However, Content and Packaging is limited in its ability to represent complex internal relationships between elements within an ePortfolio and will likely need to be extended.

Data integration

In addition to increasing the flexibility of Portfolio Management Systems, the portability of portfolios will drive the high-scale usage of the systems. One key component to make portfolio movement fluid is data integration with back-end Student Information Systems (SISs) via the IMS Enterprise specification. Conformance to IMS Enterprise allows for information about users (students and teachers), groups (courses), and group membership

(instructor assignments and enrollments) to be consistent across a campus and its deployed systems. Many portfolios also will need to be synchronized with more detailed records of students' goals, learning activities, products, and competencies stored in other enterprise systems. The IMS Learner Information Package (LIP) specification, used in conjunction with the IMS Reusable Definition of Competencies and Educational Objectives, provides a means for organizing and moving this learner-specific information. LIP will likely need to be extended to represent the complex relationships, individual goals, activities, competencies, products of learning, and other data within portfolios.

Authentication and authorization integration

In order to protect the integrity and privacy of data moving through ePortfolio systems, institutions need standardized ways to determine who can access what and within which timeframe. This problem is being addressed via the numerous specifications related to authentication and authorization integration. In order for ePortfolio systems to work within and across institutional eLearning ecologies, users need to be able to authenticate into one system and seamlessly move to another enterprise system without re-authenticating. Enterprise systems also need to be able to exchange information about the permissions, while sometimes keeping personal information private. Widespread adoption of the Internet2 Middleware group's Shibboleth system would help address this challenge. "Shibboleth is developing architectures, policy structures, practical technologies, and an open source implementation to support inter-institutional sharing of Web resources subject to access controls. In addition, Shibboleth will develop a policy framework that will allow inter-operation within the higher education community."³ The Open Knowledge Initiative's (OKI) authentication and authorization open service definitions are two related specifications that may also contribute to a solution.

Usability and accessibility

Finally, Portfolio Management Systems must be usable by all individuals, and all specifications being used to integrate the Portfolio Management Systems should take "special needs" into account. The IMS Accessibility working group is developing guidelines and suggested changes to current eLearning specifications to allow them to be usable by all. For example, IMS LIP now includes information about learners' accessibility requirements – content delivered to them should be formatted for a screen reader or that contrast between red and green should not be used to convey important information.

Existing standards do not address all ePortfolio interoperability requirements, especially those dealing with complex data structures, verifiability, and workflow. However, since reuse is a core concept of computer science, it makes sense to re-use and/or adapt as many of the current specifications for use within portfolio management systems.

³ <http://shibboleth.internet2.edu/>

Document Standards

Many disciplines use computer programs that require specific file formats. For this reason, a portfolio must be able to accommodate all files. A portfolio may also contain documents that will be used a number of years from now. The U.S. National Archives and Records Administration (NARA) and AIIM International have, in conjunction with the library community, been developing a proposed ISO standard for archiving electronic documents. As part of this development, NARA has agreed to make a viewer, such as the Adobe Reader, available throughout the life of the format.⁴

The format, called PDF/A, is based on Adobe Systems Inc.'s Portable Document Format (PDF) using only those features for archiving — hence the A — that would permit a PDF viewer, in 2053, to view today's files.⁵ Typically the PDF/A has deleted functionality that relies on proprietary technology and required embedding fonts to ensure they are available whenever the document is displayed.⁶ There is an implicit commitment that Adobe would continue to provide software that would render PDF/A or that NARA or some other organization would maintain such a viewer.

Documents, such as grade reports, key research papers, and faculty recommendations, should be stored in the PDF Archival format. For documents in typically-used formats, the capability of transforming documents from their native file format to PDF/A should be available to the portfolio user.

The PDF format supports the use of digital signatures to validate the document, to record a time and date service, or identify the certifying authority — the “stamp” on a paper document. The PDF/A does not yet support digital signatures. Registrars could, however, agree to use a PDF format that otherwise complies with the PDF/A specification.

Another long-term format may be a file that contains an XML document, XSL style sheet, and XSLT transformation. This document could support the XML digital signature. Adobe Systems, Inc., using the forthcoming XDP “package” specification, has proposed the bundling of XML and PDF documents. When this or a similar technology becomes standardized, it may be preferable to the PDF/A. If it were to be adopted and widely used, then a conversion from PDF/A to this XML package would be needed.

⁴ NARA has not made any agreement to support other formats, such as Microsoft's Word or even the e-mail format, that are now used by many government agencies.

⁵ Toru Iiyoshi, at the Carnegie Foundation for the Advancement of Teaching, used the PDF format and has the facility to convert typical file formats to PDF. This provides portability for a portfolio user that moves from one desktop environment to another. It also ensures that the document will appear the same to two different viewers, a feature that HTML does not have.

⁶ The U.S. courts and the legal profession use PDF formats because the presentation does not change when the document is displayed, assuming the fonts are available or embedded. The AIIM/NARA community discussions reflect the court's requirement that document presentation of court documents be identical.

Current ePortfolio Efforts to Establish Standards

Other organizations that are not developing ePortfolio software are nonetheless working to establish standards and specifications relating to ePortfolios. Included in these efforts are the following projects:

IMS Global Learning Consortium (IMS) (<http://www.imsglobal.org>)

IMS created an ePortfolio Working Group in May 2003. They have collected requirements from vendors and educational institutions throughout the U.S., the U.K. and Europe. Building on existing standards, the group will develop a standardized ePortfolio data model to facilitate portability of portfolios between systems and institutions.

The Electronic Portfolio Consortium (ePortConsortium) (<http://www.eportconsortium.org>)

ePortConsortium is the collaboration of select higher education and IT institutions working to define, design and develop software for the forthcoming electronic portfolio environment and system. From a conceptual perspective, the consortium is trying to invent the new electronic portfolio application environment to address various ePortfolios needs. From the technical perspective, it intends to collaborate with IT institutions to define and adopt interoperability and transportability measures and standards while building prototypes to test scenarios and conceptual environments.

The Centre for Educational Technology Interoperability Standards (CETIS)

(<http://www.cetis.ac.uk>) and Joint Information Systems Committee (JISC)

(<http://www.jisc.ac.uk>)

CETIS and JISC in the U.K are coordinating the mapping of the U.K. transcript and personal development record specification to the IMS LIP Specification. They have extended LIP to represent more complex relationships between its components. This work is being extended to map between LIP and the European transcript as well.

Open Source Portfolio Initiative (OSPI) (<http://www.theospi.org/>)

OSPI released its OSP 1.0 specification in July 2003. They have been awarded a Mellon planning grant and have begun work, including a features list and roadmap, for version 2.0 of their specification. Their next major release is expected in early 2004, and will implement some OKI service definitions.

EPAC (<http://www.educause.edu/vcop/eport/>)

Launched by National Learning Infrastructure Initiative (NLII) in January 2003, EPAC is a virtual community of practice on electronic portfolios. EPAC is actively participating in IMS, has developed a features matrix, which has been incorporated into OSPI, and is developing a Taxonomy of ePortfolio types.

