BITS Pilani
presentation

K.Anantharaman
Faculty CS Department
kanantharaman@wilp.bits-pilani.ac.in

BITS Pilani

Pilani Campus

BITS Pilani

Pilani Campus

SE ZG544 S1-24-25 , Agile Software Processes Lecture No. 1, Module-1 - Agile Methods - An Introduction

Introduction

1. Faculty introduction
2. Email Id : kanantharaman@wilp.bits-pilani.ac.in
3. e-learn portal: https://elearn.bits-pilani.ac.in/
4. Course Handout

Evaluation Scheme

EC #	Name	Type	Weight	Duration	Schedule
EC-1A	Quiz-1	Online	5%	1 Week	September 1-10, 2024
EC-1B	Quiz-2	Online	5%	1 Week	October 10-20, 2024
EC–1C	Assignment	Take-home	15%	2-4 Weeks	November 1-10, 2024
EC-2	Mid-Sem Exam.	Closed Book	35%	2 Hrs.	Saturday, 21/09/2024 (AN)
EC-3	End-Sem Exam.	Open Book	40%	2 ½ Hrs.	Saturday, 30/11/2024 (AN)

BITS Pilani, Pilani Campus

Additional Reference Books

1. Agile Practice Guide (ENGLISH) by Project Management Institute Published by Project Management Institute, 2017 (Agile methodologies)

2. Head First Agile by Jennifer Greene; Andrew Stellman Published by O'Reilly Media, Inc., 2017 (Scrum)

3. Introduction to Agile Methods by Sondra Ashmore Ph.D.; Kristin Runyan Published by Addison-Wesley Professional, 2014 (XP)

Poll

- https://forms.gle/wRadsyQREA3BpkE26

Objective:
- Online poll to understand the expectations of students attending this course.

- Link

BITS Pilani, Pilani Campus

Module-1 – Topics

- Traditional software development practices

- Need for Agile Methods

- Benefits of Agile Methods

BITS Pilani, Pilani Campus

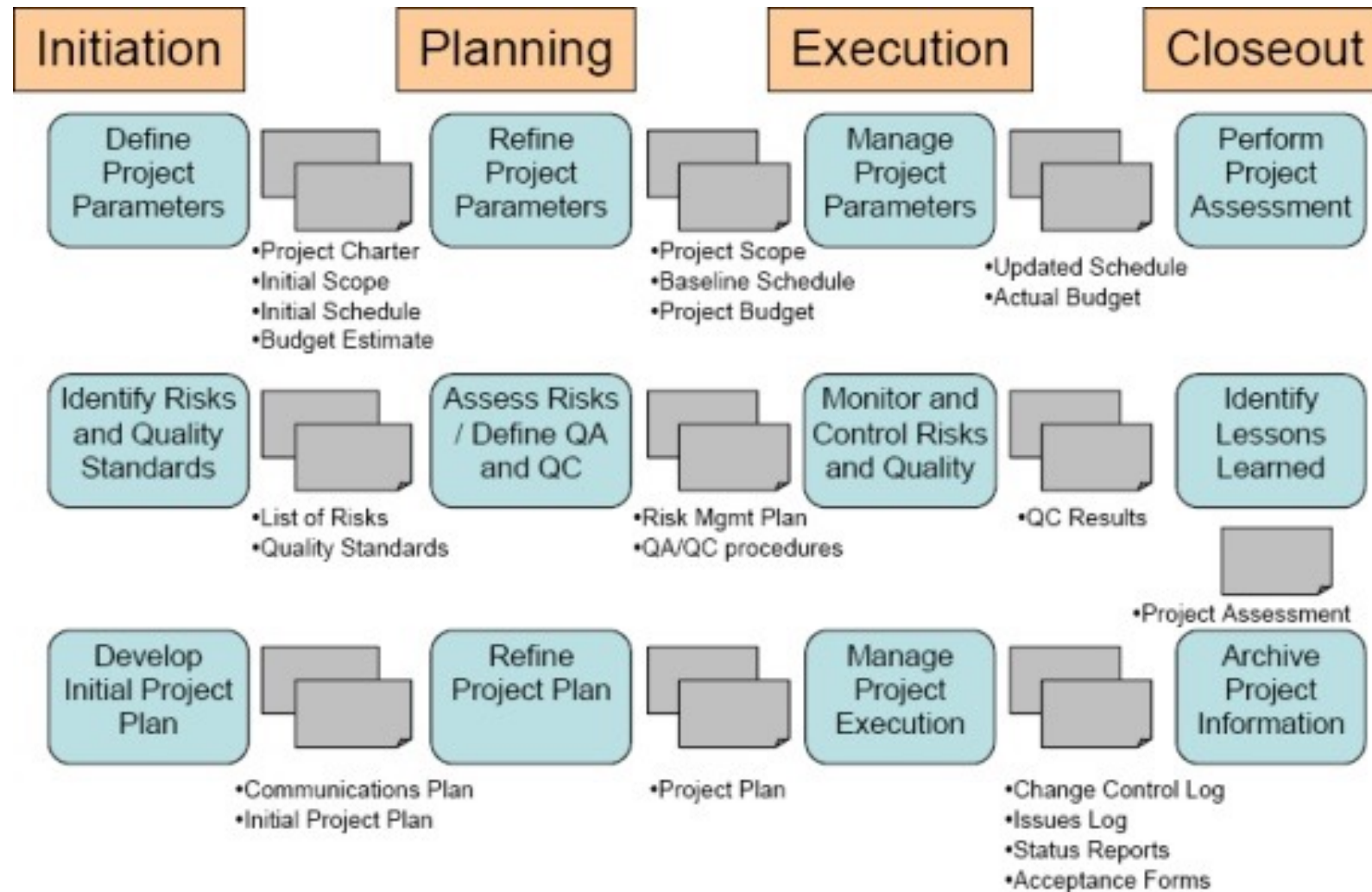# Basic Project Management concepts

- ## What is a Project?

