Extending and Evaluating a Case Study Exercise in a Systems Analysis and Design Course

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Abstract

Mitri and Cole (2007) created a case study to help students learn about the systems investigation phase of software development lifecycle. However, Mitri and Cole (2007) found that while some students liked working on the case exercise as a break from the traditional lectures, others did not find the exercise very engaging. This study modified Mitri and Cole (2007) case exercise by focusing specifically on feasibility analysis activity of the systems investigation phase of the software development lifecycle. Further, the roles performed by students were redefined to achieve greater team interdependence. Students worked on the modified exercise in teams of four over several class periods. Students were then asked to evaluate the exercise after completing the exercise. Results of student evaluation will help in modifying the exercise further to improve the learning outcomes.

1. Introduction

Use of case study based instruction has been recognized as an important pedagogical approach across many disciplines including Information Systems education. Barkley, Cross and Major (2005, p. 182) suggest several benefits of case study based instruction:

- Case studies are appealing to students as they depict realistic situations
- Case studies bridge the gap between theory and practice
- Case studies enable students to engage in critical reflection as they typically involve multiple alternatives to solving problems
- Case studies can help students develop analysis, synthesis, and decision-making skills.

Students learn the analytical and problem solving skills that employers desire (Cappel and Schwager, 2002). The Journal of Information Systems Education has been publishing teaching cases, beginning from the special issue on IS teaching cases (Hackney, McMaster, and Harris, 2003), in order to encourage Information Systems faculty to use those cases in their courses. Barkley, Cross and Major (2005) recognize that writing a good case study is a complex task. Once a case study is written it becomes a resource for other faculty to use it in their teaching. Just as knowledge in an academic discipline can be built through cumulative efforts, and good quality software is developed through iterations, case studies could be developed in a cumulative manner through iterative refinement. We need to apply the design science paradigm and design thinking methodology in order to create case studies that can meet the learning objectives of the courses in which the case studies are being used. In this article I present a methodology for designing "learning artifacts" and then demonstrate how I have modified and extended a role-playing case study designed for a systems analysis course and adapted it to suit the local educational context.

2. Design Science and Design Thinking

Design science (Hevner, March, Park, and Ram, 2004) and design thinking (Brown, 2009; Martin, 2009) has generated a lot of interest in recent years. Design science refers to the research paradigm that focuses on creation and evaluation of artifacts (Hevner, March, Park, and Ram, 2004). In Information Systems research, design science paradigm has been focused on creation of IT artifacts that solve organizational problems (Hevner, et al., 2004). However, the same approach can also be applied to the scholarship of teaching and learning in Information Systems education through creation of "learning artifacts" that help in achieving the learning goals. Design thinking refers to a problem-solving methodology (Brown, 2004) that could be applied to a variety of situations including the educational environment[1].

[1] Design thinking for educators toolkit by IDEO accessible at http://www.designthinkingforeducators.com/. While this is intended for K-12, it is equally applicable for higher education as well.

Figure 1 depicts the methodology of creation of learning activities/artifacts as applied within an educational context. Based on the learning goals identified for a course, the assessment of student needs (e.g. learning style) and their background knowledge, and consideration of the theories and literature on student learning[2], one can design a "learning artifact"[3] such as a class exercise or an assignment or a case study. One can then implement the artifact i.e. use it in the class. The artifact needs to be then evaluated systematically in order to understand whether it worked as intended and if not, what changes may be needed. Based on the evaluation results, one could then redesign the artifact, which can again be implemented and tested. This cycle of design, implementation, and evaluation can lead to improvement of the artifact to better meet the intended goals.