European Initiative for E-Learning (EIFEL) (<http://www.eife-l.org/>)

EIFEL launched the European Consortium for the Digital Portfolio at ePortfolio 2003 in France. The group hopes to address ePortfolio needs and practices in Europe.

ePortfolio Interoperability XML (EPIX) Specification (<http://www.epixspec.org/>)

EPIX was created by ePortaro, Inc. (www.eportaro.com) and released to the public in early 2003 with the goals of supporting the integration of ePortfolio Systems with other enterprise applications, and addressing issues of ePortfolio portability. EPIX is a Simple Object Access Protocol (SOAP)-based application program interface (API) and utilizes XML. ePortaro retains the copyright to the specification and users may obtain a free license after accepting certain conditions.

Conclusions

Efforts to solve the technical challenges outlined in this section can only be successful if interoperability is widely mandated in higher education and standards are widely adopted. To facilitate this, the standards bodies, vendors, and educational institutions will need to work together and be responsive to feedback from actual deployment of ePortfolio technology.

Some of the challenges that lie ahead include developing more accessible ways to represent ePortfolio content, achieving agreement on how multiple specifications should be coordinated, and developing standards to more rigorously define the relationships between elements within each portfolio and between those elements and other systems. Hopefully, with these challenges addressed and with wide acceptance of standards, portability and interoperability will be assured, and ePortfolios will flourish independent of institutional differences.

6. CHALLENGES

This section looks at the types of challenges that are likely to be encountered as universities and commercial providers develop new, and improve existing, electronic portfolio applications. It is not intended to discourage portfolio sponsors or developers, but to highlight six areas where challenges will arise:

- Hardware and Software
- Security and Privacy
- Intellectual Property and Digital Rights
- Usability
- Assessment
- Acceptance and Managing Expectations
- Long-term Maintenance

Hardware and Software

The start of any electronic portfolio system involves selecting the software and necessary hardware to provide services and assuring the necessary long-term funding. As part of this process, the following should be considered:

- What is the impact of installed or preferred systems (CMS, SIS, Databases, etc.) on the selection and development of an electronic portfolio system? Are there any licensing options available to minimize the cost of development or deployment?
- Is the system scalable and able to meet more than the predicted levels of growth, especially for usage and storage?
- What level of expertise does the organization have to develop, deploy and maintain the system?

Security and Privacy

Because the author of an electronic portfolio controls not only the content but also access, new concerns for security and privacy issues will arise. These include the following:

- What policies need to be in place for governing information access, security and privacy and how will they be determined and controlled? How will access permissions be extended to include others, such as employers, who are not known to the college or university?
- What are the institutional responsibilities under the Federal Educational Rights and Privacy Act (FERPA) for the maintenance of an electronic portfolio? How will these rights and responsibilities be maintained and transferred?

Intellectual Property and Digital Rights

Intellectual property management is of increasing concern and electronic portfolios will bring new challenges to institutions, including:

- Who is the owner of the items uploaded into an ePortfolio (the individual, institution or a combination)? What mechanisms are in place for resolving ownership issues?
- How will colleges and universities inform users of the rights of authors and publishers to documents stored in their portfolios, and what can and cannot be included, and what is possible under “fair use?”
- How will the system guarantee that the owner of the electronic portfolio created the work?

Usability

In addition to central hardware concerns, the electronic portfolio system must function on the typical desktop. To assure this, planners should pay attention to the following:

- What plug-ins and utilities will be required for the portfolio application to function? What file formats will be supported in the immediate future and what formats will be maintained long-term? What browsers will be supported as Microsoft moves away from IE for the Mac, AOL’s support for Netscape is unsure and other browsers gain popularity, such as Mozilla, Opera and Safari?
- What bandwidth and level of technology is required by the author to maintain a portfolio?
- What technologies will be used to implement an offline portable portfolio that authors can take with them (XML, content packaging, etc.)?

Assessment

One significant interest in electronic portfolios is the opportunity for developing new models for student, program and even institutional assessment. In order to better support assessment, projects should consider the following concerns:

- What type of assessment will be supported by the electronic portfolio application (institutional, program, course or the whole portfolio)? Are there standards that are appropriate to supporting the measure of assessment, such as competencies, state learning standards, etc.?
- How will assessment data be maintained long-term and how will participants have access to the assessment data after they have left the institution? Will the assessment data be harvestable by third-party providers?
- How might student assessment be used to assess the programs they participate in and how might this affect assessment of the institution?

Acceptance and Managing Expectations

With any large scale, costly project, it is important to anticipate how to manage expectations and assure acceptance. The following are a few issues to consider:

- What are the expectations from the point of view of the President, Deans, Faculty, Staff, Students, Alumni and the K-12 community for the electronic portfolio system?
- How can the project have a high probability that faculty, students and administrators will accept it?
- How does the project respond to suggestions from the community through decision-making, deployment and production?

Long-term Maintenance

Before promising that a user's portfolio will be available online throughout their life, institutions should consider the long-term challenges of an electronic portfolio system, including the following:

- What policies are needed for deleting materials or moving them out of the electronic portfolio system to manage long-term storage requirements?
- How will access to existing information, from student grades in the student information system (SIS) to URLs for documents and Web sites, be maintained over many years?

Conclusion

These are examples of some of the challenges that will need to be considered for a widespread electronic portfolio implementation. These are not unique to electronic portfolios and the cost of upgrading the information infrastructure or updating policies and practices should not be assigned only to electronic portfolios. Some issues may already have been resolved in another context and the information infrastructure may have been developed to a point that fully supports electronic portfolios. But a careful analysis of the long-term impacts should be part of the decision-making process to implement an electronic portfolio system.

7. VENDOR ACTIVITY

Based on responses from leading ePortfolio solution providers, the ePortConsortium has gathered information about various ePortfolio solutions. The ePortfolio solutions that were surveyed for this section include:

- Blackboard Content System by Blackboard.
- ePortfolio with RubricMarker 2003 from Chalk & Wire
- Epsilen Portfolios by CyberLab
- Folio by ePortaro
- iwebfolio by Nuventive
- Mosaic from the R-Smart Group
- Open Source Portfolio (OSP)

System Functionality

The underlying functionality for the majority of the surveyed ePortfolio solutions is focused on creating an organized collection of completed work that can transform learning to a more student-centered and outcome-oriented system. Among university-sponsored efforts, for instance, OSP provides a robust, nonproprietary individual-centric and life spanning ePortfolio system for use by students, faculty and institutions. Vendor offerings include Nuventive's iwebfolio, Folio by ePortaro and the Blackboard Content System by Blackboard, which are broad-based portfolio systems that are designed as a lifelong, multipurpose tool, while the Chalk & Wire solution addresses professional groups such as teachers through customized default standards, graphic designs and assessment rubrics.

Student and Program Assessment

Evident in all of the ePortfolio solutions is the ability to assess students and programs in a variety of ways. As a key aspect to data-driven decision-making, student and program assessment is at the forefront of most administrators' minds. To ease this pressure, many ePortfolio solutions, like ePortaro and the Blackboard Content System, provide a flexible framework for students to submit drafts and final versions of assignments, either through digital files or online forms. Competency targets can be used to provide a discipline-based model for learning and capability management. All individual assessments can be measured as part of a group, class, program, department or school to identify targets, gaps and best practices through a decision support database. The Mosaic solution supports student and program assessment through extensive configuration and customization that allows institutions to create and maintain ePortfolio categories. Through the use of a Master Academic Planner (MAP), the Epsilen software provides a multi-dimensional matrix that is dynamically and automatically configured to support individual student needs for learning, advisement and assessment.