  - Definite Start-End date, Temporary, Scope(Produce Specific result) ,

    Budget/Effort – Example: Building a house

- ## Project Management Life Cycle Phases

  - Initiation, Planning, Execution, Closeout, Monitoring & Control

- ## System Development Life Cycle/phases (SDLC)

  - Requirements, Design, Construction, Implementation
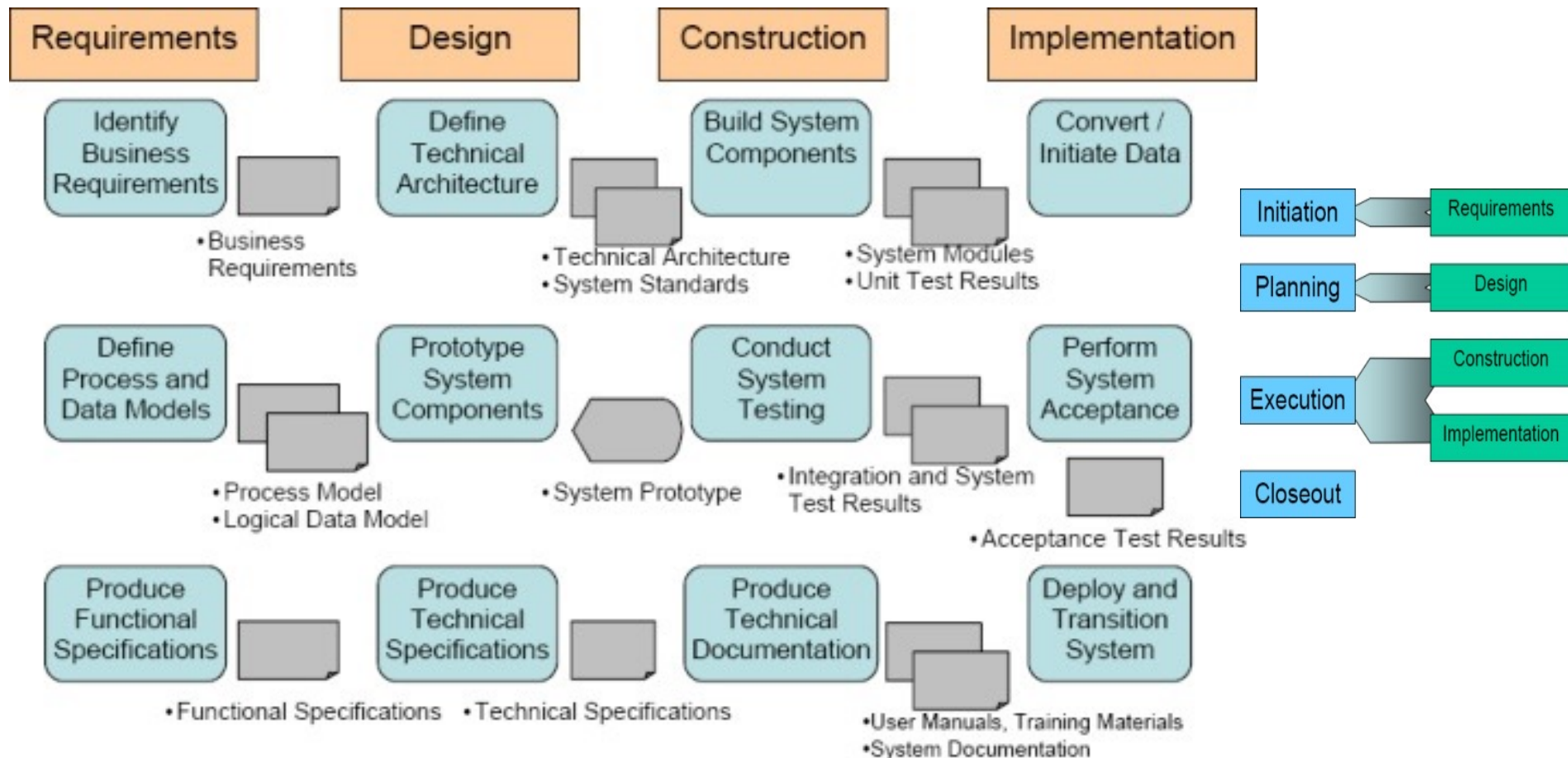
What is a Project?

- A project is a planned program of work that requires a **definitive amount of time, effort, and planning** to complete.

