Introduction to Project Management (PM101)
Section 7 – Developmental Methodologies

Workbook
Developmental Methodologies
Developmental Methodologies

Project Management & Development Methodologies

- Project management defines the overarching framework. It represents the basic guidelines.
- Developmental methodologies define the detailed process used.
- They are equally important and required knowledge of all project managers.
Developmental Methodologies

- Project Mgmt
- Process Groups
- Life Cycle
- Development Methodologies

- Initiation Processes
- Monitoring & Controlling Processes
- Planning Processes
- Executing Processes
- Closing Processes
Developmental Methodologies

- **Linear**
  - Well Known Risks
  - Sequential
  - Limited Scope Change
  - Waterfall: MIL-STD-498
  - MIL-STD-1521B
  - MIL-STD-2167A
  - DOD-STD-2167A

- **Iterative**
  - Low Formality
  - Little Documentation
  - Limited Process
  - Spiral: RUP
  - RUP

- **High Formality**
  - Well-Documented
  - Rigid Process
  - Significant Number of Steps
  - CMM
  - CMMI

- **Potential for Unknown Risks**
  - Significant Scope Change & Feedback

- **Code / Fix**
Developmental Methodologies
Three Major Types

- Waterfall (SDLC the most common type of this)
  - Is the oldest
  - Good for transaction or legacy systems

- Spiral
  - Offers prototyping
  - Can use other methodologies

- Agile
  - XP, SCRUM and APM are types
  - Offer the most flexibility
  - Requires the most experience and integration of team
Developmental Methodologies
The Basic Waterfall Model

- Analysis
- Design
- Development
- Testing
- Deployment
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Keys to the Waterfall Model

- Its key advantages include:
  - Easy compartmentalization.
  - It is the most well-known methodology.

- Its key disadvantages include:
  - It struggles to deal with scope change.
  - It does not allow for product learning.
  - It does not allow for process adaptation.
Developmental Methodologies
Waterfall Keys Challenges

- Real projects rarely follow the sequential flow of the waterfall model.
- At the beginning of a project requirements can often be uncertain.
- Developing in a waterfall model can be a long process without yielding any results until the very end.
Developmental Methodologies
The Spiral Development Cycle

1. Determine Objectives
   Requirements, Alternatives, & Constraints

2. Evaluate Alternatives & Prototypes

3. Determine Next Level

4. Plan Next Level
Developmental Methodologies

Advantages of the Spiral Model

- The spiral model is evolutionary.
- The spiral model provides strong focus on project risk.
- Prototypes allow for rapid evaluation.
- Can incorporate other models within iterations as special cases.
developmental methodologies
Challenges of the Spiral Model

- Team must have strong risk assessment expertise.
- Potentially less ability to control costs and schedule overruns.
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Prototyping

- Prototyping assumes it is often difficult to know all the requirements at the beginning of the project.

- Prototyping requires the developer to build a simplified version of the proposed system and present it to the customer as part of the development process.

- The prototype should never be deployed!
Reasons to Prototype

- Prototypes can be used to complete requirements analysis.
- Prototypes can account for design uncertainty.
- Prototypes can allow experimentation and comparison of multiple solutions.
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Dangers of Prototyping

- **False Expectations** – “the system is now complete”.
- **Increased Expense** – must develop prototype and production system.
- **Poorly Designed Systems** – Prototyping focuses on rapid development which can lead to heavy layering and a failure to make global considerations.
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Agile Development Values...
- Individuals & Interactions OVER Processes & Tools.
- Customer Collaboration OVER Contract Negotiations.
- Responding to Change OVER Following a Plan.
- Working Software OVER Comprehensive Documentation.
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The 12 Principles of Agile Software

1. Our highest priority is to satisfy the customer through early and continuous delivery of valuable software.
2. Welcome changing requirements, even late in development. Agile processes harness change for the customer's competitive advantage.
3. Deliver working software frequently, from a couple of weeks to a couple of months, with a preference to the shorter timescale.
4. Business people and developers must work together daily throughout the project.
5. Build projects around motivated individuals. Give them the environment and support they need, and trust them to get the job done.
6. The most efficient and effective method of conveying information to and within a development team is face-to-face conversation.
7. Working software is the primary measure of progress.
8. Agile processes promote sustainable development. The sponsors, developers, and users should be able to maintain a constant pace indefinitely.
9. Continuous attention to technical excellence and good design enhances agility.
10. Simplicity—the art of maximizing the amount of work not done—is essential.
11. The best architectures, requirements, and designs emerge from self-organizing teams.
12. At regular intervals, the team reflects on how to become more effective, then tunes and adjusts its behavior accordingly.
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XP Is Customer Focused

- The customer is the individual or group who actually uses the product to generate business value (Users).
- Customers or Users define features or requirements.
- Stakeholders are people who define constraints (Sponsors).
- Stakeholders define schedule and cost objectives.
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XP, How Does It Work?

