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Process-Focused Approach to a Systems Analysis & Design Group Project

Aditi Mukherjee
aditmukherjee@ufl.edu
Information Systems and Operations Management

Sarah Bleakney
Sarah.bleakney@warrington.ufl.edu
Teaching and Learning Center

University of Florida
Gainesville, FL 32611

Abstract

This case study describes an alternative process-focused approach to a group project assignment in an undergraduate Systems Analysis and Design (SAD) course. This approach more closely reflects the incremental and iterative nature of Information Systems Development Projects (ISDP) through expanded scope, modified instructions, and reallocation of class time. This approach enables students to select their own real-world ISDP and apply a wider breadth of course concepts in that context, while gaining experience in critical thinking and decision making within a group setting.

Keywords: Systems Analysis and Design, group project based learning, process-focused project

1. INTRODUCTION

This case study explores a process-focused approach to the group project assignment in a half-semester long undergraduate Systems Analysis and Design (SAD) course. Group projects are a critical component of most SAD courses as they are typically used to reinforce the concepts of SAD tools and techniques via a simulated Information Systems Development Project (ISDP). These projects enable students to apply their understanding of how the tools and concepts that are being taught in lectures can be applied within the context of the ISDP. We present an alternative, process-focused approach to SAD course group projects where the pedagogical purpose of the project is shifted from solely focusing on the quality of deliverables created by students, to meaningfully conveying to them the process used to develop those deliverables.

Project-based learning (PBL) involves assigning projects that require collaboration among group members, are long-term (i.e., span the entire course), and result in students' completion of project components and a final report. (Thompson & Beak, 2007) While these projects are unable to simulate every aspect of a real-world ISDP, group PBL is a widely used pedagogy in Information Systems (IS) classes, especially for SAD. (Harris, 2007; Melin, et al., 2006; Russell, et al., 2014; Woods & Howard, 2014) Instructors often positively perceive collaborative learning experiences as opportunities to increase student motivation, performance, engagement, and autonomy of their own learning. (Lage et al., 2010; Opdecam et al., 2014; Lumpkin et al., 2015; Stefanou, et al., 2013) As a result of the collaborative problem solving and critical thinking that comes with completing projects, and the real-life context used for them, students are able to develop a variety of technical and soft (i.e.,

teamwork and communication) skills. (Woodward, et al., 2009; Tsay & Brady, 2010)

While group PBL offers myriad benefits, it can also be associated with a variety of limitations that can make them inadequate teaching tools. While implementation of SAD group projects can vary, they typically entail few deliverables (often just one project report) and infrequent feedback from the instructor, and may require students to work in groups outside of class. These limitations may be amplified in module classes where students have to complete projects within a very restricted time frame. These features rarely allow students to fully appreciate the iterative nature of developing an ISDP or improve on their project as the semester progresses (i.e., they just get one attempt). This approach to group projects can also often lead to ineffective collaboration between students, as they report challenges in managing interpersonal issues and finding time to meet outside the classroom. These challenges can make student group projects highly ineffective, and in turn, highly unpopular with students and instructors, despite their pedagogical importance. (Favor & Harvey, 2016)

We believe that the most significant drawback of such group projects is the overriding focus on the outcome or the quality of either the deliverables or the project reports, rather than on the process used to create the various deliverables that comprise an ISDP. This focus means that students do not have the opportunity to define or experience processes that lead to high-quality deliverables. Insufficient research exists about process-based learning, particularly within the context of SAD. In teaching SAD, we seek to convey how to design and develop information systems that support various business processes. (Fuller et al., 2010; Dennis et al., 2015) What we do not focus on enough is conveying to students the process of developing information systems.