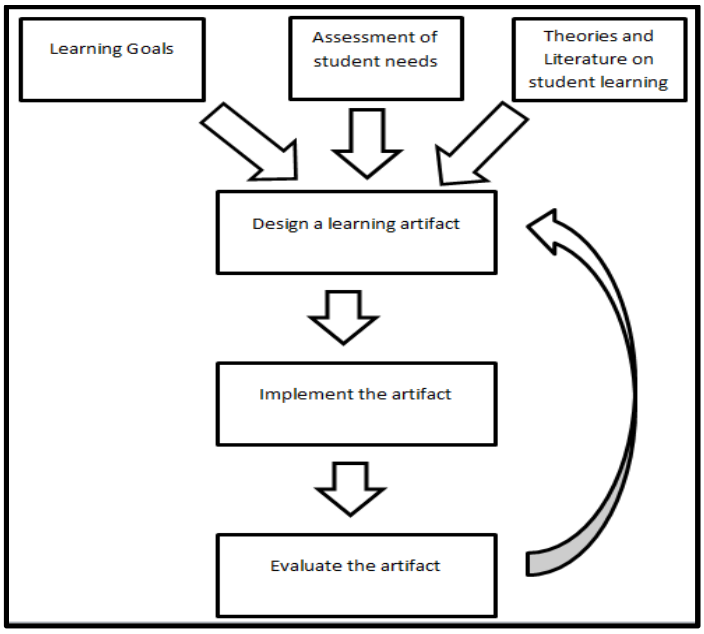


Figure 1: Methodology for Designing Learning Artifacts

3. Adopting a Systems Analysis and Design Role-Playing Case Study

I teach a course on Systems Analysis at a regional mid-western university. Students majoring in Information Systems at our university have usually worked on a number of programming assignments where the problems tend to be more close-ended, the task requirements are clear (e.g. create a program to sort numbers into even and odd and find averages for those numbers) and the focus is on identifying a single best solution to the problem. If students have not worked on real life software projects before, they may not

[2] e.g. collaborative learning (Barkley, Cross, and Major, 2005), team-based learning (Michaelsen, Knight and Fink (2002)

[3] While learning artifacts could refer to the physical technology used by instructors, our focus is on intellectual artifacts such as assignments and case study. The learning artifacts can be related to learning objects (Johnson, 2003) though these do not have to be digital in nature.

have a good understanding of the complexities of the software development lifecycle where one has to deal with ambiguous situations. Use of a case study can bring some of that complexity into the classroom for discussion.

One of the learning goals for the Systems Analysis course is that students should be able to gain skills in systems investigation including feasibility analysis, project selection, and project planning. Mitri and Cole (2007) have created a case study of a fictional company called We Sell Stuff, Inc. to help students learn about the systems investigation phase of SDLC where the activities performed are problem identification, feasibility analysis and initial project planning. I found this case study to be quite suitable for adoption in this course. Students in the Mitri and Cole (2007) case study exercise had to create a project planning report as a deliverable for the exercise. Students were assigned to groups of three and each group member had to play one of the three roles: system user, systems analyst and Chief Information Officer (CIO). Each student was provided with the information that represented the perspective of their assigned role. Through discussion, students had to integrate the information provided to them in order to find a good solution to the problem.

Mitri and Cole (2007) recommended that their case study exercise be used in classes that meet longer than the 50 minute time frame. It would be difficult for students to be able to digest all the information provided and to get clarifications in a shorter duration class meeting. Further, Mitri and Cole (2007) had found that while some students found the exercise to be enjoyable, others had found it to be "busy-work", especially the requirement to meet outside the class and to produce a report as a project deliverable.

I followed the design methodology depicted in Figure 1 in redesigning the role playing case study based exercise. The following sections depict the various stages of the redesign process.

3.1 Needs Assessment Phase – Revised Case

Given that the Mitri and Cole (2007) case study had already gone through an iteration of design, implementation and evaluation, I focused on revision of the case study based on the feedback they had obtained from their students, while also considering the local context of our own student needs and skills, and the literature and theories on student learning. I applied the methodology shown in Figure 1 for designing a learning artifact. Michaelsen and his colleagues have applied team-based learning in the courses they have taught and have conducted several studies on this approach (Michaelsen, Knight and Fink, 2002). Michaelsen and Sweet (2008) recommend that in order for team based learning to work, the team exercise must have significance for students, students should be given the same problem, students should be required to make decisions, and then all teams need to report their results simultaneously. Michaelsen and Sweet (2008) criticize group assignments that require lengthy reports to be counter productive due to the individualistic nature of the report writing task. This paper describes the efforts undertaken by the author to revise the exercise created by Mitri and Cole (2007) in order to better engage students and thereby aiming to better achieve the learning outcomes.

3.2 Design Phase – Revised Case

Several revisions were made to the case used by Mitri and Cole (2007). Instead of asking students to create a project planning report, students were asked to prepare a recommendation about the feasibility of the project. While students had to consider technical and organizational feasibility aspects, the main focus of the case was on economic feasibility. Students were provided a spreadsheet template to calculate costs and benefits of operating the new system for four years after the new system was completed. The spreadsheet template was based on an example used in the course textbook (Dennis, Wixom, and Tegarden, 2009, p. 52) and students had already worked on the textbook problem of determining economic feasibility of a project based on benefit and cost numbers provided. While the textbook example was comparatively structured, students would have to identify the benefits and variable costs of development in order to determine economic feasibility for the project described in the case. Each student team of four was given the goal of identifying alternative ways in which the business requirements could be met while achieving the maximum Return on Investment (ROI) or Net Present Value (NPV) for the project. Consistent with the recommendations by Michaelsen and Sweet (2008), the essential task facing the students was to make a decision about which business requirements to include – whether to include all the business requirements or to only include high priority requirements, and what staff to hire – whether to hire contract professionals that are expensive or use in house staff and invest in training. Their decisions would influence the economic feasibility of the project.

