

# Instructor's Manual Chapter 2

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*Methods of IT Project Management – A Systems View and Systems Methodology*

*Brewer/Dittman 2nd Edition*

## Chapter Objectives

- Define the systems approach and its impact on project management
- Define a PMLC and understand how to apply it
- Define several SDLC models and know when to use each different type
- Define the relationship between the PMLC and the SDLC and understand how the two work together

## Teaching Suggestions

We break this chapter up into two separate lectures but depending on the students familiarity with product development methodologies they could be combined into one lecture. The first lecture reviews what it means for a project manager to use a systems approach. We have found that the students find this a difficult concept to grasp. For the most part, our undergraduate classes have been centered on just the systems analysis portion of the systems approach and not in teaching the students to look at the broad organizational context and the environment. This is a good time to use the problems and exercises in the book for class discussion on how to first take a systems approach before breaking the problem down into its component parts.

The second part of the chapter focuses on project life cycles and product life cycles. If students understand the product life cycles then time only needs to be spent on understanding the project side of the equation and on how the two are integrated. Many companies do not break them out separately but have one methodology that is flexible enough to work on multiple types of products. Be sure to point out during the integration conversation the difference in deliverables (which is mostly what this text is about) and the integration points. For example, after creating the WBS in the planning portion of the PMLC you have begun to complete the requirements document contained in most SDLC models. If doing a group project you could have different groups attempt to use different models.

## Answers to Review Questions

1. What is a project life cycle, and how is it used?

*A life cycle is a prescribed order of phases in which each contains a specific deliverable which collectively deliver a result. The phases of the project management life cycle are initiate, plan, execute, control, close iteration, and close project. It is used to promote communication between stakeholders, specify the work to be done, identify resources, and define deliverables*

2. What is a product life cycle, and how is it used?

*A product life cycle is an approach to building IT systems/products that consists of several phases. Each phase has a given set of inputs and required deliverables.*

3. Explain how product life cycles differ from project life cycles. How are they similar to one another?

*A product life cycle is a model for common product development processes, and fits into a larger project life cycle, which includes the additional phases of project initiation, planning, controlling and closing. Each life cycle contains phases, deliverables, and decisions to be made before moving on to a subsequent phase but the focus and work product are very different.*

4. Explain how the integration of project life cycles with product life cycles should work.

*Typically, product life cycles become part of an overall project life cycle. For example, the project life cycle consists of an “execute” phase. During the execution phase of the project life cycle, a predetermined product life cycle would begin as a subset of the overall project.*

5. Describe the systems approach and its significance for project managers.

*The systems approach involves viewing projects in the context of the entire environment including both the inside and outside of the organization. It is important for project managers to take this approach so that projects are optimally designed and planned. It enables project managers to take many internal and external factors into consideration when planning a project, including all of the other ongoing projects in the organization.*

6. Define each of the three components of the systems approach.

*Systems theory – Systems theory is a philosophy of looking at the world as a set of principles and interventions for thinking and problem solving. Systems theory breaks all systems down into two distinct groups, open and closed.*

*Systems analysis – Systems analysis is a problem-solving technique that decomposes a system into its component pieces for the purpose of studying how well those component parts work and interact to accomplish their purpose.*

*Systems management – Systems management is the component responsible for managing the whole system. This includes objectives, internal and external environments, constraints, resources both human and non-human, and the culture and social environment of the organization*

7. Differentiate between the systems approach and the systems analysis approach taught in introductory systems analysis and design courses.

*The systems approach involves the ability to examine a problem or issue by first understanding the environment it exists within, before reducing the problem or issue into smaller components and finally managing the resolution of the problem or issue. Systems analysis is a part of the systems approach and involves decomposing a system into smaller pieces for the purpose of studying how well those pieces work together.*

8. Define the concept of systems in your own words and give examples of a system in which the sum of its parts is worth more than each part individually.

*The concept of a system is one that is hard to describe because it encompasses so much. In my mind, a system is a set of processes working on conjunction with a common goal. Typically, systems have some type of input which is then processed with the aim of producing a particular output. An example of a system where the sum of its parts is worth more than the individual parts is YouTube. YouTube needs no explanation, and the phenomenon it started is evident by the whopping price tag Google paid for it. To break down YouTube into its individual systems shows the importance of the collective system. With individual systems like a Web site, user*

*management, a robust network, content management systems, and the database backend, YouTube is not that much different than other high-end Web sites. However, YouTube clearly utilizes these systems in a unique way that made its creators rich men.*

9. Differentiate between open systems and closed systems. Why is this difference significant to a project manager?

*A closed system is considered to be completely self-contained, examined without regard to the external environment. A machine is an example of a closed system. An open system is not self-defining; to understand it you must also understand its environment. The human body and organizations are examples of open systems. This is significant to the project manager because project management takes place in an open system. As project managers are able to identify and understand all of the pressures of their external environment, they are better able to manage them.*

10. This chapter states that much of what a project manager does exists on the boundary of the project. Explain what is meant by this statement.