Some of these drawbacks may be overcome through innovative approaches such as group projects that span multiple courses (such as the threaded live case studies approach described by Waguespeck, 1997), or by involving external companies as live clients. This paper aims to contribute to this list by providing an approach that can be used in shorter, time-constrained classes. This case study describes how the group project of a SAD class can be redesigned with only a few modifications to shift the focus from the end deliverable to the actual process of working on an ISDP. This approach reduces the focus on the context of the project and shifts it to the process of developing well-thought-out requirements,

models, and designs for an ISDP that require critical thinking and group decision making. The purpose of this project is not just to challenge students to create high-quality deliverables, but to convey to them the details of the process of iteratively working on an ISDP.

In the following sections, we describe our approach used to transform a deliverable-oriented group project into a process-focused in-class group project in a SAD course. The goal of this course is for students to develop an understanding of both process-oriented and object-oriented tools for SAD. Enrollment of this course is capped at 45 and is intended for juniors and seniors in the undergraduate Information Systems and Operations Management major of a large public university. The course has a total of 12 two-hour class meetings over approximately six weeks.

2. DESIGN OF THE PROCESS-FOCUSED SYSTEMS ANALYSIS AND DESIGN GROUP PROJECT

Table 1. Outcome-Focused Group Project Structure

Class Meeting	Project Deliverables
3	GP#1: Member Names & Idea
4	GP#2: Proposal
7	GP#3: Requirements & DFD
10	GP#4: Functional Model
11	GP#5: Data Model
12	GP#6: Final Report & Presentation

In this section, we describe how an outcome-focused SAD group project was transformed into a process-focused group project. The outcome-focused SAD group project structure requires students to work in groups to apply the skills they learn in the class within the context of an ISDP of their or their instructor's choosing. The requirements of these projects can vary from a single project report that is submitted at the end of the course or several intermittent deliverables culminating in a final project report accompanied by a presentation (see Table 1). Originally, students collaborated with their groups on these deliverables outside of class. The instructor provided feedback on the intermittent deliverables and final project report and presentation.

The goal of this approach is for students to demonstrate their ability to create key SAD deliverables in the context of an ISDP. In contrast, with the process-focused group project, the goal is to encourage students to work in groups to research and discover possible alternatives using the appropriate techniques for each deliverable, make a collective decision, and then convey this decision using SAD tools and models. This approach has the distinct advantage of enabling students to develop and demonstrate critical thinking skills and group decision making.

In order to achieve this goal, the execution of the project incorporated three major changes. The first change was to increase the number of deliverables. This allowed the students to work incrementally on the project without being overwhelmed by its vast scope. This change also facilitated frequent feedback and iterative development, which reflects the nature of ISDP. The second change was to frame the requirements of the deliverables in a way that guided students through group thought processes and decision making. The instructions provided to students described the requirements of each deliverable, supported with guided prompts. The third change was to allocate in-class time for students to work on the group project. This allowed the instructor to act as mentor while students worked on the project by answering questions, clarifying the process, and guiding decision making when necessary.

We discuss each of these changes in more detail below.

Daily Project Deliverables

With the process-focused approach, students work in groups to submit one deliverable for each class meeting. Each deliverable (as outlined in Table 2) corresponds to a sequential activity in the systems development life cycle (SDLC) and builds on the previous one, which means that students work on a large project in an incremental fashion throughout the course, reflecting a real ISDP. This increase in deliverables provides a pedagogical benefit as students experience the same ISDP in greater depth and from varying perspectives (six models compared to three models in the previously used outcome-focused approach). As a result, the redesigned group project covers more course concepts than the outcome-focused approach, providing students with a more complete picture of the ISDP.

