



**EM 612**  
**Project Management of Complex  
Systems**

**Presented by**

**Stevens Institute of Technology  
School of Systems and Enterprises  
Castle Point on Hudson  
Hoboken, NJ 07030**

**Getting Started – Module 0**  
**Introduction and Overview of the Course**



## **0.1. Welcome to SYS 612: Project Management of Complex Systems**

Project Management of Complex Systems is a project-based course that exposes students to tools and methodologies useful for the effective management of systems engineering and engineering management projects. This course presents the tools and techniques for project definition, work breakdown, estimating, resource planning, critical path development, scheduling, project monitoring and control, and scope management. Reinforcing these fundamentals in project management, the course will introduce advanced concepts in project management, and establish the building blocks for the management of complex systems.

## **0.2. Course Objectives**

Project Management of Complex Systems aims to:

- Build a solid foundation in the guidelines and principles of project management.
- Identify considerations in creating a project organization, culture, and team.
- Learn how to apply quantitative techniques to project planning, risk, performance, and monitoring.
- Build a fundamental understanding of the tools of project management.
- Establish the building blocks for the management of complex systems.

## **0.3. Course Outline**

SYS 612 has been developed to reinforce the fundamental of project management and introduce the concepts of project management for complex systems. The course content will include text, lecture notes, class discussion and assignments/homework. The texts for this class are viewed as building blocks for a systems approach to project management. Material covered in the lectures will be supported by the text and will cover additional topics that are not fundamental to project management, but innovative in their thinking about project management. Because project management of complex systems is still a new and evolving area, material from academic research will be used in the lectures and provided as additional readings to introduce advanced concepts in project management and complex systems.

## 0.4. Syllabus and Schedule

Module	Subject	Notes/Reading/Assignments
0	Review Getting Started Course Administrative <ul style="list-style-type: none"> <li>• Course Expectations</li> <li>• Schedule for Week</li> </ul>	
1	Executive Overview of Project Management <ul style="list-style-type: none"> <li>• What is a Project and Project Management</li> <li>• What is Program Management</li> <li>• Benefits and Obstacles of Project Management</li> <li>• Basic Concepts of Project Management</li> <li>• Defining Roles of Leadership in a Project</li> <li>• What are Complex Systems</li> </ul>	<p>“The Alaska Pipeline” <i>American Experience</i>. Public Broadcasting System (in-class DVD; not available in web classes)</p> <p>“Why Your Business Success Depends on Projects,” Shenhar and Dvir, <i>Reinventing Project Management</i>, pg. 3-19</p> <p>Hobday, Rush, Tidd (2000) Innovation in complex products and system. <i>Research Policy</i> 29:793-804 (<i>optional</i>)</p> <p><b>“Denver International Airport (DIA),” <i>PM Case Studies</i>, Kerzner, pg. 517 (read for homework)</b></p>
2	Bounding Project Scope <ul style="list-style-type: none"> <li>• Stakeholders</li> <li>• Requirements</li> </ul> Project Classification Frameworks Creating the Project Charter <ul style="list-style-type: none"> <li>• Charter Elements</li> <li>• Examples</li> </ul>	<p>“What Makes a Project Successful,” Shenhar and Dvir, <i>Reinventing Project Management</i>, pg. 21-36</p> <p>“The Diamond Approach,” Shenhar and Dvir, <i>Reinventing Project Management</i>, pg. 37-59</p> <p>Carr (2000) Requirements engineering and management: the key to designing quality complex systems. <i>The TQM Magazine</i> 12(6):400-407 (<i>optional</i>)</p> <p><b>Part 1 of DIA (team homework, due next class)</b></p> <p><b>“Goshe Corporation,” <i>PM Case Studies</i>, Kerzner, pg. 43 (read for homework)</b></p> <p><b>“Como Tool and Die (A),” <i>PM Case Studies</i>, Kerzner, pg. 153 (read for homework)</b></p>
3	Leading and Managing the Project Team <ul style="list-style-type: none"> <li>• Difference Between Management and Leadership</li> <li>• Power and the Influencing of Behavior</li> <li>• Situational Aspect of Leadership Styles and Follower Readiness</li> <li>• Team-Building and Conflict Resolution Techniques</li> <li>• Successful Motivation Practices</li> <li>• Effective Leader Communications</li> </ul>	<p>“Novelty,” Shenhar and Dvir, <i>Reinventing Project Management</i>, pg. 63-78</p> <p>Read Leadership Paper (<i>optional</i>)</p> <p>Davies and Brady (2000) Organisational capabilities and learning in complex product systems: towards repeatable solutions. <i>Research Policy</i> 29:931-953 (<i>optional</i>)</p>