- Projects have **goals and objectives** and often must be completed in **some fixed period of time and within a certain budget.**

- Development Project
- Maintenance or Support Project (Operational work)

Project Management Phases

Initiation | Planning | Execution | Closeout

Initiation
- Define Project Parameters
  - Project Charter
  - Initial Scope
  - Initial Schedule
  - Budget Estimate
- Identify Risks and Quality Standards
  - List of Risks
  - Quality Standards
- Develop Initial Project Plan
  - Communications Plan
  - Initial Project Plan

Planning
- Refine Project Parameters
- Assess Risks / Define QA and QC
- Refine Project Plan
  - Project Plan

Execution
- Manage Project Parameters
  - Project Scope
  - Baseline Schedule
  - Project Budget
- Monitor and Control Risks and Quality
  - Risk Mgmt Plan
  - QA/QC procedures
- Manage Project Execution

  - Updated Schedule
  - Actual Budget
  - QC Results
  - Change Control Log
  - Issues Log
  - Status Reports
  - Acceptance Forms

Closeout
- Perform Project Assessment
- Identify Lessons Learned
  - Project Assessment
- Archive Project Information

https://www.pmi.org/learning/library/project-managing-sdlc-8232

BITS Pilani, Pilani Campus

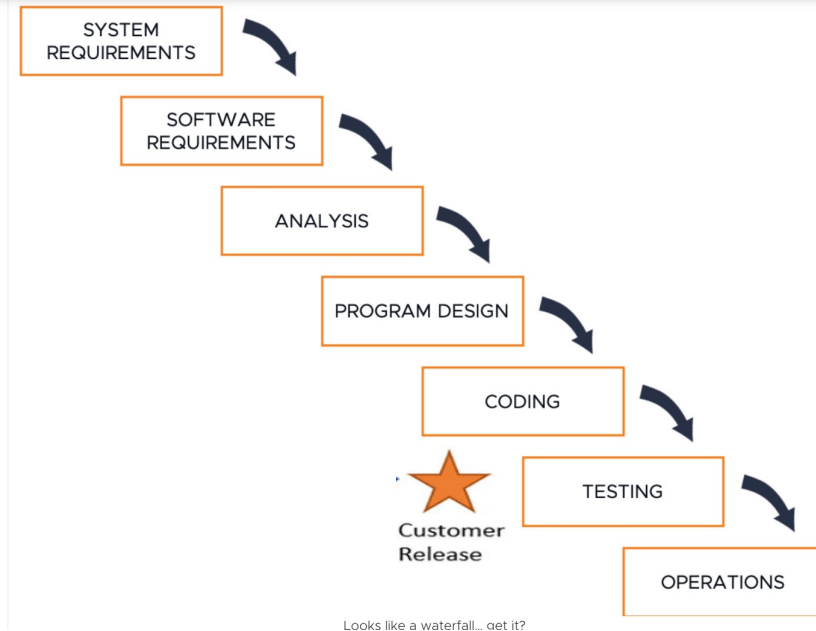# System Development Phases (Engineering activities)

BITS Pilani, Pilani Campus

Agile SW Process SE ZG544 S1-24-25

Project Management Model Water Fall Model and Agile

Waterfall Approach to Software Development

SYSTEM REQUIREMENTS

SOFTWARE REQUIREMENTS

ANALYSIS

PROGRAM DESIGN

CODING

Customer Release

TESTING

OPERATIONS

Looks like a waterfall... get it?

- **Waterfall/Predictive/Traditional** (Different terminologies that refer to same approach)
- Phases & Phase Gate

- Move to the next phase only when the prior one is complete — hence, the name waterfall.
- Origin from manufacturing like production plant

- **Upfront Planning**
- **Detailed documentation**
- **Scope of work is generally fixed.**
- Output of a phase becomes input to next phase
- Include well defined checklists, process and tools
- Customer Release-Value realization

https://www.beyond20.com/blog/when-to-use-agile-and-when-to-use-waterfall-when-managing-projects/

Agile Approach to Software Development

Iteration 1 → Iteration 2 → Iteration 3 → Iteration 4

Customer Release · Customer Release · Customer Release · Customer Release
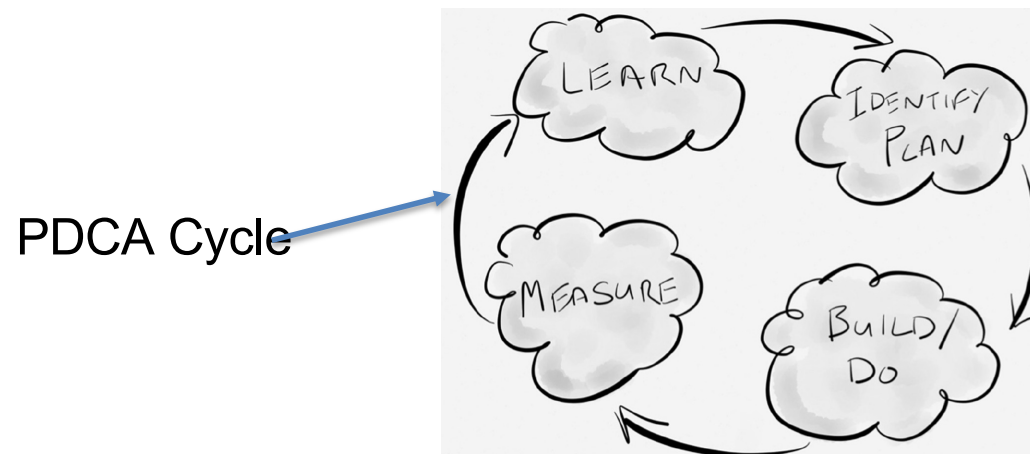
Agile/Adaptive/Iterative & Incremental
(Different terminologies that refer to same approach)
- Sprints & Sprint Review