*Most of what a project manager does involves ensuring that a particular project is not negatively affected by outside considerations. For example, a project manager must make sure that other projects do not take away key resources. Additionally, project managers must have the foresight to foresee potential external impacts on the project, such as new government regulation.*

11. Explain what is meant by the *environment* surrounding a project. How is a project affected by events in the environment?

*The environment includes everything that exists outside of the system or outside of the control of the project manager that is relevant to the system being studied. The organization, governments, economies, foreign countries, etc., all play in the environment. Changes in the environment can impact project funding, technology obsolescence, design specifications, and nearly every aspect of a project.*

12. Explain the concept and need for stage gates between project phases.

*Project managers divide projects into various phases in order to facilitate better control and communication. These phases have clearly defined deliverables and criteria that establish whether or not it is time to move on to the next phase of the project. The gaps between these phases are called “stage gates.” These stage gates allow for management to stop and review the project’s progress and performance. During this time, management can make a decision as to whether or not to continue the project or cancel it.*

13. Explain the concept of delivering a project in incremental iterations.

*Delivering a project in incremental iterations allows stakeholders to review and evaluate project progress at many points throughout the project’s life span. The key product development activities such as requirements definition, design, construction, and testing are performed during each iteration, and each iteration results in a more refined product. This enables stakeholders to agree on changes to requirements or product design as the project is in progress.*

14. Write a brief explanation of each of the following PDLC methods and explain the strengths and weaknesses of each: waterfall, iterative and incremental, spiral, Scrum, XP, and RUP.

*Waterfall: The traditional approach to systems development. It is linear and sequential, which distinct objectives for each phase. The output of one phase is the input for the next phase.*

- a) *Strengths: Well understood, easier to manage, more flexible with personnel (geographic location and skill level), can accommodate large, complex applications*

- b) *Weaknesses: Does not accommodate change well, all requirements must be known and defined at the beginning of the project, does not allow for reiteration, does not do well with user communication*

*Iterative/Incremental: Intuitive approach to the waterfall model, similar to the spiral model. In this model, the first iteration builds a product and subsequent iterations build on the initial.*

- a) *Strengths: Generates working software quickly, flexible, easier to test and debug*
- b) *Weaknesses: Not easy to manage, difficult to determine cost and time estimates, requires management plan well for multiple iterations*

*Spiral: Similar to the Waterfall model. Represents a series of short waterfall cycles, with each cycle producing a prototype. The spiral emphasizes the need to go back and reiterate earlier stages a number of times as the project progresses.*

- a) *Strengths: Accommodates change well, can react to risks quickly, software is produced quickly and early on in the life cycle, and good for large, complex projects*
- b) *Weaknesses: Costly model to use, risk analysis requires highly specific expertise, doesn't work well for small projects*

*Scrum: Based on the idea that systems development involves several environmental and technical variables that are likely to change during the process.*

- a) *Strengths: Project is more manageable, allows for forward progress despite vague/changing requirements, very visible with good communication, frequent feedback from customers*
- b) *Weaknesses: Doesn't work well with large times, requires experienced developers, not good for mission critical projects/systems, large amounts of management required, constant monitoring*

*Extreme Programming: Includes short development cycles, frequent updates, dividing business and technical priorities. Intended to place a large emphasis on testing.*

- a) *Strengths: Project is more manageable, allows for forward progress despite vague/changing requirements, very visible with good communication, frequent feedback from customers*
- b) *Weaknesses: Doesn't work well with large times, requires experienced developers, not good for mission critical projects/systems, large amounts of management required, constant monitoring*

*Rational Unified Process: An iterative process that identifies four phases of a software development project. The four phases are inception, elaboration, construction, and transition. Each phase contains multiple iterations with an executable produced, although not necessarily a complete system.*

- a) *Strengths: Early risk mitigation, manages change well, higher level of reuse, better overall quality, and enhanced team productivity*
- b) *Weaknesses: Not good for small projects, large amount of process guidelines, very detail-oriented*

15. Specifically compare and contrast the traditional waterfall model with the more modern RUP model. Should one always be used over the other? Explain.