Reflection

Reflection functionality enables users to explore their work, describe their feelings, and review their strengths and weaknesses. All of the surveyed solutions offer reflections on all or part of an ePortfolio via an attached response, typically based on a pre-developed form. The Blackboard, ePortaro and Mosaic solutions enable reviewers to add comments to students' ePortfolios. Blackboard allows all portfolio viewers (i.e., faculty, peers, academic advisors) to provide comments. Mosaic provides this functionality by uploading files or accessing URLs, while the ePortaro solution makes reflections available to peers, mentors and faculty through the use of discussion threads.

Portability

To meet users' need for transporting ePortfolios as they progress through their career, ePortfolio solutions are rapidly developing portability functionality. Currently, the developers of OSP, Mosaic and Epsilon are in the process of releasing portability functionality. The Chalk & Wire solution and Blackboard Content System enable users to either save their ePortfolio to a local hard drives or burn them to a CD-Rom. ePortaro ePortfolios can be seamlessly transferred to a hosted service and students can transfer portfolio data to their laptops or portable devices. Since iwebfolio is an application service provider (ASP) solution, it also is portable with access via the Internet.

System Support

Closely following the importance of system functionality, institutions also place high value on the availability of system support. All of the surveyed ePortfolio solutions offer some form of maintenance and end user support; however, the level of support varies from solution to solution. For instance, OSPI offers informal support such as a frequently asked question (FAQ) section on the organization's Web site, a contact us area that distributes questions to community members and a planned forum to manage communication between community members. On a more formal level, R-Smart provides system support for both the OSP and Mosaic solutions for an additional fee.

Traditional maintenance and support services, ranging from helpdesk assistance to error correction and product upgrades, are available from Blackboard, Nuventive, ePortaro and Chalk & Wire. The Epsilon portfolio solution receives support from the CyberLab at Indiana University.

Solution Availability

While most ePortfolio solutions initially were developed for the higher education market, many are beginning to offer their solutions to the K-12 market and to those individuals interested in professional development. Currently, the target group for the Folio solution by ePortaro and the Epsilen solution is the higher education market; however, both are receiving inquiries from interested customers in the K-12 sector. The CyberLab is engaged in the TeenFolio project, which is a K-12 subset of the Epsilen portfolio. At the present time, Epsilen is only available through the Early Adopters Program, while Folio is available for license by higher education institutions, K-12 and other clients.

The iwebfolio solution is available to users that include students from eighth grade to all higher levels of education and graduates who are active in the job market. iwebfolio accounts can be purchased directly from Nuventive or via SCT. For an eight-year account, K-12, higher education and professional group users can purchase the Chalk & Wire solution.

Developed originally at the University of Minnesota before being converted to run on other open source components, OSP is suitable for use in the K-12 and higher education communities with some development resources. Based on open source technology, OSP is free via a download from OSPI's Web site and Mosaic is free as well, to those who purchase services from the R-Smart Group. The flexibility of Mosaic allows it to be used effectively in higher education and in K-12 education for a wide variety of general and discipline-specific purposes. As an extension of the Blackboard Learning System, Blackboard's ePortfolio solution can be used from kindergarten through university and continuing education.

Technology Matrix

Product	Integration Strategies	Import Utility Functionality	Installed Software or Hosted?	Minimum Technology Requirements
OSP www.theospi.org	OSP is collaborating with Open Knowledge Initiative to assure integration.	No utility with SIS and CMS. Single sign-on available via integration with LDAP.	May be hosted onsite or remotely depending on need.	Similar environments using Microsoft OS, Sun or IBM hardware and OS.
Mosaic www.rsmart.com janice.smith@rsmart.com 207-372-8033	Integrates with PeopleSoft and other ERP systems.	Yes – can be configured by institution or by R-Smart Group.	Can be installed by institution or hosted by the R-Smart Group.	H Intel Pentium III 800; Web Server: RedHat Linux, Windows XP, Tomcat 4.1.24, Java 1.4.1, LDAP; Database: MySQL, Oracle 9i, PostgreSQL
Chalk & Wire www.chalkandwire.com info@chalkandwire.com 877-252-2201	Integrates with all current computer platforms. Developed from CGI Scripts written in ANSIC and Visual Basic.	Supports export of data as ASCII text files to ensure universal import/export to and from spreadsheets and databases.	Hosted	N/A
Iwebfolio www.iwebfolio.com www.nuventive.com dcraney@nuventive.com	An initial integration with SCT Banner and Blackboard. WebCT Vista is planned for 2003.	In the process of aligning with partners to offer this functionality.	Hosted by AccessData. An “on campus” solution is planned for 2004.	N/A
Epsilon www.epsilen.com cyberlab@iupui.edu 317-274-4565	In the process of developing integration with CMS software.	Yes – integration of locally developed codes to import/export data among institutional databases.	Currently – installed software solution. A hosted solution is planned for new product release.	Knowledge of Windows Server environment and Microsoft SQL Server.
Folio by ePortaro www.eportaro.com info@eportaro.com 703-220-6902	EPIXSpec standard integrates via Web Services, SOAP and XML.	Yes – many ePortfolio extensions are available.	Available as an installed or hosted solution.	Windows, Linux or Solaris servers running Oracle or SQL Server and Apache or IIS HTML servers.
Blackboard Content System www.blackboard.com info@blackboard.com 202-463-4860	Through the Blackboard platform, integrates with SCT, PeopleSoft and Datatel. Includes a set of java-based APIs.	Yes – Portfolio content can be imported in a variety of formats	Software can be installed locally or hosted via Blackboard ASP services.	Windows (SQL Server database and Windows IIS), Red Hat Linux (Oracle database and Apache) or Sun Solaris (Oracle database and Apache).

8. PROJECTS AND INITIATIVES

As part of the collaboration to develop this ePortfolio white paper, the ePortConsortium, in partnership with the American Association for Higher Education (AAHE), invited electronic portfolio projects to complete a survey developed by AAHE. Project information from these submissions is included in the Appendix of this white paper to provide a snapshot of some of the current and planned academic electronic portfolio projects.

The electronic portfolio survey is based on AAHE's Taxonomy of Electronic Portfolios (2003) and seeks to distinguish portfolios based on three discriminators. By identifying a *context*, the survey seeks to identify the setting in which the portfolio is initially being composed. By defining the *author* of the portfolio, the survey delineates who is performing the collecting, selecting and reflecting functions of the portfolio. Finally, by allowing users to select multiple *purposes*, the survey allows users to distinguish among multiple intended outcomes for the creation of the electronic portfolio.

The academic ePortfolio project profiles received for inclusion in this white paper reveal clear patterns in each of the three dimensions identified in the taxonomy.

- First, most institutions are focused on *students* as the primary author of ePortfolios. While a few institutions are using ePortfolios with faculty and to represent the work of the institution as a whole, ePortfolios systems predominantly are being offered as a service to students.
- Second, most institutions are using ePortfolios in the context of a *program*. Either as part of their majors or through institutional-wide initiatives, students are composing ePortfolios to demonstrate their development, learning and achievement beyond the confines of individual courses.
- Third, the ePortfolios developed within a single project are intended to serve *multiple purposes*. In almost every case, ePortfolios are intended not exclusively for development, assessment or presentation, but for some a combination of purposes that transcend these categories.

