Indiana University Purdue University Fort Wayne

ACS 567 - Software Engineering Project Management

Spring 2009

Final Examination

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CS 567 Final Exam

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1. ***[30 points]*** *Each group has developed a comprehensive Project Cmap this semester, including attached documentation for presentation. Based on this Cmap, prepare a **Project Cmap Guide** and attach. The guide prepared as a group serves as an orientation for a first-time user of your Cmap website and should include (a) (b) and (c):*

    1. *Table of contents of your accomplishments on display*
    2. *Navigation approach to guide*
    3. *Annotation of key concepts/documents on display (short description for each).*

   A. **ShareIt.com Concept Map Table of Contents (TOC)**

   The navigation approach to this concept map is to start
   at with the top node, "ShareIt.com" and work from the
   left and read to the bottom, then move to the right.

   - ShareIt.com "It is good for your heart and wallet!"

   Attached Resources:

   Introduction This resource is a slide show introducing the team, website, the website's capabilities and the existing competitors to the website.

      ◦ Design Phase
         ▪ Use Cases

   Attached Resources:

   Use Cases Document Document that outlines in detail the use cases for the web site.

         ▪ Microsoft Project Gantt Chart

Attached Resources:

Schedule Phase I An image showing the first phase of the project.

Schedule Phase II An image showing the second phase of the project.

Schedule Phase III An image showing the third phase of the project.

Schedule Phase IV An image showing the fourth phase of the project.

Schedule Phase V An image showing the fifth phase of the project.

- Lines Of Code Estimate

Attached Resources:

CoCoMo An excel spreadsheet that calculates the estimated lines of code for the project based on the number of screens, tables, reports, etc.

- Cost Analysis

Attached Resources:

Cost Estimate A document that details and explains the expected cost of the project.

- Site Flow

Attached Resources:

Web Flow A link to another concept map diagram that illustrates the expected flow of the web site.

- Risk Assessment

Attached Resources:

Risk Register The project development risk register.

- DFSS

Attached Resources:

CN-Trace - Example of a Customer needs Traceability Graph

FR-CN_Matrix - Example of a Function Requirements to Customer
Needs Matrix

FR-DP_Matrix - Example of Functional Requirements to Design
Parameters Matrix

Acclar-1.ad4 - Our actual acclaro project itself.

- Work Breakdown Structure

Attached Resources:

WBS - Displays the work break down structure for the project.

- Task Tracking

Attached Resources:

Scrummy Link to external web site that tracks the project's tasks and
their status.

- Prototype

Attached Resources:

Prototype Link to external web site that prototypes the functionality
for the website.

○ Explanation

- Concept map section that illustrates the explanation of the
site.

○ Team

- Concept map section that introduces the team, details the roles, lists the tasks and outlines the steps to be taken.

All Attached Resources

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2. ***[20 points]*** *Over the semester at your own pace, each you have prepared 1-page reviews for each of the 11 knowledge areas (KA) in the Software Engineering Body of Knowledge (SWEBOK) and 9 knowledge areas in the Project Management Body of Knowledge (PMBOK). Based on this foundation work, describe your understanding by addressing (a) and (b).*

    1. *For each knowledge area for SWEBOK (KA 1-11) and PMBOK (KA 1-9), list the key concepts you learned this semester (1-4 bulleted items for each KA).*

    2. *For SWEBOK and PMBOK you identified concentration areas of interest that may be related to your work. List the ways you could apply this concentration knowledge at work (1-4 bulleted items for each KA concentration).*

- PMBOK
    1. Project Integration Management
        - Preparation of the Project Management Plan (PMP) document and what it includes
        - This involves, initiating the project, planning, executing, and closing the project
        - Review of all the change requests that make their way into a project, and approval of these changes that effect the project.
    2. Project Scope Management
        - I had never created a Work Breakdown Structure document before attending this class. This WBS details out all the deliverables for each project objective that needs to be fullfilled.
        - The Project Scope document should include the deliverables, any assumptions, and also the constaints.

- This is where the stakeholders are notified of the scope and their approval is obtained.

3. Project Time Management

    - Activities of a project are defined. I prefer to call these tasks
    - The order in which they need to be completed is defined
    - Identification of the dependencies between the activities
    - Estimation of the type and quantity of resource that will be need to accomplish the project goals

4. Project Cost Management

    - Estimate cost for each activity
    - Develop an approximation of the resource cost
    - Establish a total cost baseline
    - Identify the influencing factors that can change the cost baseline

5. Project Quality Management

    - First, the quality standards relevant to the project need to be identified. This is important because, all the quality standard for a entity or company might no be relevant for every project, that determination has to be made on a project by project basis or for a project type.
    - Setting up a systematic way of meeting these quality requirements, otherwise, they will be missed or ignored by the development team.

