COMPUTER INFORMATION SYSTEMS DEVELOPMENT: Principles and Case Study

DPMA Education Foundation CIS Curriculum

HETZEL
ADAMS

COMPUTER INFORMATION SYSTEMS DEVELOPMENT: Principles and Case Study

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PREFACE

PERSPECTIVE

This book, in part, represents an implementation of the *Model Curriculum for Undergraduate Computer Information Systems Education* of the Data Processing Management Association-Education Foundation (DPMA-EF). Specifically, the information and assignments in this book meet or exceed the content called for in the suggested outline for course CIS-7—*Applied Software Development Project*. The purpose of this course is to provide students with a realistic systems project experience. Correspondence between this book and the course specifications is assured by the fact that the text was developed under the oversight of the DPMA-EF, with content appropriateness and technical accuracy validated through independent review.

This text also goes beyond the curriculum by providing instructional materials on project management. Though this perspective is not specified in the curriculum, experience gained in developing the textbook series identified the need for a strong conceptual approach to support the student project experience.

The DPMA-EF curriculum specifies a structured approach to systems development through use of structured analysis methods within an established life cycle. The curriculum is aimed at graduating students qualified as entry-level programmer/analysts in business-oriented computer facilities.

CONTENT LEVEL

This text is designed to support an undergraduate course that serves as a senior-level ''capstone'' to a computer information systems (CIS) curriculum. It is assumed, therefore, that students have completed the prerequisite courses in programming, systems analysis, and design and database management.

The focus of this book, and the majority of the work in the course it is intended to support, is a sustained system development project.

The text is designed to support a one-semester course. However, depending on the nature and scope of the course project assigned, sufficient material is presented for two semesters. Detailed teaching plans for both options are presented in the accompanying Instructor's Manual.

At the conclusion of this course, students should be able to apply specific, structured project management skills to systems projects in practical business settings.

CONTENT HIGHLIGHTS

The primary intent of the course is to provide firsthand experience with a realistic project. The purpose of this text is to structure that experience. In addition, this text is designed as a reference source for solutions to the problems of project management that inevitably arise. Thus, this text includes three essential resources:

- Project management concepts
- Systems development methodology
- Case narrative.

Project Management Concepts

Text material is included to support individual study and classroom presentations on systems project management principles and skills. Chapter 1 discusses the origin of projects, including selection methods used in industry, and introduces the concept of the systems planning function.

Chapter 2 sets the stage for project work by establishing a mindset for professionalism, including the importance of understanding business problems and applying structured analysis.

Chapter 3 presents a rationale, from management's viewpoint, for systems development life cycle (SDLC) methodologies, describes situations that call for modified development models, and presents the methodology to be used as the framework for student projects.

Chapters 4 through 7 focus on principles of managing systems projects, with specific emphasis on techniques for planning, organization, and control.

Chapter 8 generalizes from the experience described in the case narrative to describe some of the challenges and pitfalls encountered by managers of systems projects.

Systems Development Methodology

The text presents a formal methodology to be used as a realistic framework within which student projects are performed and evaluated. It is assumed that students will be organized into small project teams. Team members will collaborate on an active, ongoing

project that typically will require the entire term to complete. Managing such a project effectively is an important part of a realistic experience. Accordingly, the text develops a hypothetical environment for project work. As appropriate, the instructor can reference and use the text examples throughout the course.

In this environment, students are assumed to be employees of a fictitious company called University Software, Inc. Project teams within USI report to a Project Steering Committee (PSC) for management direction and review. (The charter of the PSC is presented as an Appendix to this text.) Project plans, schedules, and budgets are submitted to this steering committee before any project work can be undertaken, and at the conclusion of development phases. Project status is reported at regular meetings with the PSC during the term.

University Software has developed an integrated set of systems development and project control standards and procedures. This set of standards and procedures implements a life cycle methodology (derived from the SDLC presented within the CIS curriculum) with which student projects are expected to comply. Within each team, one student is appointed Project Manager, another is designated Architect (or Lead Designer), and a third member must serve as Quality Control Specialist.

Documentation standards for each phase of work are defined by a series of forms and worksheets. Teams are required to adhere to the standards and procedures of the USI methodology and to submit deliverables specified by the forms. Each team member is expected to maintain a project notebook that includes the completed forms. (Blank forms are found in the Addendum to this text.) Formal project control procedures are imposed through regular weekly and monthly status reports from each team.

The USI methodology represents an adaptation of the SDLC presented within the CIS curriculum. Predecessor texts that cover the methodology in depth are *Computer Information Systems: Analysis and Design* by Powers, Adams, and Mills and *Computer Information Systems: Detailed Design and Implementation* by Adams, Powers, and Owles. Students who have used these texts will be familiar with the methodology that is implemented in the USI standards and procedures. However, no prior experience with this life cycle model is assumed, and the complete University Software Systems Development Methodology (USSDM) is covered in this text.