Additional data about these and other projects is featured in the AAHE Portfolio Clearinghouse (<http://webcenter.aahe.org/eportfolios/>). This searchable database is a tool for individuals and institutions interested in accessing a wide variety of student, faculty and institutional ePortfolio programs in use or under development at diverse types of institutions of higher education, as well as publications and software information.

Current users or facilitators of electronic portfolio programs and developers of ePortfolio technology are invited to contribute information about their projects for inclusion in the database. Please download the submission form from <http://webcenter.aahe.org/electronicportfolios/clearinghouseform.dot> and send the completed form to Darren Cambridge at dcambridge@aahe.org.

9. CONCLUSION

This white paper has provided three perspectives on the development of electronic portfolios. Sections one, two and three focused on the user perspective and provided a conceptual overview, described possible scenarios and considered potential benefits. Sections four, five and six focused on the technical aspects of ePortfolios and included discussions on system infrastructure, interoperability and standards, and deployment challenges. Sections seven and eight provided an overview of commercial offerings and a summary of academic electronic portfolio projects. Details from the survey of electronic portfolio projects used for section eight are in the Appendix.

This white paper reflects an ongoing scholarly dialogue among visionaries, technologists and others directly involved with the development or implementation of electronic portfolio systems. Authors from academic and corporate institutions collaborated to prepare this first comprehensive review of both the conceptual and technical aspects of ePortfolios, but this white paper is by no means a completed work.

Indeed, this group has just begun to explore the true potential of ePortfolios as conceptual thinking is realized within a software environment – an electronic portfolios management system. Given the fluidity of electronic portfolios development, the authors are aware that the content and discussion in this release may require revisions. The members and friends of the ePortConsortium are committed to continuing their work to prepare the next version of this white paper by including more authors, and they accordingly extend their invitation to conceptual and technical thinkers, as well as experts in the fields of teaching and learning, to send in their comments and suggestions. With broader perspectives and greater knowledge provided by additional contributors, the next version of this white paper will render an even more complete assessment of the status and future of ePortfolios. The ePortConsortium expects that the end result of this collaborative effort will be published as a chapter book in late 2004.

Please stay in touch with this working community by visiting the ePortConsortium Web site at <http://www.eportconsortium.org>. The latest version of this white paper, including the call for contributions and announcements, will be posted on the ePortConsortium site. For specific questions regarding potential contribution to or collaboration with this working group, please contact Ali Jafari (e-mail: jafari@iupui.edu, phone: 317.274.4565) or Gary Greenberg (e-mail: Gary-Greenberg@northwestern.edu, phone: 847.491.2995).

APPENDIX

Electronic Portfolio Academic Project Summaries

As part of the collaboration to develop this Electronic Portfolios White Paper, the ePortConsortium, in partnership with the American Association for Higher Education (AAHE), invited electronic portfolio projects to complete a survey developed by AAHE. Project information from these submissions is included in this Appendix to provide a snapshot of some of the current and planned academic electronic portfolio projects.

Additional data about these and other projects is featured in the redesigned AAHE Portfolio Clearinghouse (<http://webcenter.aahe.org/eportfolios/>). This searchable database is a tool for individuals and institutions interested in accessing a wide variety of student, faculty and institutional portfolio programs in use or under development at diverse types of institutions of higher education, as well as publications and software information.

The electronic portfolio database is based on AAHE's Taxonomy of Electronic Portfolios (2003) and seeks to distinguish portfolios based on three discriminators. By identifying a *context*, the database seeks to identify the setting in which the portfolio is initially being composed. By defining the *author* of the portfolio, the database will help delineate who is performing the collecting, selecting and reflecting functions of the portfolio. Finally, by allowing users to select multiple *purposes*, the database will allow users to distinguish among multiple intended outcomes for the creation of the portfolio.

Current users or facilitators of electronic portfolio programs and developers of ePortfolio technology are invited to contribute information about their projects for inclusion in the database. Please download the submission form from <http://webcenter.aahe.org/electronicportfolios/clearinghouseform.dot> and send the completed form to Darren Cambridge at dcambridge@aahe.org.

Epsilon Portfolio Information Center(EPIC)

<http://Epsilon.with.BGSU.edu>

Milton D. Hakel

Bowling Green State University, OH

MHakel@bgnnet.bgsu.edu

(419) 372-8144

Still in its beginning stages, this program originated in the need to document student learning and achievement in tangible ways for students themselves, beyond the artificial boundaries due to organizing learning into semesters and courses. The design is sufficiently general to encompass faculty, departmental, and institutional portfolios. In January 2003, Bowling Green State University (BGSU) joined the ePortConsortium, and serious pilot testing began in August, 2003. It presently has more than 400 student accounts and over 50 faculty accounts. Pending satisfactory evaluations from students and other stakeholders, BGSU intends this program to become comprehensive.

School of Education Webfolio

<http://public.clunet.edu/%7Egatherco/eportfolio/index.htm>

Paul Gathercoal

California Lutheran University, CA

School of Education

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(805) 493-3021

The portfolio is used in the teacher education program at the California Lutheran University (CLU), with elementary, secondary and special education teacher candidates. Teacher candidates submit evidence of practice. Faculty provide feedback to candidates. This ongoing conversation within the portfolio system provides formative assessment of student work. The program portfolio is organized into five benchmarks, A to E. CLU uses the six California Standards for the Teaching Profession or Special Education program standards and additional items selected by the faculty. A summative review of student work in an exit conference occurs at the end of each semester and the end of the program. The Curriculum and Instruction master's program at CLU also uses the Webfolio to address seven program goals and is used as a growth, progress, and showcase portfolio.

The flexibility of the CLU webfolio system allows selection of standards/competencies by program faculty. While student work is considered a permanent entry into the system, each semester new or revised standards and courses can be included for subsequent cohorts of students.

The portfolio also is used by all instructors in the program for their classes and students submit their course work for evaluation and feedback via the webfolio. Student submissions consist of word-processed materials including a philosophy statement, lesson plans and personal reflections. Scanned evidence of K-12 student work, links to other student prepared material, and digital photos and video are also included. The use of the webfolio provides teacher candidates experience with imbedding the use of technology in education.

CLU has begun using the portfolio structure within the K-12 classroom context with some of its student teachers, cooperating teachers, and Curriculum and Instruction graduate students. Curriculum and Instruction master's candidates and graduates are using the K-12 Webfolio in their classrooms. The portfolio provides a valuable database

of student work and faculty evaluation that supplies data for research on teacher and program development. It provides for student assessment, program evaluation and reporting all at one time.

Connecticut College e-Portfolio

<http://eportfolio.conncoll.edu>

Cynthia Love

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Connecticut College, CT

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The Connecticut College e-Portfolio, developed through the Career Enhancing Life Skills (CELS) program, is an online tool that allows students to document their academic planning processes, academic and co-curricular accomplishments, and their career development experiences during their undergraduate years.

This innovative online resource enables students to document and present information to their CELS counselors, center and certificate program advisors, and faculty advisors; prepare for their funded internship experience; participate in career development processes through online modules; and to present evidences of their skill development through academic, internship, and co-curricular experiences in multimedia components that can be included in multiple Presentation Portfolios.