- Design, Coding and Testing in each iteration in any order
- Origin from lean manufacturing

- **Rolling Wave Planning**
- **Less documentation**
- **Negotiable feature sets**
- Minimum process and tools
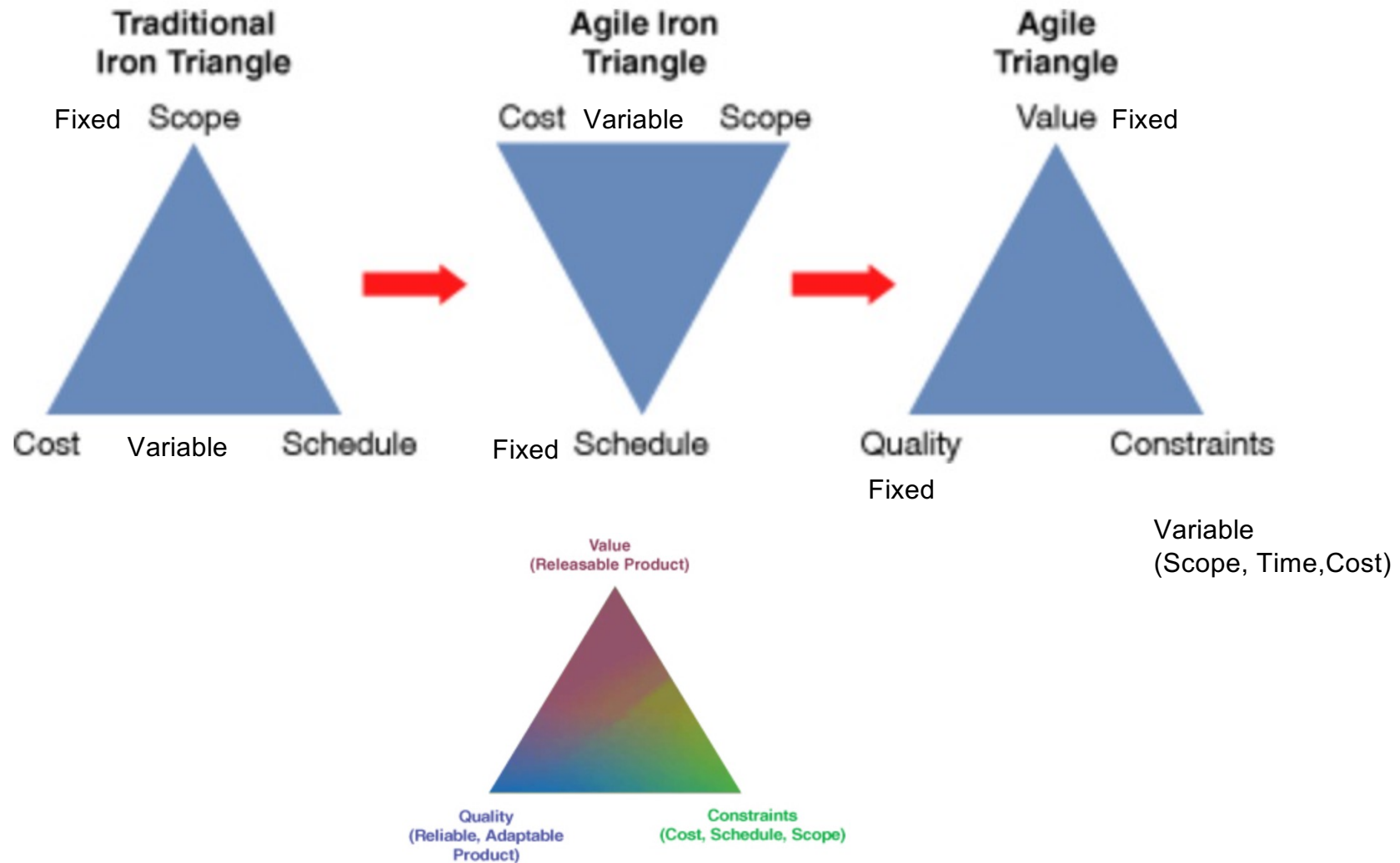- Customer Release-Value realization in each iteration

Empirical Process Control

- Inspection
  - inspect the product being created and how it is being created

- Adaption
  - adapt the product being created or the creation process if required

- Transparency
  - ensure everyone can easily see what is happening

PDCA Cycle

BITS Pilani, Pilani Campus

Iron Triangle of Project management The Evolution to an Agile Triangle

Traditional Iron Triangle

Fixed Scope

Cost Variable Schedule

Agile Iron Triangle

Cost Variable Scope

Fixed Schedule

Agile Triangle

Value Fixed

Quality Constraints

Fixed

Variable
(Scope, Time,Cost)

Value
(Releasable Product)

Quality
(Reliable, Adaptable Product)

Constraints
(Cost, Schedule, Scope)

Reference: Agile Project Management: Creating Innovative Products, Second Edition, Jim Highsmith, Published by Addison-Wesley Professional

Questions?

Link – 5 Sections

Advantages and Disadvantages of Waterfall

Advantages:

Disadvantages:

•Sequential, Upfront planning

•Error propagation

•Good Documentation

•Missing requirements

•Scope of work is generally fixed

•Error correction is costly

•Late customer feedback

Advantages and Disadvantages of Agile Model

Advantages:

• Early delivery of business value

• Continuous improvement

• Scope flexibility

• Team input

• Delivering well-tested products

Disadvantages:

• Poor Resource planning

• Less Documentation

• Fragmented output

Application of Waterfall Model

- Most common Project Management approach

- Surpassed by Agile approach after 2008.

