Agile Software Development

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Lecture 1

Agile Development: Basics
**Software Development Methodology (SDM)**

- A framework for applying software engineering practices with the specific aim of providing the necessary means for developing software-intensive systems

- Consisting of two main parts:
  - A set of modeling conventions comprising a *Modeling Language* (syntax and semantics)
  - A *Process*, which
    - provides guidance as to the order of the activities,
    - specifies what artifacts should be developed using the *Modeling Language*,
    - directs the tasks of individual developers and the team as a whole, and
    - offers criteria for monitoring and measuring a project’s products and activities.
Object-Oriented Software Development Methodology (OOSDM)

- Specifically aimed at viewing, modeling and implementing the system as a collection of interacting objects

- First appeared in late 1980s

- Categorized as
  - Seminal (First and Second Generations)
  - Integrated (Third Generation)
  - Agile

- UML was the result of the ‘war' among seminal methodologies

- Process has now replaced modeling language as the main contentious issue
Agile Development: Brief History


- The once-common perception that agile methodologies are nothing but controlled code-&-fix approaches, with little or no sign of a clear-cut process, is only true of a small – albeit influential – minority.

- Essentially based on practices of program design, coding and testing that are believed to enhance software development flexibility and productivity.

- Most agile methodologies incorporate explicit processes, although striving to keep them as lightweight as possible.
Major Agile Methodologies

- Scrum (1995)
- FDD – Feature-Driven Development (1999)
- DAD – Disciplined Agile Delivery (2012)
Agile Methodologies: Agile Manifesto

We are uncovering better ways of developing software by doing it and helping others do it. Through this work we have come to value:

- **Individuals and interactions** over processes and tools
- **Working software** over comprehensive documentation
- **Customer collaboration** over contract negotiation
- **Responding to change** over following a plan

That is, while there is value in the items on the right, we value the items on the left more.
Agile Methodologies: Principles

- Our highest priority is to satisfy the customer through early and continuous delivery of valuable software.

- Welcome changing requirements, even late in development. Agile processes harness change for the customer’s competitive advantage.

- Deliver working software frequently, from a couple of weeks to a couple of months, with a preference to the shorter timescale.

- Business people and developers must work together daily throughout the project.
Agile Methodologies: Principles (Contd.)

- Build projects around motivated individuals. Give them the environment and support they need, and trust them to get the job done.

- The most efficient and effective method of conveying information to and within a development team is face-to-face conversation.

- Working software is the primary measure of progress.

- Agile processes promote sustainable development. The sponsors, developers, and users should be able to maintain a constant pace indefinitely.
Agile Methodologies: Principles (Contd.)

- Continuous attention to technical excellence and good design enhances agility.

- Simplicity—the art of maximizing the amount of work not done—is essential.

- The best architectures, requirements, and designs emerge from self-organizing teams.

- At regular intervals, the team reflects on how to become more effective, then tunes and adjusts its behaviour accordingly.
Applicability of Agile Development

- Agile development is not the proper solution in all problem situations.

- We will discuss agile development’s applicability based on the categories of problem situations proposed by the Cynefin Framework.

  - Cynefin, pronounced ‘ku-nev-in’, is a Welsh word for **habitat**: It signifies the factors in our environment/experience that influence us in incomprehensible ways.

  - The Cynefin Framework is a sense-making framework that helps us understand the situation in which we have to operate, and decide on a situation-appropriate approach.

    - Defines and compares the characteristics of five different domains: **Simple (Obvious)**, **Complicated**, **Chaotic**, **Complex**, and **Disorder**.
Cynefin Framework

Complex
Probe, Sense, Respond
- Explore to learn about problem, then inspect, and then adapt
- Requires creative/innovative approaches
- Create safe-fail environment for experimentation to discover patterns
- Increase levels of interaction/communication
- Domain of emergence
- We'll know in hindsight
- More unpredictable than predictable

Complicated
Sense, Analyze, Respond
- Assess the situation, investigate several options, base response on good practice
- Use experts to gain insight
- Use metrics to gain control
- Domain of good practices
- Multiple right answers
- Cause and effect are discoverable but not immediately apparent
- More predictable than unpredictable