Table 2. Process-Focused Group Project Structure

Class Meeting	Project Deliverables
1	Choose Group Topic
2	GP#1:Group Introduction
3	GP#2:Project Plan
4	GP#3:System Abstract
5	GP#4:Requirements
6	GP#5:Process Model
7	GP#6:Class Diagram
8	GP#7:Use Cases
9	GP#8:Sequence Diagram
10	GP#9:Data Model
11	GP#10:Deployment Strategy
12	Final Report & Presentation

Students receive feedback on each submission within 24 hours that they can then use to revise or correct issues before they are graded on the final project report, allowing them to experience the iterative nature of ISDP. Because the project is divided into manageable components and each class is associated with one component, the instructor can intervene in a timely manner to provide guidance, coaching, and conflict resolution as appropriate. This short feedback loop enables more comprehensive and timely written and oral feedback, ensuring that students are able to incorporate any necessary changes into their next deliverable. This approach also provides students the opportunity to discuss this feedback during the next class meeting if they need additional clarification. The course grading scheme (details provided in Appendix C) used for the final report and presentation incentivizes students to carefully consider and incorporate instructor feedback.

Rewording Project Descriptions

With the process-focused approach, project descriptions were revised to include guided prompts on the process needed to complete the deliverable. The project descriptions outline those parts of each submission that students can work on individually, along with guidance on how to combine or reconcile different opinions into a single group submission. See Appendix D for an example. The descriptions are more detailed at

the beginning of the semester to set up the expectations and format of the project. As the semester progresses, the instructions become less detailed as students develop skills in working cohesively as a group rather than working individually on different parts of the project. These descriptions are used to guide students through the process of developing each deliverable. Thus, the focus shifts from students being challenged to produce a deliverable to spending time on the group discussion and decision-making necessary to create the deliverable. While these in-class interactions cannot be documented or evaluated, the instructor observes the groups as they work to create the deliverables to ensure that the recommended processes are being followed.

As the groups work within a tight schedule of 40-50 minutes in class, they are provided with a resource page for each deliverable that includes detailed instructions for:

- Submission templates and guidelines
- Time-management guidelines
- Items to prepare for the next class
- Reflection prompts for the final project
-

These templates include pre-formatted submission documents, as well as symbols to be used when drawing the model diagrams. This enables students to focus on group discussion and decision making, rather than on formatting diagrams and reports.

In-Class Guidance

As detailed in Table 2, the group project consists of 10 deliverables completed during and submitted at the end of 10 of the 12 class periods. Students are required to select a topic by the end of the first class. From the second class meeting onwards, students sit with their groups. Students are provided 40 to 50 minutes of each class period to work on the various project deliverables. Since class time is leveraged for working on projects, the complexity, frequency, and scope of the deliverables can be extended and diversified, providing students with exposure to additional aspects of the ISDP.

This structure also enables the instructor to provide students feedback more frequently and in different modalities, which encourages critical thinking and allows students to improve the quality of their projects. While students work in their groups, the instructor circulates throughout the classroom answering questions, offering constructive assistance, and providing guidance.

An additional benefit of providing students with the opportunity to work on projects during class is that issues of unequal contributions, absenteeism, and free-riding are minimized. This approach ensures that the group collaborations remain on-track and equitable, providing a higher level of student participation and, ultimately, a higher quality of project submissions.

3. IMPLEMENTATION OF THE PROCESS-FOCUSED GROUP PROJECT

The features of the process-focused approach—such as the increased number of deliverables, reallocated class time, and shortened feedback loop—increase the complexity of administering this project. In order to deal with this complexity while also supporting student engagement, the structure of the project itself was modified in a number of ways. In this section, we describe how the process-focused group project is implemented, assessed, and supported.

Group Topic and Group Member Selection

The mode used to assign project topics and group members is an important component of the process-focused approach for group projects. Rather than having students propose topics, the instructor provides a list of topics related to various areas of student interest often associated with campus activities that students are able to select (see Appendix A for a list of topics). Since the topics list was developed by the instructor, this approach ensures that the topics used for group projects have sufficient breadth and complexity to reflect realistic ISDP. To encourage student engagement and interest, on the first day of class, the instructor introduces the topics, provides a brief synopsis of the project, and answers questions. Students then self-select into groups of five based on their interest in one of the topics. As students possess pre-existing interest in or experience with the topic, they can leverage domain knowledge, ultimately encouraging higher levels of student engagement over the entire course, and in turn, greater levels of student success. This approach enables the instructor to reinforce course concepts within the context of a topic that students are familiar with and can relate to.