*The waterfall model is considered the traditional approach to systems development. It describes a development approach that is linear and sequential, has distinct objectives for each phase, and the output of one phase is the input for the next. Once a phase has been completed in the waterfall model, the activities within that phase cannot be revisited. The primary disadvantage of this model is that it doesn't easily accommodate changes to requirements, as the waterfall model expects that all requirements will be defined at the beginning of the project.*

*In contrast, RUP is an iterative process that identifies four phases of a software development project. Each phase of Inception, Elaboration, Construction and Transition contains one or more iterations where an executable is produced. This approach makes it easier to manage change and allows the project team to mitigate risks earlier.*

*While the waterfall method is best used for highly critical systems where requirements are well known, RUP is more tailored to large projects in which changes in requirements are expected.*

## Answers to Problems and Exercises

1. You work for a large pharmaceutical company that has offices spread out all over the globe. Your boss comes to your office, excited about a new methodology he just read about called Extreme Programming, and he wants you to use it on the new HR application that your group is getting ready to work on. The HR software will track employee information such as job performance, salary, vacation, and so on for all 12,000 employees in all countries, and it will tie into the corporate payroll system. The project team contains members from the United States, the United Kingdom, Singapore, Japan, and India. Write a memo to your boss, explaining why the use of Extreme Programming might not be such a good idea for this project.

*Mr. Lumbergh,*

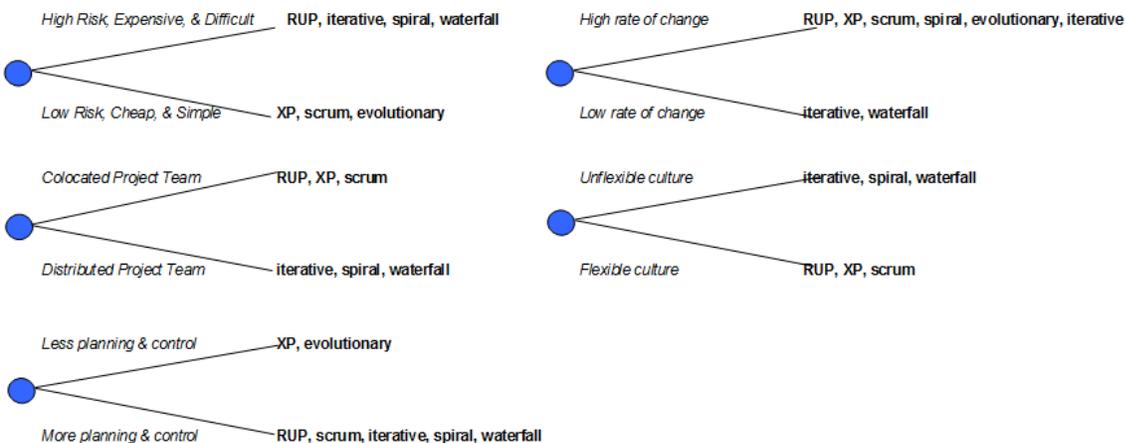
*I have considered your suggestion of eXtreme programming as the methodology of choice for the new HR application that is so critical to our company's success. Having had a great deal of XP experience in my previous position, I must say that this decision should be carefully considered.*

*While XP has been known to make projects more manageable and improve communication among teams, it does not have a good track record with large teams or projects. Further, XP requires experienced developers, which we will likely not find in the outsourced help that has been recruited. Finally, XP is not recommended for mission critical systems like the HR application. A more appropriate methodology that employs risk analysis and works well for complex projects is the Spiral Methodology.*

2. Lori is the newly appointed project manager for the Fultz Metal Works Company, a small \$30 million tool-and-die manufacturer. To remain competitive, the company is launching a series of projects to upgrade all of its computer-aided machinery. The project will be costly and risky for Fultz Metal. Unfortunately, no one in the company is familiar with the new hardware and software. The company wants all work done in house doesn't trust outsiders. If you were offering advice to Lori on the selection of a methodology, what would you say and why?

*Given the circumstances, I would advise Lori to use RUP. The reason for this is because the project is very large, and will almost certainly see changing requirements. Given that the project is a companywide upgrade, quality and reuse are high priorities. Additionally, RUPs focus on process guidelines will fit well with the heavy manufacturing focus of this process.*

3. Based on the following criteria, construct a decision tree to determine the best product development methodology: risk, size both in dollars and effort, company culture, location of team participants, amount of planning and control needed, and rate of environment change.



4. Give some examples of projects you have worked on where you feel the wrong methodology was used and where you feel the right methodology was used. Explain the ramifications of these methodology choices.

*Student answers here will vary greatly but should support their answers with information from the text and outside reading.*

5. Which one(s) of the methodologies described in this chapter do you feel would be the most difficult to manage? Explain. Which do you think is the most successful? Why?

*The most difficult to manage would probably be the Spiral model, due to the expertise in risk management that is required. The RUP might be the most difficult to explain, due to the large volume of process guidelines and detail associated with each process. The most successful methodology depends on the type of project, though the iterative process may work for the greatest number of projects*

6. Write a memo to a nontechnical manager, explaining why a team decided to use an iterative and incremental development methodology on its project.