I considered it more appropriate to divide the original three roles into four: Chief Information Officer (CIO), Project Manager (PM), Senior Systems Analyst and Infrastructure Analyst. The role of the system user was eliminated since the main focus of the task was to make a recommendation about the feasibility of the project. Both CIO and PM roles were provided with information about other ongoing projects in the company and the staff that were tied up with those projects, the cost of hiring new employees with specific skills, and the overall IT budget. Further, unlike the original Mitri and Cole (2007) case, the CIO was provided information about how meeting the user requirements would lead to an increase in the market share for the company. Estimates were provided that for every 1% increase in market share, the estimated benefits would increase by $100,000. Thus, as more business requirements were included, more benefits could be realized but the cost and time frame of development would rise as well. The Senior Systems analyst role was provided information about some additional requirements that had been identified, which were not likely to greatly increase the market share, the estimates of labor costs for meeting various requirements, the cost of buying off the shelf software and cost of training employees to be able to work with the software. The Infrastructure Analyst was provided information about the current systems (hardware and software) and about which employees had expertise in various hardware and software. Thus, the information was distributed across the four team members and while there was some overlap of information, the team had to pool in the information in order to work on the task. Students also had to consider the tradeoff of hiring lesser expensive staff without any training and then providing the training against hiring contract staff that is already

trained but is more expensive. Students had to make sure to not exceed the budget for hiring staff.

3.3 Implementation Phase – Revised Case

When the revised case was first introduced in the Systems Analysis course as an assignment, it was identified that students had difficulty in forming a good mental model of the problem structure inherent in the problem that was given to them. Hence, the second time we decided to provide the students with a concept map of problem structure (see Figure 2) so that they could understand how their decisions about hiring of the staff would affect the labor costs, and how their decisions about including more or less of the desired business requirements would affect the extent of benefits the new system would provided and the overall costs.

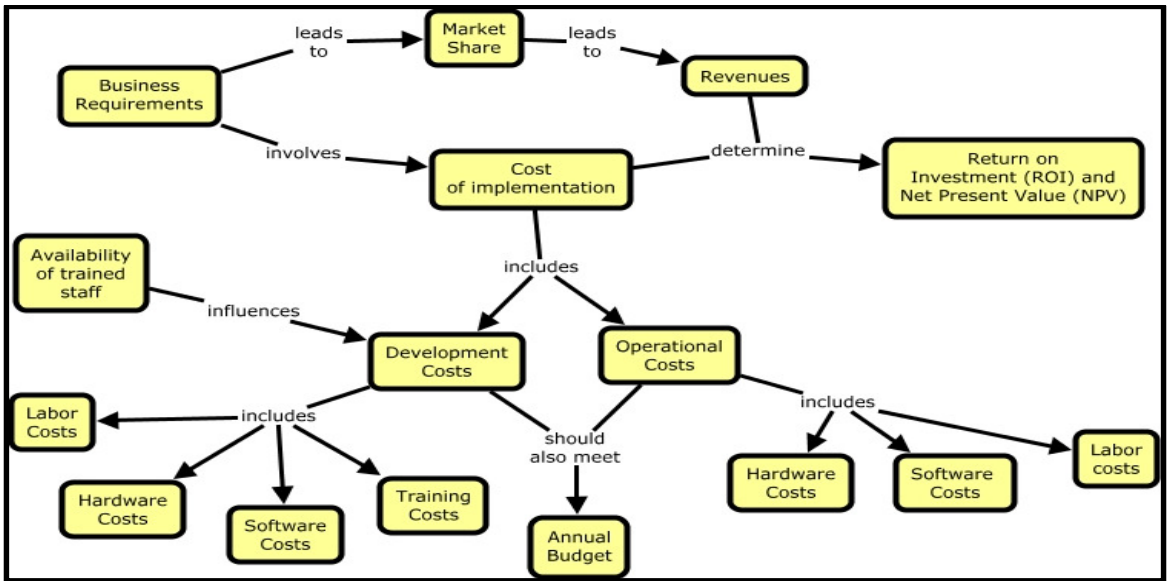


Figure 2: Concept Map of the Problem Structure of the Revised Mitri and Cole (2007) Case

Instead of allowing a single class period for completing the exercise, several class periods were allocated to complete the exercise so that students had the opportunity to ask questions as well as work on the task outside of the class as well. The instructor was available during class periods for any clarifications. Student teams were encouraged to come up with alternate analysis by considering at least two scenarios.