Final Project Report and Reflection

In addition to the project deliverables due at the end of each class, on the last day of the course, each group submits a final project report and delivers a final presentation. This final report reinforces a core concept of SAD: the iterative development of a project. For the final project

report, students combine the ten deliverables produced over the course of the semester into a cohesive system proposal. The instructions students receive for the final project are provided in Appendix B. To ensure student do not rush or poorly execute the creation of this final project report, they are encouraged to work on the report in parallel with each of the deliverables. The instructions for each deliverable include suggestions for how students can reconcile previous deliverables with what they have more recently developed. This approach ensures consistency and lack of contradiction across the different deliverables, and in turn, the components of the final report (for example, features in the system prototype that were not consistent with system requirements or the data model).

In addition to the project deliverables and final report and presentation, the groups submit a "reflection" section, where they reflect on what they learned through the process of working on this project. Having students complete this reflection further reinforces the process-focused approach to the project.

3.3. Learning Management System Support and Organization

The Learning Management System (LMS) is an important tool in supporting the additional complexity that the redesigned project entails. The LMS is used to create a structured learning environment that supports each phase of students' completion of the group project deliverables. To ensure that students collaborate during class with their group members to complete deliverables, assignments are only available the day and time of their associated class meeting. The group assignment function of the LMS is used to assign the deliverables, collect timely submissions, and ensure that instructor feedback is provided to the entire group.

The LMS provides students with an online space devoted to collaborations to share files and participate in project-related discussions. The advantage of using the LMS for group work is that the instructor can access a permanent record of all work, which can be useful for conflict resolution. To further support collaboration, students also use additional tools on their own, such as Google Docs for collaborative writing, along with Facebook to interact with group members outside of (and during) class.

4. CONCLUSIONS AND RECOMMENDATIONS

The process-focused approach to the group project has been successfully implemented six times in different class settings, including the flipped classroom approach and traditional lecture setup. We have observed a substantial increase in the quality of the projects students submitted compared to the outcome-focused approach. Our implementation of the process-focused group project in a SAD course has four key features that distinguish it from the outcome-focused approach. Each of these features have been incorporated with certain benefits in mind, though they also present particular challenges that need to be overcome.

The first feature is the increase in the number of deliverables from five to ten in the same course framework. This increase in deliverables enables students to examine the project in more detail, while providing them with the time necessary to understand the process of working on each deliverable. This approach enables students to work on an ISDP as a whole, rather than jumping from one disconnected deliverable to another. The challenge of this feature is that increasing the number of deliverables also increases the workload for both students and the instructor. This challenge can be overcome by efficient use of class time, leveraging the LMS (including use of rubrics), clear instructions, and an objective grading scheme. See Appendix C for the grading scheme.

The second feature of the process-focused approach are the modifications made to the wording and structure of each project deliverable. In essence, instead of merely describing the deliverables, the instructions provide prompts that guide students through the process of working in a group to make collective decisions regarding each deliverable and then communicating their vision using SAD tools. The student takeaway is how to work effectively in a group on an ISDP rather than generate a solution to a specific problem. The main challenge of this feature is that students can struggle with not having a definitively "correct" answer to the complex problem of an ISDP. To overcome this challenge, instructors can verbally reinforce that the point of the group project is not submitting the "correct solution," but rather working as a group to arrive at a "serviceable solution" and learning from the process rather than focusing on the end product.