6. Project Human Resource Management

    - Identification and documenting of project roles and responsibilities needs to happen very early in the project, so there is an effect of ownership rather than confusion of who is doing what. If this is not done, there might be chance for

duplication of work which would negatively effect the project.

- Improve competency and interaction between team member by providing the tools that facilitate this.
- Track team member performance and provide immediate feedback to manure the project back into the right course.

7. Project Communication Management

- Make information for any and all to see, especially the project stakeholders.
- Provide project information to the whole team on a timely basis
- This project information should always include the current level of complementness and the forcast.

8. Project Risk Management

- There are several types of Risk's, the PM cannot identify them by going down on a checklist. This will have to come from experience and being able to ask the right questions and identify the risks from the answers that are provided.
- Prioritize the risks for further analysis
- Determine their probability of occurrence, there will be a lot riding on this piece of information

9. Project Procurement Management

- Whether to buy or build and the decision making process for this.
- Documentation of products, services and results requirements
- Identify potential sellers
- Draw up the contracts

- SWEBOK

1. Software Requirement
   - Elicitation, analysis, specification and validation of software requirements
   - Gathering of the user stories or in other words the 'VOC' voice of the customer
   - High level design specifications are drawn up along with detailed use cases that refer back to the user stories.

2. Software Design
   - Considerable amount of a successful project is spent in design
   - The design parameters are identified and these are linked back to the user stories, this ensures that all the user stories are covered
   - This process of solving the issues and planning out the solution are commonly known in the industry a SDLC - Software Development LifeCycle.
   - Use design patterns where ever possible so that we are re-inventing the wheel.

3. Software Construction
   - Simple, development begins.
   - A very detailed descriptions of the tasks to be completed is done at this level, also this might be known as use cases or just UML documentation
   - Tools like Acclaro DFSS can be used to map these description or use cases back the user stories that they relate to

4. Software Testing
   - Identify the test level, i.e. if the test is being performed in a single module or a group of module (including interaction between software components) or the whole system.

- Identify an appropriate testing technique for the current project, this has to be done on a project by project basis and is very much dependent on the type of software development project it is.
- This stage also should involve the identification of bugs, priortizing the bugs and fixing them.

5. Software Maintenance
    - Software maintenance is the modification of a software product after delivery to correct faults, to improve performance or other attributes, or to adopt to a new environment.
    - Schedule improvement or change that is going to happen to the software is planned out in a 'Maintenance Plan' for the software.
    - Bug Maintenance Plan needs to be created as well. This should include the steps from bug identification, approval process, documentation of resolution and changes

6. Software Configuration Management
    - This is indispencable and taken for granted in development community these days. Is to keep track of the changes that are being made to a product or software.
    - Main reason being, back tracking and analysis is easier.
    - Documented process of configuration management, meaning the development teams needs to be aware of steps that need to be taken to commit changes and maintain consistency.

7. Software Engineering Management

- Software project planning, which addresses the activities undertaken to prepare for successful software engineering from a management perspective.
- Software engineering measurement, which deals with the effective development and implementation of measurement programs in software engineering organizations
- Initiation and scope definition, which deals with the decision to initiate a software engineering project.

8. Software Engineering Process

- The main aim behind this process is to find a repeatable, predictable process that improves productivity and quality.
- Although there are several different processes defined and available for consumption, I believe every company is different and so is every project to a certain level. Hence, a plan has to be create for a company that works for them specifically.

9. Software Engineering Tools

- We have used several new tools this semester which meet this criteria, and some of the once that found very useful were, c-map by far. I was very resistent to the acclaro tool at first, but working with it, proved the importance of what it accomplishes. It relates everything of a project to the each other in a sense and using the tracability feature to view the linkage, it is very easy to identify if any of the user requirements have been missed.
- The different types of tools are worth mentioning here, Requirements Tools, Design Tools, Construction Tools, Testing Tools, Maintenance Tools, Configuration Management Tools and finanly the process tools.

10. Software Quality

- Two different types of quality, product and code.

- Product quality is the over all quality of the end product, the completeness of the product compared to the requirements that were established.