The authors recognize that alternate life cycle methodologies and modified development models may be required for some types of student projects. For example, projects that make use of high-level program generators or that involve installation of software packages may require tailored approaches. Accordingly, the USI methodology is designed to be general in approach, yet adaptable to the needs of instructors and students. Also, Chapter 3 includes a discussion of

modified development models for different development tools and approaches.

Case Narrative

Interspersed with the chapters covering management concepts are portions of an extended case narrative. The case, an in-house project at USI called the University Software Project Support System (USPSS), illustrates the standards and procedures set forth in the methodology. The case is divided into five sections (Case Projects I through V) that, taken together, describe a development effort from start to finish. The appropriate project planning and technical documentation, as well as required project control reports, are illustrated at each step, with the same standard USI forms that students are expected to use. Thus, the case narrative and illustrations comprise a model that students can follow in directing their own projects.

Although the case illustrates the use of USI forms, it is not intended as a formal model or rigorous development methodology. The narrative is drawn from an actual project in industry and, as such, is subject to all of the imperfections, political issues, and behavioral difficulties that typify real projects. These issues are intended to reinforce text discussions of the pitfalls of project management. Students should be able to identify readily with the case, since the size of the project team and the scope of the effort are likely to parallel their experiences in the course.

TEACHING STRATEGY

Text assignments presented at the end of each chapter are intended to form a bridge from the conceptual presentation to application of development standards and procedures. The sequence of text discussions, text assignments, case narrative sections, and student project work is intended to supplement the teaching of theory immediately with illustration and reinforcement—all as groundwork for the student project.

A teaching strategy for conducting the course within a single semester would involve covering Chapters 1 through 3 and Case Projects I and II in the first two weeks. Concurrently, student teams would be formed, projects selected, and most of the work on investigation and feasibility study completed. (Suggestions for project selection are presented in the Instructor's Manual.)

During the next two weeks, the material on project management (Chapters 4 through 7) would be covered, along with the reading of Case Project III. Also during this time, student project teams would apply these principles by preparing a project plan and budget and completing the necessary control and progress reports as set forth in the USI methodology.

The remainder of the course centers on the actual analysis, design, and implementation of student projects. Case Projects IV and V support this work. These narratives may be read concurrently with project work or may serve as examples for reference.

The final week of the course would include the presentation of final reports by each team. Chapter 8, which presents a critical view of the text case, can provide a basis for classroom discussion and the drawing of valuable conclusions from student projects.

The authors feel that a good project course can be one of the student's most challenging—and rewarding—experiences. The course marks a transition from the classroom into a professional career. The intent of this book is to support the student in integrating prior CIS course work, as well as related studies in business practices and communication skills.

It is hoped that students will develop an appreciation for the importance of teamwork, good communication, and sound principles of project management. Fuzzy problems, practical constraints, political issues, competition, management challenges—such factors operate outside of the usual realm of the classroom. However, projects undertaken for this course should bring students face to face with all of these issues. Herein lies the excitement and challenge of taking or teaching a project course.

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CONTENTS

THE ORIGIN OF A PROJECT 1

Abstract

- Completion of a student project that addresses a real business problem is the primary requirement for a capstone course in Computer Information Systems. The purpose of this chapter is to describe a realistic systems development environment within which student projects may be undertaken.
- A structure for student project teams is proposed, as well as reporting relationships to a Project Steering Committee and the maintenance of project notebooks.
- A systematic set of standards and procedures, the University Software Systems Development Methodology (USSDM), is presented as a framework for student projects.
- The characteristics that distinguish projects from other types of work effort are discussed.
- A survey of the project selection process in industry leads to a discussion of the need for formal systems planning.

STUDENT PROJECTS

The text is designed to support a ''capstone'' course in which you bring together and apply the CIS knowledge and skills you have been accumulating. Like a capstone in architecture, this work falls neatly in place if the proper foundation has been laid.

Your capstone experience is to complete a project for developing a computer-based system. The project will follow a structured approach, or *life cycle methodology*. Such a methodology is presented

within the CIS curriculum as the *systems development life cycle (SDLC)*, an approach that partitions projects into five phases and 15 activities.

Within this text, a tailored version of that SDLC is presented as a set of standards for your project work. The effect is to structure project work as nearly as possible to an actual work setting, with organization-specific procedures. To implement these standards and procedures, a set of forms is provided for documenting and reporting work at key checkpoints within the project.