Chaotic
Act, Sense, Respond
- Act immediately, then inspect to see if situation has stabilized, then adapt to try to migrate context to complex domain
- Many decisions to make; no time to think
- Immediate action to reestablish order
- Look for what works instead of right answers
- Domain of the novel
- No one knows
- No clear cause and effect

Simple
Sense, Categorize, Respond
- Assess situation facts, categorize them, base response on established practice
- Domain of best practices
- Stable domain (not likely to change)
- Clear cause-and-effect relationships are evident to everyone
- A correct answer exists
- Fact-based management

[Rubin 2012]
Cynefin: Complex Domain

- In complex problems, things are more unpredictable than they are predictable.
- If there is a right answer, we will know it only with hindsight; this is the domain of emergence.
- We need to **probe** to learn about the problem, then **sense** and **respond** based on our learning.
- Working in complex domains requires creative and innovative approaches. Routine solutions simply don’t apply.
- We need to create a safe-fail environment for experimentation so that we can discover important information.
- In this environment high levels of interaction and communication are essential.
- Innovative new-product development falls into this category, as does enhancing existing products with innovative new features.
- Agile methodologies are particularly well suited for operating in a complex domain.
Cynefin: Complicated Domain

- In complicated problems, things are more predictable than unpredictable.
- Complicated problems are the domain of good practices dominated by experts.
- There might be multiple right answers, but expert diagnosis is required to figure them out.
- The approach is to sense what’s coming in, analyze using expert knowledge, and respond by deciding on and applying good practices.

Suitable methodologies:
- Lighter agile methodologies such as Scrum can work in a complicated domain (e.g., software maintenance), but they might not be the best solutions.
- Heavier agile methodologies such as DSDM and DAD are better suited because they are analysis and design processes based on expert knowledge and good practices.
- As complexity increases, model-based heavyweight methodologies prevail.
Cynefin: Simple (Obvious) Domain

- In simple (obvious) problems, the domain is stable and everyone can see cause and effect.
- Often the right answer is obvious and undisputed.
- This is the domain of legitimate best practices; there are known solutions.
- Once we **assess** the facts of our situation and **categorize** them, we can **respond** by determining and applying the proper predefined solution.
- Agile methodologies can be used in a simple (obvious) domain, but they may not be the most efficient tools.
  - Using a process with a well-defined, repeatable set of steps that are known to solve the problem would be a better fit.
  - For example, if we want to reproduce the same product over and over again, a well-defined assembly-line process would be a better fit than Scrum.
Cynefin: Chaotic Domain

- In chaotic problems, there is a crisis and we need to act immediately to prevent further harm and reestablish at least some order.
- There is no clear cause and effect.
- There are many decisions to make, and no time to think.
- No one knows the answers.
- We have to look for what works instead of the right answers.
- We need to **act** immediately, then **inspect** to see if the situation has stabilized, and then **adapt** to migrate the context to the complex domain.
- Agile methodologies are not the best solutions in a chaotic domain.
  - In such domains, we are not interested in prioritizing a backlog of work and determining what work to perform in the next iteration. We need to **act** fast.
Cynefin: Disorder

- You are in the disorder domain when you don’t know which of the other domains you are in.
  
  □ This is a dangerous place to be because you don’t know how to make sense of your situation.

  □ In such cases, people tend to interpret and act according to their personal preferences for action; this is often a recipe for disaster.

- When in the disorder domain, the way out is to break down the situation into constituent parts and assign each to one of the other four domains.

- You are not trying to apply methodologies in the disorder domain; you are trying to get out of this domain.
Interrupt-Driven Contexts

- Plan-based agile methodologies (such as Scrum) are not well suited to **highly interrupt-driven** (or request-driven) work.
  - Interrupts may disrupt your plans and constantly change your priorities, prohibiting reliable planning of iterations of a week or more.
  - For example, during product support, the plan (or backlog) is populated continuously as you receive support requests.

- In interrupt-driven environments you would be better off considering an alternative agile approach called **Kanban**.
  - Kanban is not a stand-alone process solution, but instead an approach that is overlaid on an existing process.
Cynefin and Software Development

- The many facets of software development and support will not fit nicely into just one Cynefin domain.

- Most software development work falls in the domains of complicated or complex.

- However, software development is a rich endeavor, with aspects that overlap and activities that fall into all of the different domains.
  - It should be noted that the spectrum of work can range from innovative new-product development to maintenance/support.
References