- Code quality on the other hand is a tricky one, because the computer does not case if the code is well-written or not. This is done entirely for the benefit of developers to follow and for the sack of maintainability

11. Related Disciplines of Software Engineering

- Disciples such as computer engineering, computer science, management, mathematics, project management, quality management, software ergonomics and systems engineering provides the necessary foundation on which software engineering is built.

- Most of the decisions made during a software project are based on
mathematical insights and analysis.

- Ergonomics, is a common term in daily life, but Software Ergonomics is less so. 'Ergo' means work, so ergonomics is the study of how someone or something works. This leads to the changes that make it better. Per software that is the changes that are need to accomplish a better user experience.

- Concentration - SWEBOK: Software Engineering Process

  ◦ The recognition that there is no silver bullet as far as Engineering Process for software is concerned. Since software is substantially different from other types of engineering. What I take back to work

with this article is the knowledge that there is no, one way, yet. We have to figure out our SDLC and stick to it.

- Concentration - SWEBOK: Software Requirements
  - As far as requirements are concerned, the one main thing I take back to work from this class is the enlightenment that Acclaro DFSS has given me. Every company that I have worked for does requirements differently and for good reason. And everyone of them complicated, difficult to maintain etc. Using Acclaro DFSS showed me that by everything that we do as developer has to be related to a requirement in some fashion or another. And these requirements in turn are related to Customer Needs or Voice of Customer. This helps developers see where the design parameter is coming from, and what else it touches, also what other piece have to play well together.

- Concentration - PMBOK: Project Quality Management
  - Having a quality plan is not something we do at work today, either as part of a project or any other way. Reading this article of Project Quality Plan, I have come to realize that quality is not just meeting the requirements of a project, but meeting the expectations of the end user or customer, which can sometimes be a completely different thing. My paper (attached in c-map) which identifies the items that need to be documented inorder to come close to meeting the customers expectations, has to be review by my project team at work and adopted to some level.

- Concentration - PMBOK: Project Time Management
  - Although, this concentration area does not have any document, items or steps to take a back to work, it has cleary correctly my vision of Project Schedule or Project Cost Management versus Project Time Management. The focus should not be on the cost to

drive the other sections of a project, but it should be on time. When you estimate time for each of the iteration and identify what can be accomedated within that time frame and the stakeholders are notified of this. It is easier to stay in budget and stay with in schedule.

3. **[20 points]** *After the completing the foundation work, our semester focus turned to completion of the Project Management Plan (PMP) deliverable. Write a summary of what you learned by developing the PMP after the midterm (1- page).*

I worked with my team member Deep in writing the PMP for our project. As a writer, the PMP forces you think about the following question, while you are working on it.

- What are the goals of the current project?
- What is my timeframe?
- Who are the stakeholders that I will need to include in this project?
- What resource are needed to accomplish the project goals?

Once the above question are answered documented with in the PMP, it becomes the roadmap for quality project delivery. This helps the project team (construction team) maintain a constant focus toward project delivery and customer needs, wants and expectations. The PMP, with all it contents, in essence is an agreement between the Project Team and Customer or end user, of the scope and end product that is to be delivered.

More often then not, projects start with opening up a project management tool like Microsoft Project and starting to enter information. Athough, these tools are very useful, there do not provide the high level view that is needed initially to plan and accomplish the project. The tools help immesely later on in the following areas, Time Management, Resource Management, Scope Management and Cost Management.

If we take PMBOK's guildline, the following are the steps that need to be completed before we even start to look into any of the tools;

- Develop priliminary project statement

- Develop a project charter

- Project scope plan

- Define project scope

- Create a Work Breakdown Statement and create activities

- Estimate resources

- Estimate duration

- Identify sequencing

- Schedule development

4. *[20 points] We emphasized industry standards throughout the semester to ensure that your work products are compatible with major international corporations, including local defense contractors. Show what aspects of class that best prepared you for industry standards this semester by addressing (a) and (b):*

    1. *Identify the key IEEE industry standards learned in this class.*
    2. *Which standards did you apply on your project documentation work?*

- IEEE 1471 - 2000: Consistent Definitions for Software Systems

    There are several terms that are used in the industry, but without consistent definitions, or with several overlapping definitions by different bodies or organizations. This standard is an attempt by IEEE to establish definitions for the most prominent terms used in software-intensive systems. The standard aims to facilitate the expression and communication of architectures and thereby lay a foundation for quality and cost gains through standardization of element and also practices for architecture description in the software field.