- Simple and small systems.

- Enchantments to software systems

- Mission critical systems.

BITS Pilani, Pilani Campus

Application of Waterfall and Agile Model

- Fast Changing deliverables - New Technology Emerging projects

- Projects without clear requirements in the beginning

- New Product Development Projects

- Early Visibility, Quality, Risk identification

BITS Pilani, Pilani Campus

Need for Agile Methods

BITS Pilani

Pilani Campus

Traditional Software Development Model – Waterfall Model

Waterfall Approach
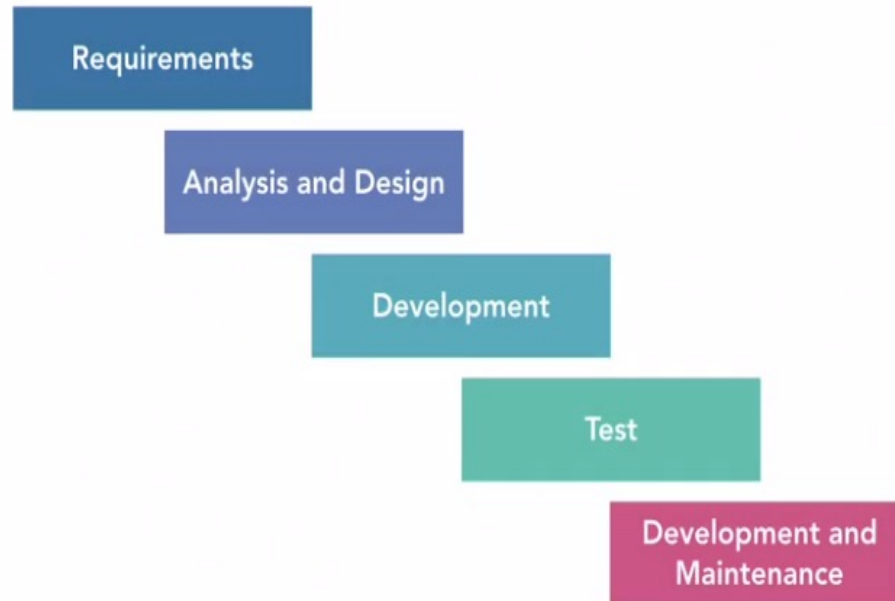
Requirements

Analysis and Design

Development

Test
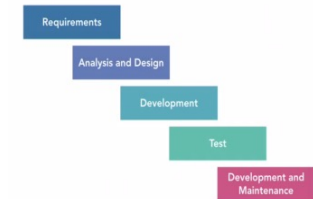
Development and Maintenance

- Move to the next phase only when the prior one is complete — hence, the name waterfall.
- Origin from manufacturing like production plant
- **Upfront Planning**
- **Detailed documentation**
- **Scope of work is generally fixed.**
- Output of a phase becomes input to next phase
- Include well defined checklists, process and tools

https://www.lynda.com/Developer-tutorials/Software-Development-Life-Cycle-SDLC/5030981-2.html

BITS Pilani, Pilani Campus

Issues with Waterfall approach

- **Error** in one phase will **propagate** to next phase

- **Missing requirements** will result in **missing software feature**

- **Error correction** is **costly** if it is detected at later phase

- **Customer does not get to see the product** before the **early** testing phase which is usually two-thirds the way through the product time line.
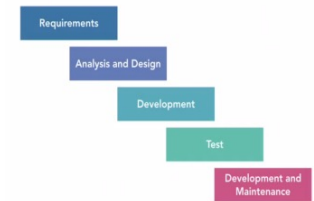
https://www.lynda.com/Developer-tutorials/Software-Development-Life-Cycle-SDLC/5030981-2.html

BITS Pilani, Pilani Campus

Issues with Waterfall approach …

- You could be in the Deployment and Maintenance phase when you could realize that the product you are building was **no longer viable** due to **change in market conditions, or organizational direction**, or changed computer landscape

- (OR) You could realize that the product had a major **architectural flaw** that prevented it from being deployed.

- In other words, your product development initiative **could completely fail** after a lot of money and time had been spent on it.

https://www.lynda.com/Developer-tutorials/Software-Development-Life-Cycle-SDLC/5030981-2.html

BITS Pilani, Pilani Campus

Impact of Waterfall

- ## Project failures
  - Many organizations treated this failure as if there was a failure in a production factory. So they tried to fix their waterfall approach, by adding more comprehensive documentation.

- ## Comprehensive documentation
  - Having a well documented software system is good. But the documentation by itself adds no value to the stake holders.