4	<p>Work Breakdown and Organizational Structures</p> <ul style="list-style-type: none"> <li>• Work Breakdown Structure</li> <li>• Organizational Structures</li> <li>• Selecting the Organizational Form</li> <li>• Selecting the Project Manager</li> <li>• Building the Project Team</li> <li>• Complex Systems: Organizational Issues</li> </ul>	<p>“Technology,” Shenhar and Dvir, <i>Reinventing Project Management</i>, pg. 79-100</p> <p>Hobday (2000) The project-based organization: an ideal form for managing complex products and systems? <i>Research Policy</i> 29:871-893 (optional)</p> <p><b>Part 2 DIA (team homework, due next class)</b></p>
5	<p>Task Planning</p> <p>Introduction to Estimation</p> <ul style="list-style-type: none"> <li>• Time Estimates</li> <li>• Equipment Driven Activities</li> </ul> <p>Labor-Driven Activities</p> <p>The RAM</p>	<p>“Complexity,” Shenhar and Dvir, <i>Reinventing Project Management</i>, pg. 101-121</p> <p>Jolivet and Navarre (1996) Large-scale projects, self-organizing and meta-rules: towards new forms of management. <i>International Journal of Project Management</i> 14(5):265-271 (optional)</p> <p>Read Software Cost Estimation: Metrics and Models (optional)</p> <p><b>Part 3 DIA (team homework, due next class)</b></p>
6	<p>Project Network Modeling</p> <ul style="list-style-type: none"> <li>• Introduction to Networks</li> <li>• Creating the Network</li> <li>• Determining the Critical Path</li> <li>• Gantt Charts</li> <li>• Fast-Tracking The Project Schedule</li> </ul>	<p>“Pace,” Shenhar and Dvir, <i>Reinventing Project Management</i>, pg. 123-135</p> <p>Introduction to Networks and Solution Algorithms for PERT Networks (optional)</p> <p>Probability in a PERT Network (optional)</p> <p>Ivory and Alderman (2005) Can Project Management Learn Anything from Studies of Failure in Complex Systems? <i>Project Management Journal</i> 36(3):5-16 (optional)</p>
7	<p>Project Management Software</p> <ul style="list-style-type: none"> <li>• MS Project and Other Software Packages</li> <li>• Gantt Charts</li> </ul> <p>MS Project Tutorial</p> <ul style="list-style-type: none"> <li>• Practical Knob-ology</li> <li>• Example Gantt Chart</li> </ul> <p>Resource Leveling and Project Budget</p> <ul style="list-style-type: none"> <li>• Resource Leveling</li> <li>• Generating a Project Budget</li> <li>• Management Reserve/Contingency Funds</li> <li>• Budget Estimation Tips</li> </ul>	<p>“Managing Projects for Business Innovation,” Shenhar and Dvir, <i>Reinventing Project Management</i>, pg. 139-160</p> <p>Florice and Miller (2001) Strategizing for anticipated risks and turbulence in large-scale engineering projects. <i>International Journal of Project Management</i> 19:445-455 (optional)</p> <p><b>Load MS Project Before This Class</b></p> <p>“Ducor Chemical,” <i>PM Case Studies</i>, Kerzner, pg. 237 517 (read for homework)</p> <p><b>Part 4 &amp; 5 DIA (team homework, due next class)</b></p>