- Short timeboxes are fixtures.
- Customers get to schedule and prioritize features.
- Customers respond to real versions of the product they can use.
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Iteration 0

- Critical to Agile Methods.
- Iteration 0 produces the architecture and feature list.
- No useable functionality is produced in Iteration 0.
- Iteration or milestone plan is critical to completion.
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The Basic Steps

- **Envision** – determine the product vision project community, and how the team will work together.
- **Speculate** – develop a feature-based release, milestone, and iteration plan to deliver on the vision.
- **Explore** – deliver tested features in a short timeframe, constantly seeking to reduce the risk and uncertainty of the project.
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The Basic Steps

- Adapt – review the delivered results, the current situation, and the team’s performance, and adapt as necessary.
- Close – conclude the project, pass along key learnings and celebrate.
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Tools For Agile Development

- The Vision Box
- The Project Datasheet
- The Iterative Feature Plan
- The Work Breakdown Structure (can also be a Feature Breakdown Structure)
Developmental Methodologies

Feature Cards

- Can be used as part of Displayed Thinking.
- Front of card contains business feature information.
- Back of card contains technical information.
### Developmental Methodologies

<table>
<thead>
<tr>
<th>Methodology</th>
<th>Type</th>
<th>Strengths &amp; Necessary Conditions</th>
</tr>
</thead>
<tbody>
<tr>
<td>Waterfall</td>
<td>Serial</td>
<td>Known &amp; agreed upon requirements</td>
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<tr>
<td></td>
<td></td>
<td>Well understood systems architecture</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Stable requirements</td>
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<td></td>
<td></td>
<td>Stable team</td>
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<tr>
<td>Spiral</td>
<td>Cyclical</td>
<td>Manages technical risks</td>
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<tr>
<td></td>
<td></td>
<td>Prototyping</td>
</tr>
<tr>
<td>Agile</td>
<td>Cycles of Chunks</td>
<td>Constant access to customers</td>
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<tr>
<td></td>
<td></td>
<td>Team size 6 to 10</td>
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<tr>
<td></td>
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<td>Very senior self-managing team</td>
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<tr>
<td></td>
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<td>Manages technical risks</td>
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<tr>
<td>Code &amp; Fix</td>
<td>Random</td>
<td>Unplanned projects</td>
</tr>
</tbody>
</table>
Developmental Methodologies

Selecting A Methodology

- The best methodology hinges on four factors:
  - Project manager’s experience
  - The project team
  - The product or service of the project
  - The organization

- The relationship between these four is key.
Questions and Answers
Review Questions:

1. Which of the following statements about development methodologies is false?
   A. Project management defines the overreaching management
   B. Developmental methodologies define how the technical work is done
   C. Development methodologies and project management cover the same areas
   D. They are equally important and require knowledge of all project managers

2. Which of the following statements is true concerning the waterfall development model?
   A. It is relatively new
   B. The waterfall model is good for transaction or legacy systems
   C. All projects can be completed with the waterfall model
   D. The waterfall model has the fewest requirements risks

3. Which of the following statements is true concerning the spiral development model?
   A. The spiral model is one of the only models that offers prototyping
   B. Other methodologies cannot be used with the spiral model
   C. The spiral model requires all requirements to be defined at the beginning of the project
   D. The spiral model does not provide stage-gates for management

4. Which of the following statements is true concerning the Agile family of development methodologies?
   A. Agile development is easy to do and does not require an experienced team
   B. Agile development does not require much input from the business
   C. Agile development is very good at managing cost and schedule risks
   D. Agile development requires an experienced and integrated team

5. In an organization where all work is managed by a highly functional structure, which methodology is most likely to be successful?
   A. Waterfall
   B. Spiral
   C. Agile
   D. There is not enough information to determine
6. Which of the following is a key advantage of the waterfall methodology?
   A. It forces business and technical people to work closely together
   B. It provides tools that make it easy to change scope
   C. It provides the easiest compartmentalization and managerial control
   D. It provides the best risk management

7. Which of the following is a key disadvantage of the waterfall methodology?
   A. It does not offer easy stage gates
   B. It does not allow for process adaptation
   C. It does not allow for good documentation
   D. It does not focus enough on project quality

8. The most common implementation of the waterfall model is what?
   A. Extreme Programming
   B. Rational Unified Process
   C. Software Development Life Cycle
   D. None of the above

9. Each of the following is a step in the spiral methodology except:
   A. System analysis
   B. Evaluate alternatives
   C. Prototype
   D. Determine next level

10. Which of the following is NOT an advantage of the spiral methodology?
    A. The spiral model provides strong focus on project risk
    B. Prototypes allow for rapid evaluation
    C. Can incorporate other models within iterations as special cases
    D. The spiral method provides the easiest compartmentalization and assignment of work
**Answer Key:**

1. C
   Development methodologies and project management do not cover the same areas.

2. B
   The waterfall model is good for transaction or legacy systems and is the oldest development model.

3. A
   The spiral model is one of the only models that offers prototyping and can use other methodologies.

4. D
   Agile development offers the most flexibility and requires an experienced and integrated team. XP, SCRUM, and APM are all types of Agile development.

5. A
   The waterfall methodology is most likely to be successful in an organization where all work is managed by a highly functional structure.

6. C
   The waterfall methodology provides the easiest compartmentalization and managerial control and is the most well-known methodology.

7. B
   The waterfall methodology does not allow for process adaptation, which is a key disadvantage.

8. C
   The Software Development Life Cycle is the most common implementation of the waterfall model.

9. A
   The final step in the spiral methodology is to plan the next level, not system analysis.
10.D
Providing the easiest compartmentalization and assignment of work is not an advantage of the spiral methodology.