*The team ultimately utilized the iterative/incremental development methodology for several reasons. The first and foremost reason was the speed with which a working prototype could be produced. This allowed for the development team to design flexible software with more extensive testing and debugging, and the prototype was shown to users early on. This allowed for greater communication between the project team and the users, ultimately resulting in a product that successfully met the users' needs.*

7. As a student, you generally take more than one course during a given semester. Each course requires different amounts of your time, at varying schedules. Many students spend more time on the courses within their major than on others because generally they are more interested in the subject. But students need to be able to balance their time and demonstrate a solid overall GPA. How might the systems approach aid students in budgeting their time and efforts?

*The systems approach would help students to define and focus on all areas of their life to succeed academically, and in their major. A systems approach might take into account adequate rest, exercise, and studies in subjects outside of their major. If students focused on all the factors that*

*affected their ability to perform mentally, manage class work, and demonstrate a solid overall GPA, they would notice areas for improvement in the ways that they balance their time*

8. Explain the difference between systems thinking and analytical thinking. Also, explain why both are important to a project manager.

*Analytical thinking involves directly addressing the individual processes that make up a system. This approach focuses on how inputs are processed and outputs are derived. Systems thinking focuses on a process with the knowledge of how the process fits in the overall organization or system. Systems thinking is intended to view a large, complex system by breaking it down into its smaller individual systems and how they all work in conjunction. Both are important to a project manager because the manager needs to understand the intricacies of the process while at the same time recognizing how the process fits into the overall system.*

9. For an IT project dealing with upgrading all company computers to the latest version of the Windows operating system, list and explain the forces in the environment that may cause problems.

*Some of the environmental factors include company performance and available budget, hardware requirements, software compatibility, electronics disposal regulations and costs for upgrades, ongoing projects which will allow little or no PC downtime, software stability and patches available, expertise and training on the new operating system, and the availability of training courses.*

*This project is likely to be expensive, and may need to be postponed in the event of a budget crunch. Further, the existing software that employees use may or may not be compatible with the operating system, and software that is purchased in the future will need to be compatible with the new operating system. Employee's existing hardware should be compatible with the operating system, otherwise extra downtime and cost will be required to deploy the new OS. If employees or support personnel need to receive training to use and be effective with the new OS, then the availability and cost of that training will impact the project's schedule.*

10. Mark, Pam, and Rick all work in the IT department for a large manufacturing company. Mark supports the accounting department, Pam supports the purchasing department, and Rick supports the quality control department. Mark has started working on a new software application to upgrade the financial software to something that runs on a different operating system than the previous version. Pam is in the middle of a project that involves delivering better custom reports, based on purchasing data. Rick has been asked to develop a new custom system for the quality assurance department that will help the company in receiving ISO 9000 certification. Problems began to surface during the implementation of the new accounting software. It turned out that the new accounting software was not compatible with the old purchasing software and required new information to be tracked by the purchasing agents. Pam was nearly done with her new reports when she found out that they would need to be changed, and the work so far has been wasted. Rick was upset because they would have to stop their work on the ISO 9000 certification until the issues were resolved. Explain how the use of the systems approach could have helped avoid many or even all of these problems.

*The systems approach would have been a great benefit to Mark, Pam, and Rick because they would have addressed these issues at the onset of their individual projects. By using the systems approach, the three IT professionals would have acknowledged how their projects fit into the overall organization and what the potential environmental impacts were. By recognizing how their individual projects fit into the organization, they would have recognized the conflicts which only became apparent to them near the end of their projects. These mistakes proved very costly to their employer.*

### Mini Case Discussion Questions

1. Describe how you would convince Reid and Mark of the value of PPMS's services. Defend the allegations of always using a rigid process to increase billable hours. Respond to the statement that Mark could hire a programmer, and the project would be completed in one-third the time and at one-third the cost (even though the requirements haven't even been fully determined yet) and that they could start programming in two days. What compromises might you suggest to make Reid feel more comfortable about his decision?

*Students will have a variety of answers but should cover the following points: the value of planning, the idea that PPMS has provided a flexible methodology, multiple vendors will be involved in this project so coordination will be important, the tools proposed by A.J. are not very scalable, also students could look at chapter 9 of the text to research the proper way to run a procurement process.*

2. You are Jeff and Kevin, and you know there is a risk that A.J. might sabotage the project. How do you approach Reid with your fears, and at what cost? How do you "manage" Mark? You know he doesn't trust you because his beliefs have already been biased by A.J. Is there anything you can do to win him over? Finally, how do you deal with A.J.? Personally, you can't fire him, so how do you manage the relationship so it will not affect the project? How can you convince A.J. that if he stays in line, it can be a win-win situation?

*Students will have a variety of answers but should include a way to include A.J. in the project, making him a part of what is going on and teaching him the value of a repeatable process. The old adage of "keep your friends close and your enemies closer."*