- ## Checklists and Coding standards
  - Many software teams resorted to maintaining comprehensive checklist, to make sure they were producing systems of high quality. Checklist such as coding standards and architectural reviews are helpful. But you cannot produce a single recipe book for building software

➢ More time should be spent on delivering working software features early and often. And enlisting customer feedback

https://www.lynda.com/Developer-tutorials/Software-Development-Life-Cycle-SDLC/5030981-2.html

BITS Pilani, Pilani Campus

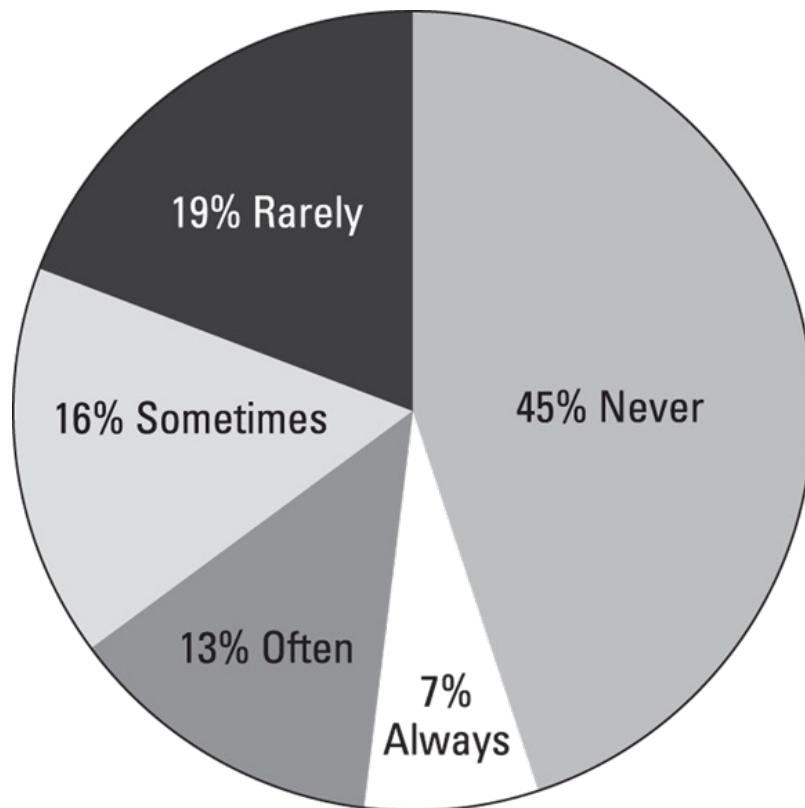# Software Project Success and Failure

- In 2015, Standish Group did a study of 10,000 projects in USA. The results showed that:

- 29% of traditional projects failed outright
  - The projects were cancelled before they finished and did not result in any product releases. These projects delivered no value whatsoever

- 60 percent of traditional projects exceeded the budget
  - The projects were completed, but they had gaps between expected and actual cost, time, quality, or a combination of these elements. The average difference between the expected and actual project results — looking at time, cost, and features not delivered — was well over 100 percent.

- 11 percent of projects succeeded.
  - The projects were completed and delivered the expected product in the originally expected time and budget.

The problem with Status Quo

- Traditional projects that do succeed often suffer from scope bloat.

19% Rarely
16% Sometimes
13% Often
7% Always
45% Never

Actual use of requested software features.

- The numbers in Figure illustrate an enormous waste of time and money.
- Direct result of traditional project management processes that are unable to accommodate change.
- Project managers and stakeholders at the start of a project ask for :
  - Everything they need
  - Everything they think they may need,
  - Everything they want,
  - ~~Everything they think they may want~~

Copyright Standish Group

BITS Pilani, Pilani Campus

Project management Needed Makeover

- In software development, **everything changes**. Requirements, skills, people, environment, business rules, et cetera.

- As **time progresses, you learn better** techniques of doing things.

- Your stakeholders need to change requirements to match changing **organizational strategy or Technology trends or changing market conditions.**

- In other words, the only **guaranteed thing is change** and the shown process to refine our work.

- Software development is **inherently an iterative process** and does not work like a Waterfall cycle.

- **Over emphasis on checklists and controls does not help** because software development is human centric and is heavily dependent on judgment and creativity.

- Software is not a product designed to be built by assembly lines.

Ref: Agile Project Management for Dummies - Mark C. Layton John Wiley & Sons - 2012

BITS Pilani, Pilani Campus

Definable Work

- Definable work projects are characterized by **clear procedures** that have proved successful on similar projects in the past.

- The production of a **car, electrical appliance, or home** after the design is complete are examples of definable work.

- The production domain and processes involved are usually **well understood** and there are typically low levels of execution uncertainty and risk.

- Definable work is **automated**.

