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ABSTRACT

World Wide Web page projects offer both opportunities and limitations as hands-on projects for students in systems development classes. This paper outlines common pedagogical goals for systems analysis and design courses and then maps the advantages and disadvantages of Web projects over more traditional systems development projects. An example advantage is a greater likelihood of project completion by the end of the term, while a potential problem is the lack of fit between Web page design and traditional modeling tools and techniques. The conclusion is that Web page projects can be beneficial when applied to appropriate objectives and courses. (Author/AEF)

MAPPING SYSTEM DEVELOPMENT GOALS AND METHODS TO WEB PAGE PROJECTS

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Web page projects offer both opportunities and limitations as hands-on projects for students in systems development classes. This paper outlines common pedagogical goals for systems analysis and design courses and then maps the advantages and disadvantages of Web projects over more traditional systems development projects. An example advantage is a greater likelihood of project completion by the end of the term, while a potential problem is the lack of fit between Web page design and traditional modeling tools and techniques. The conclusion is that Web page projects can be beneficial when applied to appropriate objectives and courses.

INTRODUCTION

This paper discusses the appropriateness of Web page design and implementation as hands-on projects for systems development courses. Web page development offers opportunities but also risks in supporting the pedagogical goals of these courses.

In many IS curricula, systems analysis, design, and implementation classes are among the key areas of study. In some programs, IS students are required to work in teams on real projects in the community in these courses. The strengths of this approach include experience in the ambiguities of gathering, documenting, and designing a system with real, changing, and sometimes conflicting requirements. A limitation of this approach is that students rarely have time to fully implement a system, including testing, training, documentation, and user acceptance, by the end of a single course.

Using a Web page as a systems project potentially provides students with a greater likelihood of completing the project. Web page development can incorporate much of the methodology used for traditional systems development projects. However, a limitation of Web page projects is that standard modeling tools and techniques, such as data flow diagrams, do not easily fit the requirements of a Web page. This paper outlines the topics and pedagogical objectives commonly found in systems development courses, then examines how well Web projects support these objectives. The authors report on their own experiences in recent courses, then suggest guidelines for making the best use of Web projects in covering particular areas.

SYSTEMS DEVELOPMENT

Courses in systems development commonly include: systems analysis, systems design, database processing, programming, and perhaps

a project course in which students take a complete project from beginning to end. At Kennesaw State, additional courses in which development methods can apply include courses in project management and end-user systems. In many IS programs, due to credit hour constraints, opportunities for students to learn everything they need to know about systems development, including project management, may be limited to a single course in systems analysis and design, with perhaps a second course in database processing and management. Thus, Web page projects may offer a better opportunity for students to experience the full system development life cycle (SDLC) within a single term.

Pedagogical Goals

Systems analysis and design represents the essence of the IS major in bringing together both technical and social perspectives and skills (Dewitz, 1996; Gogone, Couger, Davis, Feinstein, Kasper, & Longenecker, 1995). Technical pedagogical goals include understanding the importance of systems methodologies, learning to use various modeling tools and techniques, documenting design specifications, and developing prototypes. Social or behavioral aspects of systems development that students need to learn include interviewing skills, working on teams with other developers and with end-user clients, understanding organizational behavior and context, and written and oral presentation skills.

On the surface, Web page projects offer opportunities for students to experience many of the social aspects of systems development, such as organizational context and written and oral communication skills. Clearly, Web pages also offer students opportunities to develop technical skills in evaluating and using tools for prototyping, designing user interfaces, and implementing pages. However, Web projects, at least for relatively simple cases that students would encounter within a term, do not require significant analysis, design, and implementation of business processes. They do not lend themselves easily to traditional modeling techniques such as data flow diagrams. Thus, a Web project may limit students in their ability to learn and use these tools, in contrast to what they would learn in analyzing and designing a more traditional system.

Table 1 summarizes potential strengths and weaknesses of using Web pages to achieve systems development learning objectives. As shown, some aspects may have both strengths and limitations with respect to Web projects.

TABLE 1

LEARNING OBJECTIVES AND WEB PAGES

Technical Aspects	Strong	Weak	Comment
Project Management		X	Too easy to jump ahead to implementation
Methodologies		X	Standard methods don't apply easily
Prototyping / RAD	X		Quick and easy to develop
Modeling		X	Standard modeling tools don't apply easily
Tool Use	X	X	Tools still rapidly changing, no standard set
Design Specs		X	Not much processing to analyze and specify
Social Aspects	**Strong**	**Weak**	**Comment**
Interviewing	X	X	Little emphasis on understanding business processes
JAD / Teamwork		X	Less need for JAD sessions to clarify requirements
Organizational Behavior	X		Rich opportunities for politics and multiple conflicting views
Documentation	X	X	Web pages are somewhat self documenting
Implementation & Maintenance Planning		X	Opportunity is there but may be neglected
Oral Presentation	X		

RESULTS AND DISCUSSION FROM EXPERIENCES

Recent experiences with using Web projects in several classes involving systems development have supported most, but not all, of what is outlined in Table 1, and have provided some additional insights and issues which need to be addressed.

Advantages. Students are indeed better able to implement their design within the time constraints of the term. Prototypes can be generated and modified quickly and easily. The development team gets needed feedback from the client because of the short turn-around time of the prototype iterations and the ability of the client to view the prototypes from anywhere they have access to the Web. Furthermore, the work can be viewed and assessed by other members in the class, both team-members and other teams, by accessing the Web site. Artistic ability and creativity are important and valued contributions within the development team, along with technical skills.