    Some of the terms defined by this stardard are listed below:

    1. Architecture
    2. Mission
    3. Environment
    4. System
    5. Stakeholder
    6. Model
    7. View

- IEEE 830: Software Engineering Requirements Standards

    This standard defines how, requirements are to be documented. What different types of requirements mean and how to eliminate ambiquity

in documentation of these requirement in a software field. The established goal for this standard is that requirements should be correct, unambiguous, complete, consistent, ranked for importance and/or stability, verifiable, modifiable and traceable.

Verifiable Requirements - When documenting requirements use precise, falsifiable language over pleasent generalities.

5. **[10 points]** *This semester, each of you had the opportunity to develop a project through the initiation and planning phase, as defined by the scope of this project management course in the software domain. List the tools, techniques, and methods for software project management you learned this semester (hint see extra handouts posted and Midterm answers for ideas).*

- Acclaro DFSS

  This tools aims to fill the gap between customer requirements and what needs to built to satisfy those requirements. This is to be used by Business Analysts in the earlier stages of a project to gather what the customer wants (Functional Requirements: FR's). These FR's are later used to drive the design of the application/solution.

  It has the ability to show the design parameters (DP's) and FR's in a matrix like layout making it easy to understand the relationship and interdependency of the two. This is useful to identify quickly which of the customer requirements are high priority and which take a long time to implement. The information can then be used by the stakeholder's early on in the project to determine which of the requirements should be complete to meet the budget.

- Microsoft Project

  Microsoft Project is very well known in the industry of project management. It is practically a standard in its field and one that is used

to measure other up coming tools. Although tools has many capabilities and more get added with each release, it is not geared toward analysis and modeling of a project specifically during the development phases. This product is very attuned to helping a Project manager in establishing a plan for the project at hand, allocating resources to tasks in the plan, monitoring the progress of the task as well as the plan as a whole and forecasting the stages of the project on a timeline.

Our particular interaction with MS Project has been mainly to identify and organize the tasks in the our project plan. Assign resources to the tasks as well as estimated duration associated with individual tasks. This quickly organized the tasks into categories and enabled us to view the complete timeline. Project also does a surprisingly good job at determining the budget for the project when the resource cost information was provided.

This is a invaluable tool for any project manager.

- C-map tools

This is one of several applications, in what appears to be a very hot market of tools to replace the simple 'paper and pencil' in a brainstorming session. Let face it we have all in the project management or development field have brainstormed with colleagues using 'paper and pencil' or whiteboard which every is accessible. Some of the brainstorming session go undocumented and others are completely lost leading to mistakes or rework.

C-map fits into this category very comfortably with 'ease of use' as its biggest strengths, followed closely by 'zero cost' and 'export to HTML' features. We initially used c-map to document our brainstorming session for our project 'ShareIt.com'. The main idea behind the site and what the features are going to be offered as part of it. Now the c-map has morphed into the main repository for all our documentation and collaboration on the project. We have also documented our website page flow in c-map for quick reference. As mentioned earlier, c-map and similar tools cannot be categorized into a certain area of software project management, they can be used for anything and everything depending on what is needed.

- ## Visio/Telelogic for OO modeling using UML/SysML

Visio, another Microsoft application, is well suited for visualizing infrastructure or connection/interactions between different nodes of a software based application. It provides a way for the project manager to quick document for the rest of the group, how the project environment is going to be laid out. Another feature to note is DB visualization, this particular feature enabled Visio to connect to any database via ODBC connection and retrieve the schema structure along with the relationships between the tables.

Although the product is advertised as such, it does not support UML very well. It can be used for UML design, but that would need more ingrained knowledge of the tool and UML concepts. Definitely not the standard for UML modeling, often used within projects to document the infrastructure decision and changes.

Bonus [5 points each]:

B1: What aspect of the PMP preparation did you enjoy the most?

After the pieces that we worked on through out the semester, seeing it all come together in the comprehensive document to listed everything and providing a detailed picture of the project was great. Our team is really interested in seeing this project work through and creating the web site we have using for this project. Although the estimated budge is out their for what we are planning to do, it still provides a good start to accomplishing our personal goals in the project.

B2: Describe any extra handouts this semester that interested you.

I have become a big Agile Development process evagelist recently and actually see the RUP (Rational Unified Process) document, which is the parent of AUP (Agile) is especially interesting. To see the roots of agile and the difference between the two and possible reasons for the differences are interesting reads. I have since found myself researching what others have found in terms of the difference.

B3: Reproduce the foundation and focus triangle approach for the course.