8	<p>Project Control</p> <ul style="list-style-type: none"> <li>• Elements of Project Control</li> <li>• Earned Value Analysis</li> <li>• Change Control and Configuration Management</li> </ul> <p>Introduction to Final Project (online discussion)</p>	<p>“Managing Projects Within the Existing Organization,” Shenhar and Dvir, <i>Reinventing Project Management</i>, pg. 161-187</p> <p>Glass (1996) Chaos, Non-Linear System and Day-to-Day Management. <i>European Management Journal</i> 14(1):98-106 (optional)</p> <p><b>Homework I, Earned Value (individual assignment, due next class)</b></p>
9	<p>Project Quality Management</p> <ul style="list-style-type: none"> <li>• Project Metrics</li> <li>• Calculate Performance Metrics</li> <li>• Quality Control</li> <li>• Quality Assurance</li> </ul>	<p>“How Markets and Industries Affect Project Management,” Shenhar and Dvir, <i>Reinventing Project Management</i>, pg. 189-203</p> <p>Hobday (1998) Product complexity, innovation and industrial organization. <i>Research Policy</i> 26:689-710 (optional)</p> <p><b>Homework II, Shea Stadium (due last class)</b></p>
10	<p>Contracting and Sub-contracting</p>	<p>“Reinventing Project Management for Your Organization,” Shenhar and Dvir, <i>Reinventing Project Management</i>, pg. 205-213</p> <p>Eriksson and Lillieskold (2002) Project Management Competence Requirements when Procuring Complex Systems. <i>IEEE</i> (optional)</p> <p><b>“The Space Shuttle Challenger Disaster,” PM Case Studies (read for homework)</b></p>
11	<p>Risk Management</p> <ul style="list-style-type: none"> <li>• Risk Management Process</li> <li>• Identifying Risks</li> <li>• Qualitative and Quantitative Techniques</li> <li>• Risk Mitigation</li> </ul>	<p>Appendix 4, 5A &amp; 5B, Shenhar and Dvir, <i>Reinventing Project Management</i></p> <p>Miller and Lessard (2001) Understanding and managing risks in large engineering projects. <i>International Journal of Project Management</i> 19:437-443 (optional)</p> <p><b>“The Space Shuttle Challenger Disaster,” PM Case Studies (read for homework)</b></p> <p><b>Part 6 DIA (team homework, due next class)</b></p>
12	<p>Evaluating, Directing, and Closing Out a Project</p> <ul style="list-style-type: none"> <li>• Independent Assessments</li> <li>• Project Closeout</li> <li>• Lessons Learned</li> </ul>	<p>Appendix 6A, 6B, &amp; 7, Shenhar and Dvir, <i>Reinventing Project Management</i></p> <p>Williams (1999) The need for new paradigms for complex projects. <i>International Journal of Project Management</i> 17(5): 269-273 (optional)</p> <p><b>“Quantum Telecom,” PM Case Studies, Kerzner, pg. 329 (read for homework)</b></p>
13	<p>Business Ethics</p> <p><i>Enron - The Smartest Guys in the Room</i> (DVD)</p>	<p><b>Final Project Due One Week from Final Class (instructor will notify of exact date and submission requirements)</b></p>

## 0.5. Assignments

SYS 612 employs both individual and project teams to facilitate the learning process. There will be two individual assignments and two team assignment (6 Parts of DIA and final project). Each team will consist of three to five students who work on the final project and team homework assignments throughout the class. The class is divided into modules. These modules include lecture notes and other resource materials which students use to complete the assignments, and learn more about the subject. All assignments should be submitted to the instructor via email by the assigned due date.

## 0.6. Lecture Notes and Text

Students will notice that lecture notes have been prepared from presentation slides originally. Slides are titled to follow the syllabus with descriptive subtopics. Reviewing the material with other members of their team, applying it in the team project, participating in the discussion, and reviewing the text all play a role in developing an understanding. Students are encouraged to rely on the entire process rather than struggle to understand a particular point that may seem unclear in the slides.

### TEXT:

1. Aaron Shenhar and Dov Dvir, *Reinventing Project Management: The Diamond Approach to Successful Growth and Innovation*, Harvard Business Press; ISBN:978-1-59139-800-4
2. Harold Kerzner, *Project Management Case Studies* (Paperback), 2<sup>nd</sup> Ed. (January 3, 2006), Wiley; ISBN: 0471751677

## 2.1. Grading

Graded Events	Quantity	Points Ea	Total Pts
Denver International Airport Parts 1-6 (Team)	6	20	120
HW I Earned Value (Individual)	1	60	60
HW II Shea Stadium (Individual)	1	100	100
Participation in Discussions			60
Final Project (Team)	1	140	140
Completing Student Profile*	1	20	20
Course Total			500

\* Online classes only. 20 points will be added to the final project for non-online classes.

### GRADING AND CRITERIA FOR PASSING:

- (1) Turn in all written material (see Lesson Schedule).
- (2) Final grades will be awarded in accordance with the following scale:

Grade	Percentage
A	90 - 100
B	80 - 89
C	70 - 79
F	<70

## 2.2. Criteria for Course Completion

In order to successfully complete the course, each student must:

- a) Complete a **student profile** at the beginning of the course.
- b) Ensure that **assignments** are **submitted on time** for each module for which they are assigned.
- c) Participate in the **class discussions**.
- d) Contribute to the **team project**.
- e) Complete the **evaluation form** at the end of the course