The third feature of the process-focused approach to the group project is how class time is used. Working on group projects during class time requires a paradigm shift. Students have to adapt to a wholly different approach to group projects than what they may be used to. From the instructor's perspective, course content may have to be redistributed to accommodate reduced time for in-class instructions and other activities. Despite the adjustments required, however, the process-focused approach eliminates a significant number of issues associated with group projects. A common complaint among students assigned group projects outside of class is that conflict between group members can occur. However, when students work within the classroom's supervised environment, the instructor can address these conflicts through timely intervention. Students can also face challenges in scheduling meetings outside of class time due to varying class and work schedules, which can lead to students dividing up the assignment and working individually. Since students submit each deliverable at the end of a class period, they use class time to collaboratively discuss and develop project deliverables.

The fourth feature of the process-focused approach is the increased amount and types of feedback that the instructor is able to provide students. When students work on their projects during class, they are able to ask questions, clarify ideas, and receive timely verbal feedback as a group while developing their project. They also receive formal written feedback on their daily submissions before the next class meeting. This shortened and varied feedback loop supports and encourages student creativity and critical thinking, ultimately resulting in more nuanced and sophisticated project reports. One challenge of the open-ended nature of the ISDP is that students can be hesitant to present their ideas, and instead often mimic examples from the textbook or lectures. A benefit of the varied and in-person approach to feedback is that the instructor can take on a consultative role, guiding students in the direction of the project, alleviating their concerns, and encouraging creativity.

The process-focused approach can be used to supplement other outcome-focused projects, such as individual assignments that are completed outside of class that focus more on reinforcing the concepts, tools, and techniques that are being taught. As a result, students can benefit from both types of pedagogy. Through the implementation of these changes, we have observed that students have obtained a deeper understanding of the course concepts and have

displayed higher levels of engagement in the class. Moreover, when compared to the outcome-focused approach, we have observed less variance in the quality of the project reports across the groups.

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APPENDIX A: GROUP PROJECT TOPICS

GROUP PROJECT TOPICS

CHOOSE A PROJECT TOPIC

Please pick one of the nine topics described below for your group project. Please note the following regarding group membership.

- Students who choose the same topic will work together on the project for the entire module and may not change groups.
- Each group will contain a maximum of 5 students only, so membership is on a first-come first-serve basis.
- The instructor cannot add or remove students from the group.
- Students who do not choose a group by Jan 7 will not be assigned a group and will not receive any credit for the entire Group Project component of their course grade.

TOPIC LIST

- Find Me a Roommate
- Zoo Animal Management
- Gym Management Software
- Video Game Store
- Uber for Tutors
- Student Organization Management
- The Ultimate Travel Manager
- Fantasy Sport League Management
- Job Search Management

APPENDIX B: GROUP PROJECT REPORT AND PRESENTATION INSTRUCTIONS

GROUP PROJECT REPORT & PRESENTATION

REPORT

Your final report is a synthesis of all your previous deliverables. The most important aspect of this final report is that all the different sections should be consistent with each other. Your report should be presented in a professional manner and all the diagrams should be drawn using the notation shown in class and should be in black and white. Your diagrams can be landscape if they don't fit on the page in portrait mode. You can use the logo, colors and formatting from your initial branding exercise in your report. You must submit the report as a PDF.

GRADING CRITERIA

- **Presentation [20%]:** Points will be deducted for reports that are submitted in a non-professional format, if the diagrams are not black and white and if they use incorrect notation, if the cover sheet or table of contents are missing.
 - **Completeness [40%]:** Points will be deducted if any sections are missing or incomplete.
 - **Consistency [40%]:** Points will be deducted if your report lacks consistency.
-

PRESENTATION

As a group, you will also deliver a brief 8 minute presentation to the rest of the class summarizing your project report. You must convey your final report to the class with this presentation. The point of the presentation is to convey the most important and interesting aspects/features of your project using the different modeling tools that you have learned in this class.

GRADING CRITERIA

- **Presentation [20%]:** Points will be deducted if the presentation is not professional. Please practice presenting beforehand and make sure that you are audible at the back of the class.
- **Content [60%]:** Points will be deducted if the presentation does not cover all the important aspects of the project.
- **Reflection [10%]:** Points will be deducted if your group does not share the lessons you learned while working on the project.
- **Time Management [10%]:** Points will be deducted if your presentation goes over the prescribed 10 minute time limit or if the presentation is too short.