The ePortfolio provides functionality that enhances student interaction with their advisors. The various interfaces within the ePortfolio enable faculty, program advisors, career development counselors and guests to view student portfolios or Presentation Portfolios, via special permission by the student, in a secure environment. The general functionality of the ePortfolio includes an "Upload Files" feature that students can use to document information in the Archives that reflects their academic, internship and co-curricular experiences in various multimedia formats; a "Presentation Portfolio" function that allows students to select and present information about themselves and their learning experiences in various multimedia formats; a "Resumé Program" that creates a student resumé in a Word document; and a "Notes" function that allows faculty advisors to record and share information from their advising sessions with the student and other advisors. Version 3.0 of the ePortfolio is currently under development.

Connecticut College currently is engaged in an ePortfolio Collaboration Project with Dartmouth College, Mount Holyoke College and Union College. Each college developed pilot programs in which selected groups of students, faculty, advisors and career counselors access their own institutionally customized version of the ePortfolio via network access to Connecticut College. This project is scheduled to run until January 2005.

The FSU Career Portfolio

<http://portfolio.fsu.edu>

Jill Lumsden

jlumsden@admin.fsu.edu

Florida State University, FL

The Career Center

(850) 644-6433

The Florida State University (FSU) Career Portfolio enables students in all majors to develop a strategic career vision, pursue learning activities that will enhance the likelihood of their achieving personal and professional goals, and document their skills. It also provides employers with evidence that students are ready to make effective contributions in the workplace. The Career Portfolio is a student-managed system that enables users to learn about, build and manage up to three versions of their Career Portfolio. Components of the Career Portfolio include: 1) career profile, 2) resumé, 3) skill documentation, 4) artifacts or work samples, and 5) references. Students also may choose to make their unofficial academic and/or service transcript available for viewing.

Skills available for students to include in the Career Portfolio are: 1) communication, 2) creativity, 3) critical thinking, 4) leadership, 5) life management, 6) research/project development, 7) social responsibility, 8) teamwork, and 9) technical/scientific. In addition, a tenth skill can be selected and added by each student that is specific to their major or career field.

Evidence of skills is documented through a “skills matrix” that provides the following experiences in support of skill development: 1) courses, 2) jobs/internships, 3) service/volunteer work, 4) memberships/activities, and 5) interests/life experiences. Included in the skills matrix are counters that enable users to quickly review entries in all 50 cells included in the skills/experience matrix. This enables students to acquire a summary of strengths and limitations in all skills areas. Students can access their courses via a link to the FSU Registrar database and import information directly into any skill area. Students have control over all information included in their completed portfolio, i.e., only skills and portfolio sections identified as desirable by students are shown in the output that is made available by students via Web access provided to employers and other referred users.

New Century College E-Portfolio Program

<http://classweb.gmu.edu/jyoung8/eportfolio/>

James B. Young

jyoung8@gmu.edu

George Mason University, VA

New Century College

(703) 993-9051

New Century College (NCC) of the College of Arts and Sciences at George Mason University has had a portfolio degree requirement since it first offered an Integrative Studies degree in 1996. Students develop a portfolio as part of each of their four, sequenced, first-year courses and again as part of a graduation requirement. These portfolios are fundamentally a reflection on learning experiences and the required graduation competencies. Students also are encouraged to keep developing their portfolio between those two stages of their academic career. This precedence has firmly grounded both faculty and students in an assessment culture rooted in active performance measures. Building upon this foundation, the NCC ePortfolio initiative was fostered by two central

thrusts: (1) a groundswell of interest from technically savvy undergraduates; and (2) a George Mason University College of Arts and Sciences' Technology Across the Curriculum (TAC) departmental grant. Part of TAC grant required NCC to charge faculty team with designing a course supporting this initiative.

The NCC graduation portfolio requirement recently has been revised so that an ePortfolio is encouraged for students with new media interests and strengths. The key issue under discussion is how to encourage individuality and creativity while developing some consistent review standards. NCC does not want students to simply present a digital archive of collected work nor fill in the spaces in a formulaic "myportfolio." Therefore, NCC is encouraging imaginative responses from students who are adept with digital arts and media and aware of the aesthetic and ethical dimensions of interacting in a new and different rhetorical space. However, the portfolio does fulfill — and must cover — specific graduation requirements. NCC is working on guidelines that help students think through imaginative hypermedia composition and linking, while providing enough guidance that there is real fire behind the flash.

eFolios Project

<http://rhetcomp.gsu.edu/portfolios>

George Pullman

gpullman@gsu.edu

Georgia State University, GA

Rhetoric and Advanced Composition

(404) 651-2900

Designed initially as a pilot project for program assessment, the eFolios Project will eventually be developed to include student achievement assessment.

Student Portfolio System

<http://portfolio.ilstu.edu>

Douglas Love

Gerry McKean

doug.love@ilstu.edu

gerry.mckean@ilstu.edu

Illinois State University, IL

College of Business

(309) 438-7751

(309) 438-7779

Students at Illinois State University's College of Business have undertaken creation of multimedia WWW-based portfolios since 1995. The portfolios are intended to demonstrate student mastery of curricular standards and show how students interweave formal course work, career planning and student life activities into their educational experiences.

College of Business students begin their portfolios as a requirement in a core course by creating and adding artifacts to their portfolios using the Profport Webfolio System. The students produce the initial artifacts (work samples) in response to assignments in this course. Working in a team, faculty created assignments addressing the underlying standards for the course. "Best practices" are supported by the portfolio software, which allows easy sharing of assignments and syllabi resources among faculty.

Students may add to their portfolios either as a requirement or an optional activity in subsequent courses and include career planning and job-search related materials (e.g. resumé) as they near graduation. Each student can control what groups of portfolio

viewers can see each section of his/her portfolio. In other words, the student can create alternative views of his/her portfolio for teachers, other students, recruiters, and mentors. Recently, students have the capability to export their portfolio to business card CDs.

The software automatically organizes program standards, course competencies, and guidelines to enhance co-curricular activity as resources for students and these appear with each student artifact for the viewer to see. Faculty can place professional standards/competencies in the system with associated artifact producing activities for students to complete and then can provide comments (mentors can comment too) for the student in a comment log that is maintained for each artifact a student produces. Faculty and mentors can provide an assessment score for each artifact. Assessment data are tied to curricular standards that can be exported for evaluation of programs.

ePort at IUPUI

<http://eport.iupui.edu>
Sharon Hamilton

Indiana University Purdue University Indianapolis, IN

shamilto@iupui.edu

(317) 278-1846

The Indiana University IUPUI ePort is constructed as an enterprise system fully integrated with its course management system, and designed to be integrated, after the installation of PeopleSoft, with the institution's registrar's office, student information systems, and digital libraries system. It is also being developed in collaboration with the Open Source Initiative. ePort currently is organized around a Learning Matrix based on the IUPUI Principles of Undergraduate Learning (PULs), although additional customizable matrices will be available for a range of uses and users. The Learning Matrix takes a developmental look at foundational knowledge and skills (such as critical thinking; written and oral communication; and the like) by structuring four levels of intellectual growth: Introductory (first 26 credit hours); Intermediate (first 56 credit hours); Senior; and Experiential (co- and extra-curricular). Further development will include a learner profile, resumé-builder, knowledge mapper, and advising function.