Ref: Agile Practice Guide (ENGLISH) Published by Project Management Institute, 2017 (Agile methodologies)
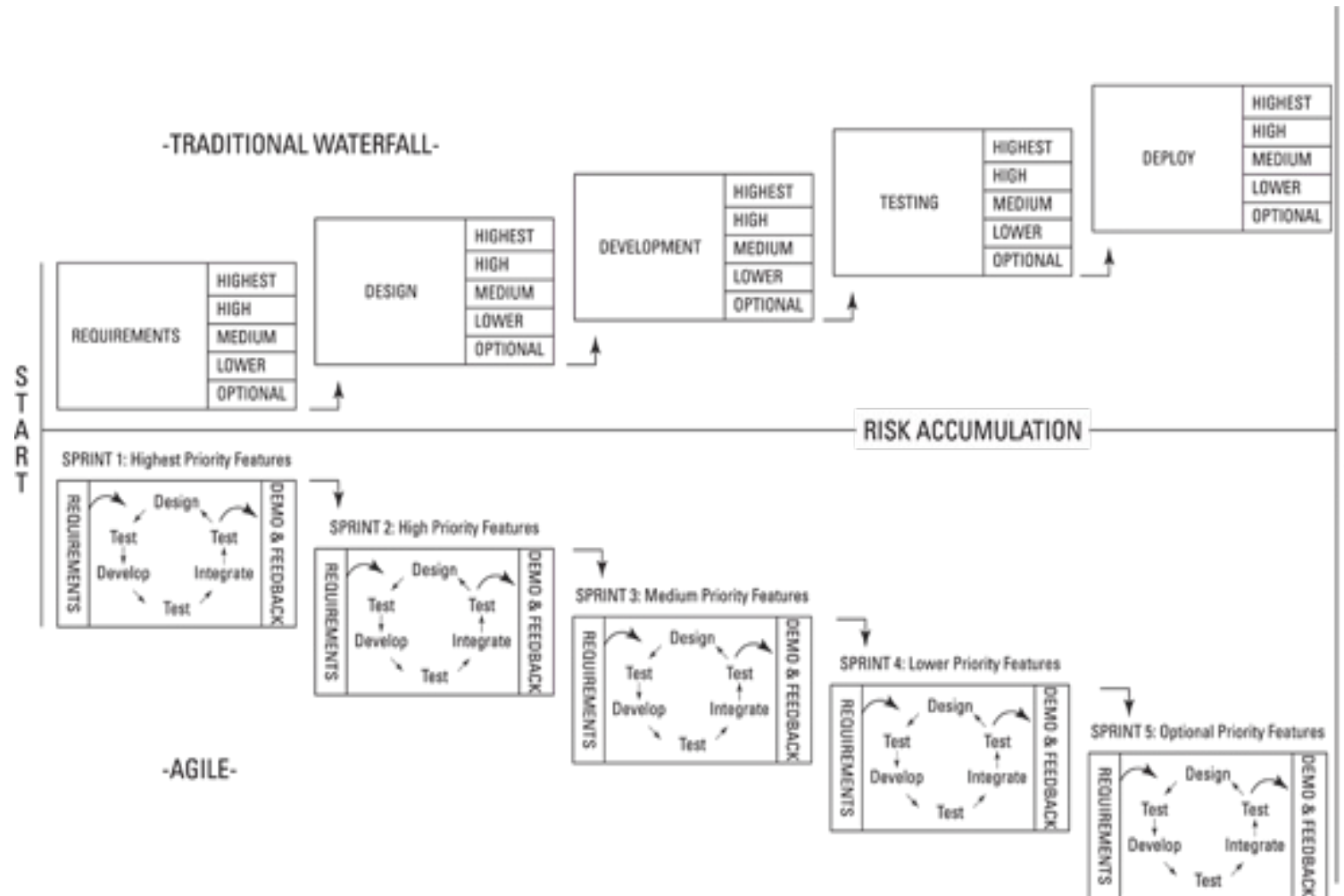
BITS Pilani, Pilani Campus

High Uncertainty Work

- **New design, problem solving**, and not-done-before work is **exploratory**. It requires subject matter experts to collaborate and solve problems to create a solution.
  - Examples of people encountering high-uncertainty work include software systems engineers, product designers, doctors, teachers, lawyers, and many problem-solving engineers.

- High-uncertainty projects have **high rates of change, complexity, and risk.**
  - These characteristics present problems for traditional predictive approaches that aim to determine the bulk of the requirements upfront and control changes through a change request process.

- **Instead, agile approaches were created to explore feasibility in short cycles and quickly adapt based on evaluation and feedback.**

Ref: Agile Practice Guide (ENGLISH) Published by Project Management Institute, 2017 (Agile methodologies)

BITS Pilani, Pilani Campus

Waterfall vs agile project

-TRADITIONAL WATERFALL-

-AGILE-

RISK ACCUMULATION

START | RELEASE

SPRINT 1: Highest Priority Features
SPRINT 2: High Priority Features
SPRINT 3: Medium Priority Features
SPRINT 4: Lower Priority Features
SPRINT 5: Optional Priority Features

Mixing traditional project management methods with agile approaches:

The answer, of course, is **you can.** If you fully commit to an agile approach, you will have a better chance of deriving benefits of Agile project

Ref: Agile Project Management for Dummies - Mark C. Layton John Wiley & Sons - 2012