You may use Power Point slides for the presentation. If you choose to do this, please be sure to upload them to the class website before class begins on the day of presentations. All members of the group must be present on the day of the presentation and must participate during the group presentation.

DELIVERABLE

The following files should be uploaded to the assignments section on Canvas by 6pm.



One PDF Document [[Download Sample](#)]



One Power Point Presentation [[Download Sample](#)]

APPENDIX C: GRADING SCHEME

The group project is worth 30% of the final grade and distributed among the various deliverables as shown in the table below. The daily deliverables are low stakes (only 1% of the final grade) to motivate students to turn in the work in a timely fashion and stay on track with the group project. Additionally, the low stakes also serve to encourage the students to be more creative in their responses without the fear of adversely affecting their grades.

Class Meeting	Project Deliverables	Grade
1	Choose Group Topic	
2	GP#1:Group Introduction	1 %
3	GP#2:Project Plan	1 %
4	GP#3:System Abstract	1 %
5	GP#4:Requirements	1 %
6	GP#5:Process Model	1 %
7	GP#6:Class Diagram	1 %
8	GP#7:Use Cases	1 %
9	GP#8:Sequence Diagram	1 %
10	GP#9:Data Model	1 %
11	GP#10:Deployment Strategy	1 %
12	Final Report	10 %
	Final Presentation	10 %
	Total	30 %

Another advantage of the grading scheme is that students are assessed fairly for their contributions to group projects, which also ensures more equitable grading. For example, students only receive credit for the daily deliverables if they are present in class. Moreover, for the final project and presentation that makes up 20% of students' course grades, group members only receive credit if they attend and contribute to at least 50% of the daily deliverables, which prevents the common issue of free-riding in group projects.

APPENDIX D: SAMPLE GROUP PROJECT DELIVERABLE INSTRUCTIONS

To simulate stakeholder analysis, the project description includes role-playing activities where each student takes on the role of a different stakeholder and voices their expectations of the system. Following this role playing exercise, the group as whole consolidates these different expectations and writes a single requirements document that incorporates or at least addresses all the stakeholder opinions.

GROUP PROJECT #3: SYSTEM ABSTRACT

PART A: SYSTEM ABSTRACT [10 MIN - 1 PAGE]

Write a one page system abstract for your project. You should use the word document template that you created for Deliverable 1. Your system abstract must clearly describe the following:

- Purpose of the System: Describe the main purpose of this system.
- Basic Scope: Broadly outline the main features or sub-systems that comprise the system you are developing.
- Basic Design: What will your system architecture look like? This decision needs to take into consideration the types of users it will have, how they will use the system, on what types of devices, and how many users you will have. You may make use of symbols in this file if you wish to draw a diagram.

PART B: STAKEHOLDER ANALYSIS [25 MIN - 1 PAGE/STAKEHOLDER]

Identify at least 5 (one per group member) stakeholders for your project. Each group member should represent one of the stakeholders and must do the following:

- Give the stakeholder a name (e.g., Bob Roberts)
- List 5-10 things that the stakeholder might expect from the system.
- Moving forward with requirements gathering, how would you gather requirements from this stakeholder? Why?
- Explain your description to the rest of your group members. Do you find that there are conflicting expectations from the different stakeholders?

For the submission, write the description and details for each stakeholder. You should also indicate if there are any conflicting or contradictory requirements. Each stakeholder should be on a separate page.

DELIVERABLE

The following files should be uploaded to the assignments section on Canvas by 6pm.



One Word Document. [[Sample Submission](#) - This would get a grade of 7/10]

FOR NEXT CLASS

You must do the following before your group meeting during the next class period:

- Think about the functional and non-functional requirements for your system.
- Think about what the user interfaces for your system look like?