The portfolio will be helpful for students to demonstrate their improvement and achievements in learning in their disciplines in relation to the PULs; it will be helpful for the campus to access information about student learning of the PULs; and it will be helpful for the overall learning mission of the campus as the infrastructure guides students to reflect on and integrate their learning. The portfolio is being conceptualized on a commitment rather than a compliance basis. IUPUI's intention is to build the best, most helpful infrastructure possible, based on input from faculty and students, have it well-begun during the first year learning communities and gateway courses, and then invite departments and professional programs to adopt it or adapt it according to their needs, and enable students to continue the portfolio throughout their undergraduate careers. This faculty-led and student-advised initiative is in its third year, with the pilot about to begin spring of 2004.

EDoc: A Cross-disciplinary ePortfolio Project**Iowa State University, IA**

NO URL

Dr. Niki Davis

nedavis@iastate.edu

(515) 294-3596

Dr. Pete Boysen

pboysen@iastate.edu

(515) 294-6663

The eDoc system is a campus-wide electronic portfolio system that will allow students to collect and present digital information that demonstrates academic and professional competencies to faculty advisors, departments, and employers. Known simply as eDoc, the system is the collaborative brainchild of the ePortfolio Group, an exciting partnership among four colleges (COE, LAS, Engineering, and FCS), AIT, and ITC. Under this web-based system, students can create an individualized portfolio organized according to a particular “theme” designed by a department, college, or employer to define the competencies, information, and format required by the reviewing agency. This theme-based approach will allow eDoc to adapt to the diverse needs of the university community while providing the consistency often required by a reviewing agency. It will also allow students to prepare portfolios for both academic and professional audiences. The completed system will be centrally maintained by Academic Information Technology (AIT), supported by the Instructional Technology Center (ITC), and tested initially in departments within the four partner Colleges.

On-line Career Portfolio**Kennesaw State University, GA**<http://careerctr.kennesaw.edu>

The Career Services Center

Karen B. Andrews

kandrews@kennesaw.edu

(770) 423-6555

The On-line Career Portfolio (OLCP) was created by the Career Services Center to enhance the learning experience at Kennesaw State University. The student, in the classroom and individually, has the opportunity to submit experiences ranging from coursework to student activity to employment. They then are asked to reflect on the experience based on a skill set established by employers who hire recent college graduates.

LaGuardia's ePortfolio Initiative**LaGuardia Community College/CUNY, NY**<http://eportfolio.lagcc.cuny.edu>

Nakiso Maodza

nmaodza@lagcc.cuny.edu

(718) 482-5449

LaGuardia's ePortfolio Initiative began over two years ago in an effort to improve program assessment, help students to reflect on their learning and smooth the transition to the worlds of work and advanced education. Initially coordinated by the LaGuardia Center for Teaching and Learning to show the potential of ePortfolios as a learning tool, the College has now embarked on a large-scale effort that will, eventually integrate ePortfolios into the experience of all LaGuardia students.

The ePortfolio encourages students to think about their learning in a broad context of family, career, culture and experience. It provides a record of where a student is, where a student has been and where a student would like to go. What distinguishes the ePortfolio at LaGuardia is the presentation of student diversity through text, images and other creative work.

iWebfolio at Mercy College

www.nuventive.com

Deborah Landes

Mercy College, NY

Developmental Semester, College Experience

dlandes@mercy.edu

(914) 674-7394

Mercy College is an early adopter using iWebfolio in a pilot program with approximately 200 students. Mercy College uses iWebfolio to ensure that the five competencies it requires of its graduates are attained and documented, and will continue to use portfolios to ensure that its non-traditional student population achieves and communicates levels of competency consistent with the College's vision.

eFolio Minnesota

www.efoliominnnesota.com

Paul Wasko, Gary Langer

Minnesota State Colleges and Universities, MN

Academic Programs

paul.wasko@so.mnscu.edu

(651) 649-5956

eFolio Minnesota provides Minnesota residents and students with the ability to create and administer their individual Web-based portfolio. The tool, which is available free of charge, permits individual users to display any form of text or multimedia objects. The primary purpose of this effort is to support education and lifelong learning for all Minnesota residents as they pursue their learning or workplace goals.

Student Electronic Learning Folio (SELF)

<http://self.nus.edu.sg>

Ivy Tan

National University of Singapore

Centre for Instructional Technology

cittani@nus.edu.sg

6874-5106

Version One of SELF was launched on February 2003, and the National University of Singapore currently is working on Version Three. The University is integrating it with the LMS and other student databases. Students upload significant assignments so as to build a portfolio. They write reflections on their activities and make career plans. Lecturers can write comments on students enrolled in the modules (classes) they teach. They can view the students' profile and students can choose to publish their portfolios online.

Teaching ePortfolio

NO URL

Gilles Doiron

National University of Singapore

Centre for Developing Teaching and Learning.

cdtjagd@nus.edu.sg

6874-2529

The Teaching ePortfolio is an ePortfolio System that would be used to assess teaching practices within the university. Each lecturer's portfolio will contain evidence of teaching practice, reflections, teaching philosophy, personal profile and publications. The first version of the system will be ready by April 2003 and it will be integrated with databases within the university. There are plans to integrate the Teaching ePortfolio with the Student ePortfolio (SELF) and the LMS.

The Collaboratory Project ePortfolio

<http://collaboratory.nunet.net>

Gary Greenberg

Gary-Greenberg@northwestern.edu

Northwestern University, IL

Illinois K-12

(847) 491-2995

The Collaboratory Project is a Northwestern University initiative funded by State of Illinois, federal and foundation grants. The project provides consulting, training and technical support to educators interested in using the Collaboratory, an easy-to-use, Web-based collaborative learning environment, to improve student learning and achievement. Teachers use the Collaboratory to develop innovative project-based activities in a framework for engaged learning that are aligned to Learning Standards and provide for assessment. Collaboratory Communication Services support collaboration among teachers and students. Collaboratory Resources provide the scaffolding to develop innovative project-based curricular activities. Collaboratory services and resources are available through a standard Web browser from servers at Northwestern 7 days/week, 24 hours/day.

Every Collaboratory participant has a personal ePortfolio that provides a personal workspace organized in binders and folders created by their teachers. Work is created using well-designed Web-based document templates that provide placeholders for text, graphics, sound and video. Media from documents is saved in personal repositories and can be reused. Access to documents can be private between the teacher and student, shared with other members of the binder/folder, or public on the Internet. All documents support private comments between the teacher and student, threaded discussions by members of the binder/folder, feedback in the form of short polls and personal reflections. Portfolio folders can be aligned to Illinois Learning Standards and Performance Descriptors. The Collaboratory ePortfolio is being used by teachers to share and comment on student work and encourage peer review and is supporting teacher professional development efforts.