3.4 Evaluation Phase – Revised Case

During Fall 2012, when the revised Mitri and Cole (2007) case was used the third time, data was collected at the end of the exercise to obtain student feedback on whether they found the exercise to be engaging and whether it helped them in gaining skills in

feasibility analysis. Table 1 provides some descriptive statistics of student feedback about the role-playing case exercise.

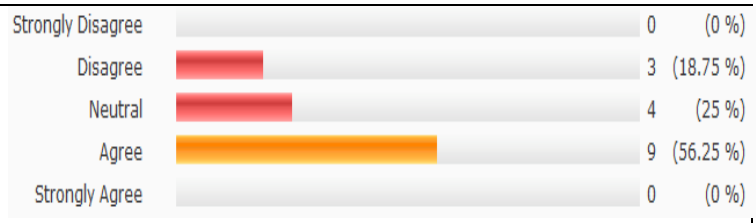
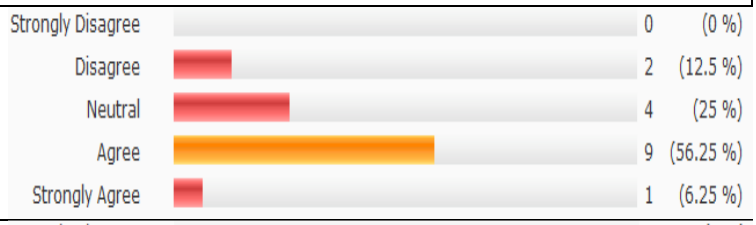
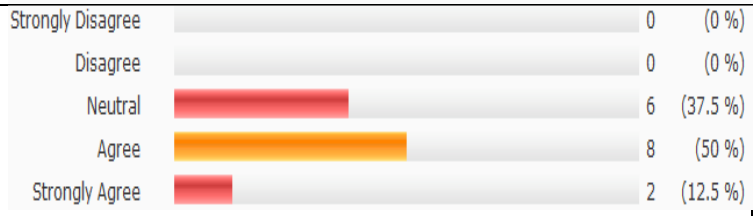
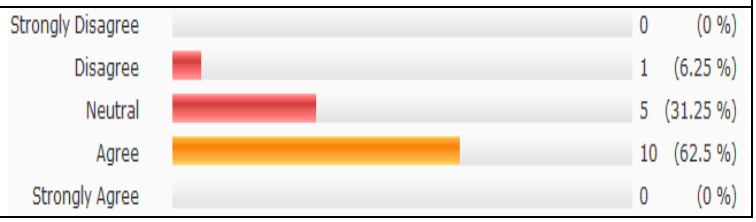
I found the role-playing exercise on feasibility analysis to be engaging.	
I found the role-playing exercise on feasibility analysis helpful in gaining an understanding of the planning phase of the systems development life-cycle.	
I believe that I have gained skills in conducting feasibility analysis as a result of participating in the role-playing exercise.	
I would recommend that this role-playing exercise be used again when this course is taught the next time.	

Table 1. Student Evaluation of the Role-Playing Case Exercise

A slight majority of students found the exercise to be engaging and helpful in learning about the planning phase of the systems development lifecycle. A somewhat greater percentage of students at least agreed that the exercise had helped them gain skills in feasibility analysis and they would recommend that this exercise should be used again.

Students were also asked about what they liked most about the exercise. Six out of sixteen students reported working in a team to be the best part of the exercise. One student pointed out how they had to combine the information that each group member had. Other responses varied and included having to deal with the trade-offs in allocating resources where there did not appear to be a single best answer, and performing the calculations for feasibility analysis. Students were also asked about the aspects of the role-playing exercise that they found least engaging. Student responses had varied for this question and there was no dominant response. Responses varied from difficulty of working in a group where not everyone contributed equally, to the case having too much of information to handle, and amount of work involved.

Based on the student feedback, further modifications will be made when the course is taught again in Fall 2013.

4. Conclusion

This paper presents a methodology for designing "learning artifacts" in the context of Information Systems education. Further, this paper discusses the adoption of a published case study and how the case study was modified using this methodology. When "learning artifacts" are revised in this manner the quality of these artifacts can improve and can indeed become more useful for adopters.

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