Teamwork. The widespread accessibility of the Web can greatly facilitate students' ability to work on a team. If students take advantage of the Web to share all their project documentation (schedules, interview notes, models, discussion) and deliverables, then Web projects could increase even more their ability to communicate and coordinate without having to meet face-to-face as frequently.

Organizational Behavior. Web pages often involve multiple stakeholders and constituents with potentially conflicting views of system (Web page) goals and design. This offers students an opportunity for rich, although frequently frustrating, experiences with organizational power, politics, and culture, and with changing system requirements. Student teams must be sure to identify and involve early on ALL the major stakeholders, and must determine who will be making the final decisions.

Disadvantages. Web projects appear to motivate students to jump prematurely to implementation, because Web development is initially easy and fun. What they lose includes numerous important aspects of systems development. They neglect to focus, and re-focus, on system objectives, to develop and use conventional metrics for cost-benefit analysis and ROI, to consider alternative solutions, and to formally document user needs in terms of attributes, behaviors, and values. Manual procedures surrounding the system seem less relevant than in conventional projects and are ignored. The student interest and emphasis is on making the HTML code work, not on analyzing and fulfilling stakeholder requirements.

System Objectives. In Web page-based projects, students often have a difficult time identifying the specific, measurable objectives that these systems must accomplish. This is partly because the clients themselves may be unclear about why they want a Web site. "To have a Web presence," "to increase awareness of the organization that owns the Web site," and "To increase visits to the site" are common but vague and inadequate against which to measure success.

Modeling. Modeling methods for hypertext systems are likely to serve as more appropriate tools for Web page design (e.g., Isakowitz, Stohr, & Balasubramanian, 1995). However, this still reduces the students' opportunities to learn more common and traditional methods such as data flow diagrams and entity-relationship models.

Prototyping. Prototyping is not a methodology. It is a technique best used in the design phase of an end-to-end methodology to confirm user requirements, after preliminary analysis of the system has established appropriate system objectives, system scope and measurements of success. Conventional prototyping strategies recommend that the prototyping activities be clearly delineated from system construction activities, so that the client does not confuse the prototype with the delivered system. Because student teams prototype their Web pages on the same platform with the same tools with which the system will be implemented, the verification of each successive iteration of the prototype gets blurred with the construction activities of the system, often resulting in premature cut-over. These systems will lack adequate testing, documentation, back-up and recovery procedures, maintenance procedures, and other attributes

that are a result of conventional implementation and installation procedures.

Object-Oriented Development. Current object-oriented methodologies (Booch, 1996) appear on the surface to be especially appropriate for Web page development. The argument goes: "We are entering the era of object-oriented technologies; web-page development is a new technology; therefore it will be best served through the application of object-oriented system development methodologies" (Dick, 1996). However, tools and methods for OO analysis and design are not yet standardized (Joukhadar, 1997), and existing tools tend to focus less on early phases in the life cycle and more on detailed design and implementation (Carlson, 1997). They fail to guide the developer toward a meaningful analysis of the client's problems, opportunities to be exploited, and constraints to be addressed in the development of the system.

Tools. The degree of access to Web page development tools, clip art, cgi scripts, Java applets, etc., can create an uneven playing field in the evaluation of student Web page projects. Students who have access to a Web page workbench will have a substantial advantage over those who do not. Care must be taken to establish objective team project evaluation that reduces the impact of student team access to commercial construction tools, or, alternatively, all students must be provided with access to a similar toolset. This, however, is difficult in the current environment of rapidly evolving Web-related tools.

Trademarks and Intellectual Property. This is an additional issue that arises with Web pages much more than with traditional systems. Students quickly learn to "right-button" good ideas off of the Web and incorporate them into their projects. Backgrounds, art work, animated "gifs", Java applets, etc. are freely captured and reused. Course policies dealing with intellectual property must be developed and understood by the development teams. Because the student project has the potential to be viewed by any Web user, care should be given to the appropriate disclaimers as well as potential violation of institutional policy, local, state, and federal law.

CONCLUSIONS AND SUGGESTIONS FOR EDUCATORS

In spite of some limitations, the authors believe that Web projects can provide some benefits over traditional projects for students learning about systems development. The authors conclude, however, that Web projects will be more appropriate in courses other than in a systems analysis and design (SAD) class. This is because, as discussed above, some of the most important concepts in systems analysis and design may be de-emphasized, neglected, or difficult to support when developing a Web page. More appropriate courses would include: Introduction to Information Systems, a follow-on course to SAD which focuses on the later stages of the SDLC (design and implementation), project management if separate from SAD, and coursework which focuses on User Interface Design.

However, if a particular curriculum limits systems development coverage to a single term-long course, then Web pages could still be used. Special attention should be paid to emphasizing and producing deliverables that demonstrate understanding of the early stages of SDLC, such as system objectives, feasibility and cost-benefit, and measurement of project success. Some methods and modeling techniques may be adapted to Web projects, such as structure charts and object models, and students should also be required to develop and document implementation and maintenance plans.

Development of Web pages should be distinguished from development of Web page *systems*. Development of systems includes such broader issues as project management, setting and measuring objectives, procedures for security, backup, and maintenance. Web page projects should strive to incorporate this broader perspective. If Web page projects are viewed by students and faculty as systems, then they can be used more effectively to teach and learn systems concepts and skills.

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