Capstone Project Electronic Portfolios

<http://www.arche.psu.edu/thesis>

Jonathan U. Dougherty

M. Kevin Parfittm

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kp@psu.edu

Pennsylvania State University, PA

Dept of Architectural Engineering

(814) 863-9093

(814) 863-9093

The Department of Architectural Engineering at Pennsylvania State University has begun an implementation of learning-based Information and Communication Technologies (ICT) as a part of the senior capstone design experience, a two semester course sequence. Each senior student enrolled in the course is required to design and maintain a Capstone Project Electronic Portfolio, or CPEP. The CPEP sites are maintained by the student and hosted by the Department of Architectural Engineering. The portfolios include all aspects of the capstone project from student resumés to project abstracts, technical assignments and progress reports.

Through the design, construction and use of the CPEP sites, students learn valuable project management skills. Additionally, students use the ePortfolio as an extension of their resumé to offer potential employers insight into their background and capabilities through the comprehensive senior project. The AE faculty involved in the course have greater control over course management issues by utilizing the Web sites for course submissions and to confirm student progress.

The AE Department continues to provide valuable resources in the form of industry practitioners who work with the students on an individual and course-wide basis. Many outside professionals assist the students in their projects including a group of specialists who are classified as the practitioner mentors and are a formal part of the capstone project program. These practitioners, almost always located at locations distant from Penn State, will use the CPEP sites and integrated asynchronous discussion technology to collaborate with the students.

Of great significance to the faculty, the department and future students is the archival aspect of the Capstone Project e-Portfolios and the potential for use in the ABET accreditation process. The CPEP sites will serve as an annually updated source for future students to review and draw on industry innovations, trends, and best practices.

Penn State's ePortfolio Initiative

<http://portfolio.psu.edu>

Glenn Johnson

gjf100@psu.edu

Pennsylvania State University, PA

(814) 863-3923

Penn State's e-Portfolio Initiative supports students, faculty and staff at Penn State who are interested in using the 200 MB student Penn State Personal Web Space accounts to plan, reflect upon and publish what students have learned at Penn State. This service promotes the development of ePortfolios, which are personalized, Web-based collections that include: selected evidence from coursework, artifacts from extra-curricular activities, and reflective annotations and commentary related to these experiences. Some programs of study at Penn State require that students publish online Program portfolios. Many

faculty require students to publish course work online in Course portfolios. Students may link to, describe and reflect upon any or all of this evidence in their comprehensive Penn State ePortfolio.

The ePortfolio development process encourages all students to become more actively involved in planning, and more responsible for achieving, their own educational goals. Students also benefit by sharing examples of their work with potential employers, mastering transferable information technology skills, and demonstrating knowledge, skills and attributes gained beyond the classroom.

The portfolio.psu.edu Web service is a centrally maintained Web service for all ePortfolio developers at Penn State. The service is a collaborative effort of Penn State's Information Technology Services, the Division of Student Affairs, the School for Information Sciences and Technology, and the EMS e-Education Institute. The aspects of service that this Web site focuses on includes showcasing exemplary student ePortfolios, providing instruction needed to foster independent and peer learning about ePortfolio development, and providing support for faculty to incorporate ePortfolio-related assignments in their courses.

University Studies Student Portfolios

<http://www.ous.pdx.edu/assess/index.html>

Judy Patton

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University Studies is a four-level, general education program based on four goals: inquiry and critical thinking, communication, social responsibility and ethical issues, and the diversity of human experience. Entering students take a yearlong, interdisciplinary course called Freshman Inquiry. Every student creates a yearlong portfolio and a random sample of those are evaluated for program review. Currently, 80 percent of those portfolios are in electronic form.

This year there is an initiative to continue the electronic portfolio through the rest of the program. The other levels of the program are Sophomore Inquiry, the Upper Division Cluster and Senior Capstone. All Senior Capstones are community-based learning courses in which interdisciplinary teams of students use their learning from University Studies and their majors to work on a community issue or need. The courses are facilitated by a faculty member with a community partner. Each Capstone results in a final product.

The next elements in the student portfolios will be key assignments from each Sophomore Inquiry course (three are required), key assignments from the UD Cluster courses (three are required), reflective pieces and the final product from the Capstones.

Sample Education/Teaching Portfolio

<http://www.pritchardschool.com/portfolio/martin/portfolio.html>

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Pritchard Digital Arts School, MA

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This online interpretation of a model portfolio for educators is created by a new site offering to assist with career portfolios. They have illustrated how a career portfolio can be succinctly crafted, with strong examples, clear links, and options for browser.

Purdue Electronic Portfolio

<https://eportfolio.soe.purdue.edu>

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The Purdue Electronic Portfolio (PEP) system is a large-scale, web-based, database-driven electronic portfolio system for teacher education students. Developed as part of a Preparing Tomorrow's Teachers to use Technology implementation grant from the U.S. Department of Education, the PEP system is designed to allow teacher education students to document their teaching knowledge, dispositions, and performances. It serves as a tool for student self-reflection, for assessment within the teacher education program, and ultimately as a tool for producing a presentation portfolio for students' seeking employment. This custom-designed e-portfolio system relies on a web-based interface to a large database that stores students' materials. The system allows students to store digital files of any type and create artifacts, which are coherent collections of files coupled to reflective narratives and addressing specific standards. Students use an artifact template, which provides consistency and ease-of-use while also affording some flexibility, to submit artifacts, which generally are major assignments in teacher education courses. Completed artifacts are "published" as web pages, although all work remains secured behind a password protected barrier. Faculty review and assess student-created artifacts within the system. Since the fall of 2002, use of the PEP system has been required for all teacher education students at Purdue University. Its use is woven throughout the teacher education program, which spans three or more years for most students.

Digital Media Assessment Portfolio

<http://dmap.ci.qut.edu.au>

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The Digital Media Assessment Portfolio (DMAP) project initially was funded in 2002/2003 by an Australian Research Council (ARC) Discovery grant, with the purpose of: "Constructing a new conceptual framework for using digital technologies in achieving better arts assessment." The ARC project research proposed to:

1. Identify the qualities of artistic knowing across five art forms (Drama, Dance, Visual Arts, Media and Music).
2. Identify the gaps in assessment of these qualities in current approaches to arts assessment.

3. Conceptualize ways in which digital technologies can be used in arts assessment to overcome inadequacies in current approaches.
4. Develop and trial a conceptual framework for better arts assessment and evaluation and fundamental knowledge that takes optimum advantage of the capacities of NICTS to facilitate learning.

The project has examined the different interpretations of the idea of ePortfolios from stake holders perspectives (Institution, pedagogy, student, teacher and community). Ideas for portfolios include a documentary of learning, an exhibition space, a Curriculum Vitae, a site of discourse about arts learning, and even a work of art about arts making. These ideas have been investigated alongside traditional text based reflective folios. It is worth noting that DMAP utilizes media artifacts of actual art works alongside traditional assessment text and a number assessment that links these to artifacts.

The University also has identified issues where protocols need to be developed. These issues include: access and control; ethics and rights management- confidentiality, intellectual property, copyright, etc.; implementation - technical and policy constraints, etc.; representation and recognition of artistic learning. Policy to deal with these issues are being developed by experts in each field based upon evidence drawn from the research data and in accordance with each stakeholders position. The next stage of the research will involve a full implementation of the database model and observation of the ways in which artists and educators use DMAP in undergraduate and Postgraduate contexts.