This text tracks a single case project as an example of the procedures applied. You will select (or will be assigned) another project that your project team will develop in parallel as you proceed through the text and the work of the course. In general, small groups, or project teams, will be designated to work on specific projects. Formal duties, or job functions, will be assigned within each team for the duration of the project. Team members will be expected to complete project control notebooks that are to be turned in to the instructor to monitor progress. These notebooks also provide a basis for reporting to a *steering committee*, or oversight group. Notebooks use a prescribed set of forms and follow procedures that represent an established development methodology.

From the Classroom to the Business World

Undertaking a student project requires a basic shift in emphasis and attitude from that of most academic assignments. First and most important, the goal of a systems project is a solution, not a program or a report. A program that has many dazzling features and executes perfectly may have nothing to do with the real problem at hand. Similarly, a report is of little use if the business problem has not been understood or addressed.

A second distinction lies in the manner in which rewards and motivational systems are administered. Classroom and instructional experiences typically establish a set of values centering around the *deliverables* that measure progress in the course—reports, quizzes, tests, and so on. Deliverables in a systems project, however, are not ends in themselves. Rather, deliverables exist only to provide ways of monitoring progress and managing the work; and achievement must be measured based on how well an individual contributes to the solution of the overall business problem.

A third point is the importance of management issues and considerations. Your capstone course probably will involve just one major assignment—the completion of a systems project. In the process of completing this project, project teams will become involved in planning, scheduling, and budgeting—that is, in basic, critical management issues. Most projects will involve actual implementations of working systems, although perhaps of limited scope, depending on the resources available.

You inevitably will apply the full range of skills gained in prior CIS and business course work—as well as practically every other skill, talent, or ability you otherwise possess. Public speaking, written communication, interview techniques, budgeting, scheduling, and forecasting are all related, required skills. Also, you will acquire new skills and perhaps discover some abilities you didn't know you had. All of this is important and integral to the course experience.

A final distinction is that a classroom experience will not expose you to the organizational culture and political issues to which business projects are subjected. Where possible, this text attempts to provide some of this perspective.

Project Guidelines

The goal of the project undertaken for this course, then, is not the mastery of any particular body of knowledge but an integrative understanding through achievement. Although some differences will be encountered among instructors, the general guidelines for setting up student projects are outlined below.

Project teams. The class will be organized into work groups, or project teams. Each team will be expected not only to perform a project but also to manage it with the responsibility and accountability expected in a business environment. Managing the project implies that it is as important to plan, schedule, and control the work as it is to complete it. Each team should designate a project manager, who will be personally responsible for the performance both of the team as a unit and of individual team members.

Project selection. Selection of group projects will be controlled by the instructor and subject to formal approval by a steering group that includes the instructor and may involve CIS professionals and industry managers.

Organization. Project teams must have formal organization, with work assignments planned for each member. Project teams also will be required to develop project plans, schedules, and budgets.

Control. Project team members will be expected to account for their efforts by completing weekly time sheets. Time sheets should be broken down by task and day of the week and will be turned in to a team member responsible for the reporting function. The team also must make monthly reports, or summaries of work performed and progress toward objectives, to the management steering group.

Standards. An established methodology will be expected to be applied. A uniform development environment will be provided to all teams, and management approval will be required for deviation from the standards.

Procedures are set forth below for the implementation of these guidelines.

The Project Steering Committee

A project steering committee (PSC) will be formed as the management body to which project teams report. The Appendix contains a suggested charter for the PSC. The following responsibilities represent a summary of this charter:

- Review of project team proposals and approval of project plans and schedules
- Review of project team presentations at the completion of major phases
- Meetings for status and overall steering of individual project efforts
- Primary input for project team evaluations for purposes of providing feedback and eventual assignment of grades.

A typical PSC schedule would involve four or five meetings during the semester. Each meeting could be expected to last a maximum of four hours. During the first meeting, which typically occurs during the second or third week of the course, project teams are expected to have been formed and to present their proposals and have their plans and budgets approved. Also, the PSC customarily has a chairman, who prepares and issues an agenda for each meeting. Project managers are expected to coordinate agenda items with the chairman, as required. Reports of each meeting are produced and distributed to all teams.

Project Team Organization

Each team will be required to designate key members with the following job titles:

- Project manager
- Architect
- Quality control specialist.

Project manager. In general, the project manager has overall responsibility for the team. In addition, the project manager must coordinate all presentations to the PSC and develop and maintain the project plan and budget.

Architect. The architect is responsible primarily for the technical solution and must sign off on all general and detailed design documents.

Quality control specialist. The quality control specialist is responsible for project status reporting and testing, and also tracks project history in terms of resource usage, quality problems, and so on.