Webfolio Electronic Portfolio Project

<http://wordsworth2.net/webfolio/>

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To make learning visible to themselves, classmates, their teacher, and others, students in some composition and content classes (writing, literature, and humanities) at Tidewater Community College construct an instructional digital portfolio called a Webfolio. This culminating project is centered around a substantial reflective hypertext essay where students synthesize and publish their thinking and writing, thereby demonstrating learning as both process and product.

When the project began in 1996, students previously unfamiliar with computers learned basic hypertext markup language and used templates. Because PCs are now so much a part of contemporary culture and higher education, templates are no longer necessary. Classes use a textbook emphasizing construction of a digital portfolio rather than Web page development, *The Web Portfolio Guide* by Miles A. Kimball. Students may use any accessible tools for developing a collection of artifacts linked from their reflective hypertext and linked to each other as appropriate.

Students are encouraged, but not required, to publish their Webfolios. They also have the option of providing a CD. Nonetheless, most students do post their projects in an online Webfolio Gallery. In full online courses, most students have not met in person; however,

they come to know each other through online discussions and collaborative online writing workshops. Publishing their Webfolios for classmates and families both complements and extends their learning community.

Students and teachers assess their evolving understanding of course content as well as their understanding of the rhetorical features of composing in and for various media and audiences. Students perform ongoing active reflection and publish a culminating reflective composition with hyperlinks to their own and others' online work, including appropriate media. Students identify and connect their academic and career interests, as well as goals for an electronic resumé or online college record.

Senior Portfolio

Valley City State University, ND

<http://www.vcsu.edu/facultystaff-dev/portfolios.htm>

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“Assessment” is to learning what “accountability” is to public policy. A portfolio is a tool that allows students to present evidence of their knowledge and skills. Portfolios offer a student-centered structure that engages the learner in both the learning and the assessment processes. Digital portfolios offer a focus that is authentic and that allows the creator to communicate in different ways. At Valley City State University (VCSU), academic divisions use the senior portfolio to assess individual student development over their college experience. Senior portfolios are also becoming part of academic program review, where the portfolios and projects provide faculty with a richer understanding of student learning in their discipline. In addition, all faculty applications for tenure or promotion are in the form of an electronic portfolio. Students use audio, video, hyperlinks, as well as document created in a number of softwares to document their learning.

“Electronic portfolios take advantage of emerging technologies such as multimedia, hypermedia, and the World Wide Web to capture, organize, and represent the complex nature of teaching and learning activities,” according to Toru Iiyoshi, Director of the Knowledge Media Laboratory at The Carnegie Foundation for the Advancement of Teaching. <http://www.eportconsortium.org/old/whatis.aspx>). Valley City State University’s portfolio is an excellent example of the portfolio described by Iiyoshi.

Valley City State University requires all students to submit an electronic portfolio showing evidence of their knowledge and skills on the eight University Abilities defined by the faculty. VCSU has required Senior electronic portfolios of all its graduates since 2002. With several years of experience and the advantage of universal technology access, VCSU has a growing track record in this area.

Catalyst Portfolio Tool

University of Washington, WA

<http://catalyst.washington.edu/tools/ppp.html>

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The Catalyst Portfolio is an online tool developed at the University of Washington (UW) by Educational Partnerships & Learning Technologies. The tool helps UW students create electronic portfolios to demonstrate their skills and accomplishments. Students can use the tool to collect “artifacts” of their education (papers, Web projects, pictures, etc.), reflect on the contents of their collection (often with the help of a mentor), and choose their best work to present to a variety of audiences including: teachers, peers, potential employers and graduate schools.

The Catalyst Portfolio Project Builder is a companion tool for instructors, advisers and other mentors who want to provide guidance for students as they build portfolios. Mentors invite students to participate in a portfolio project, asking them questions that are designed to help students select and present the best examples of their work, and providing feedback through the tool’s commenting feature.

Portfolio Paradigms

University of Wisconsin – Stout, WI

<http://daqwood.dqrc.crc.ca/eportfolio>

School of Education

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The ePortfolio is a requirement for all education students as part of PI 34.13.3.13. The ePortfolio contains evidences of performances and teaching abilities that will be used for assessment as students proceed through benchmarks in teacher education programs. Carefully chosen artifacts and reflections will help demonstrate a student’s understanding and competency in acquiring knowledge, skills and dispositions necessary for teaching licensure. A reflection also can demonstrate how selected artifacts fit into Danielson’s domains of learning and the Ten Wisconsin Teaching standards and include a rationale for placing the artifacts in the ePortfolio. Reflections will help to assess a student’s growth in the knowledge, skills and dispositions they have acquired through their program.

The ePortfolio will be assessed throughout a student’s program of study. It will allow students to move through the benchmarks and finally, obtain licensure. In courses, instructors are naming artifacts that can be submitted to the ePortfolio. Faculty and staff will be using the Rubric marker tool that will allow numerous faculty and staff the ease of doing multiple assessments of students portfolios.

The ePortfolio can be used as a tool for job placement. Students will be guided in their efforts to alter their assessment portfolio in order to create a professional portfolio that will help them obtain a teaching position. Finally, it is hoped that the e-Portfolio can be used as the basis for developing a professional development plan after obtaining a job.

UW-Eau Claire Portfolio Project

University of Wisconsin-Eau Claire, WI

<http://www.uwec.edu/acadaff/policies/Assessment/BPP-faculty.htm> University Assessment Committee

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At UW-Eau Claire, the Baccalaureate Portfolio Project is a long-term project that begins with freshmen students in First Year Experience classes beginning the development of a Baccalaureate Portfolio; over their collegiate career, students submit work as the best examples of their learning and growth.

The Portfolio Project is intended to benefit both students and the University. A student benefits first, by monitoring and reflecting on growth and development, and second, by keeping a file of materials that can be used for scholarship applications and to demonstrate competencies to potential employers or graduate schools. The faculty benefits from using the reviews of the portfolios to enhance curriculum and instruction at the University.

Learning Outcomes ePortfolio

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Center for Teaching and Learning

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The Learning Outcomes ePortfolio supports the Zayed University (ZU) academic program model by providing an infrastructure designed to support an outcome-based learning and assessment program. It provides support for students to demonstrate development in the six ZU Learning Outcomes: critical thinking and reasoning, information literacy and communication, information technology, global awareness, teamwork, and leadership and it supports faculty in assessing students' achievements.

All students enrolled in ZU are required to complete a digital portfolio. This ePortfolio may include Web pages, documents, PowerPoint presentations, hyperlinks, images, digital audio and/or video or any other digital media as evidence of proficiency in the learning outcomes. Reflections on student's yearly progress in each of the six learning outcome areas accompany their evidence. Faculty assessors review this material, attend the student's presentation, questions the student, and submit assessments to the ePortfolio at the end of the student's third year.

Learning Outcomes ePortfolios demonstrate students' academic achievement and personal growth; integrate educational experiences, be they formal or informal, curricular or extracurricular; present examples of students' work and reflective writings that demonstrate the student's understanding and attainment of the ZU Learning Outcomes; and prepare students for Capstone experiences and final assessments before graduation.

Faculty are encouraged to review their students' ePortfolios in order to assist them in building knowledge and skills within specific areas. A student's Learning Outcomes ePortfolio becomes a roadmap leading him/her toward understanding and achieving the skills necessary to live and work in today's world and in tomorrow's changing environment.