Evolution of Agile Project Management
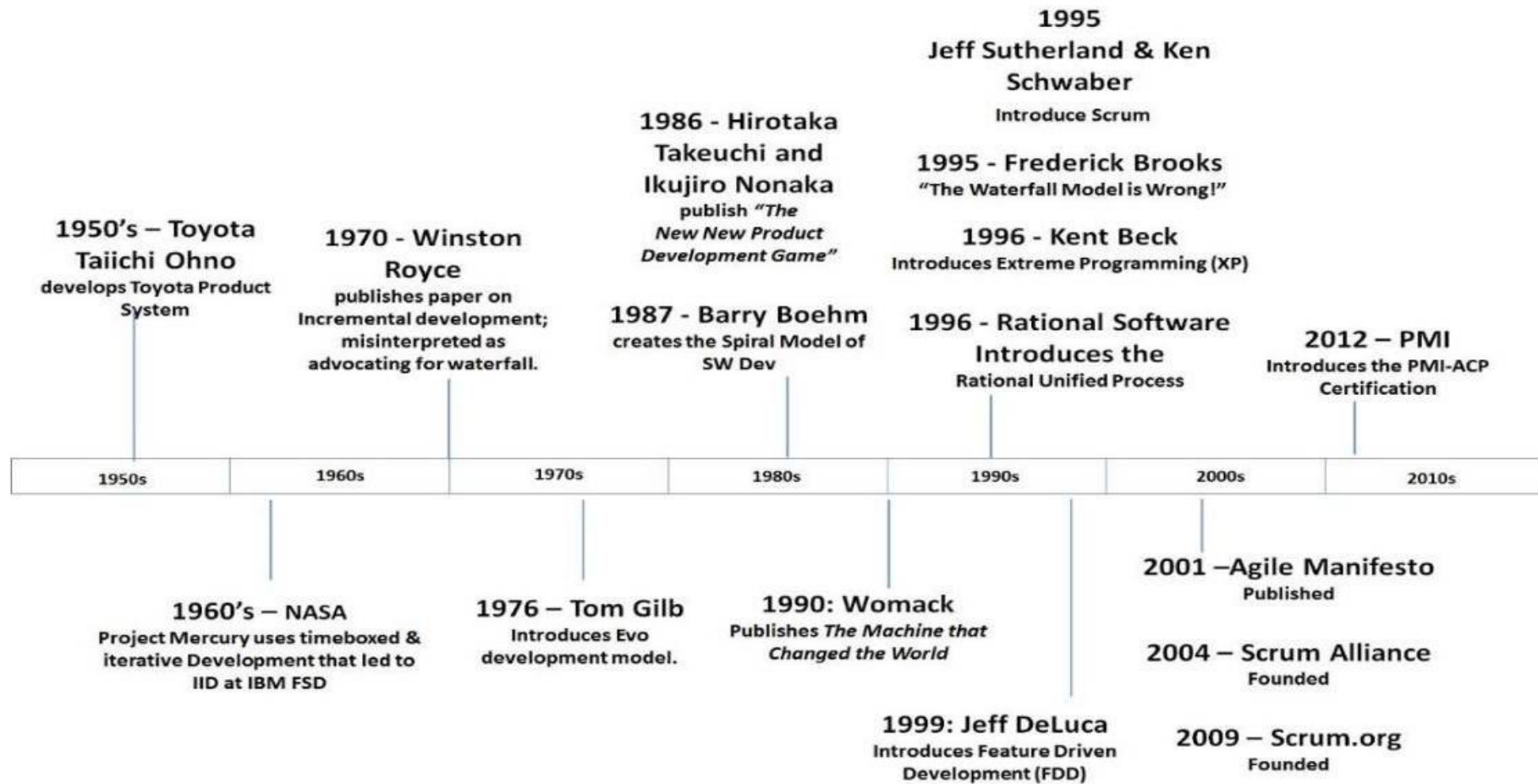
Agile Project Management

- *Agile project management* is a style of project management that focuses on :
- **Early delivery of business value**
- **Continuous improvement** of the project's product and processes
- Scope **flexibility**
- **Team input**
- **Delivering** well-tested products **frequently** that reflect customer needs.

Evolution of Agile Frameworks

A Brief History of Agile

1995
Jeff Sutherland & Ken Schwaber
Introduce Scrum

1986 - Hirotaka Takeuchi and Ikujiro Nonaka
publish "The New New Product Development Game"

1995 - Frederick Brooks
"The Waterfall Model is Wrong!"

1996 - Kent Beck
Introduces Extreme Programming (XP)

1950's – Toyota
Taiichi Ohno develops Toyota Product System

1970 - Winston Royce
publishes paper on Incremental development; misinterpreted as advocating for waterfall.

1987 - Barry Boehm
creates the Spiral Model of SW Dev

1996 - Rational Software Introduces the
Rational Unified Process

2012 – PMI
Introduces the PMI-ACP Certification

| 1950s | 1960s | 1970s | 1980s | 1990s | 2000s | 2010s |

1960's – NASA
Project Mercury uses timeboxed & iterative Development that led to IID at IBM FSD

1976 – Tom Gilb
Introduces Evo development model.

1990: Womack
Publishes *The Machine that Changed the World*

1999: Jeff DeLuca
Introduces Feature Driven Development (FDD)

2001 –Agile Manifesto
Published

2004 – Scrum Alliance
Founded

2009 – Scrum.org
Founded

Source Material e-learn(Recorded)

innovate   achieve   lead

Evolution of Agile Frameworks …

- In 1986, Hirotaka Takeuchi and Ikujiro Nonaka published an article called **"New New Product Development Game" in the Harvard Business Review.**

- Takeuchi and Nonaka's article **described a rapid, flexible development strategy** to meet **fast-paced product** demands.

- This article first paired the term **scrum** with product development. (Scrum originally referred to a player formation in **rugby**.)

- **Scrum** eventually became one of the **most popular** agile project management frameworks.

Evolution of Agile

- In 2001, a group of software and project experts got together to talk about what their successful projects had in common.

- This group created the *Agile Manifesto,* a statement of values for successful software development:

- ***We will see more details about Agile Manifesto in the next Module***

Why Agile Projects Work Better

- The Standish Group study, mentioned earlies slide "Software project success and failure," found that while **29 percent of traditional projects failed outright, that number dropped to only 9 percent** on agile projects.

- The decrease in failure for agile projects is a result of agile project teams making **immediate adaptations** based on **frequent inspections** of progress and **customer satisfaction**.
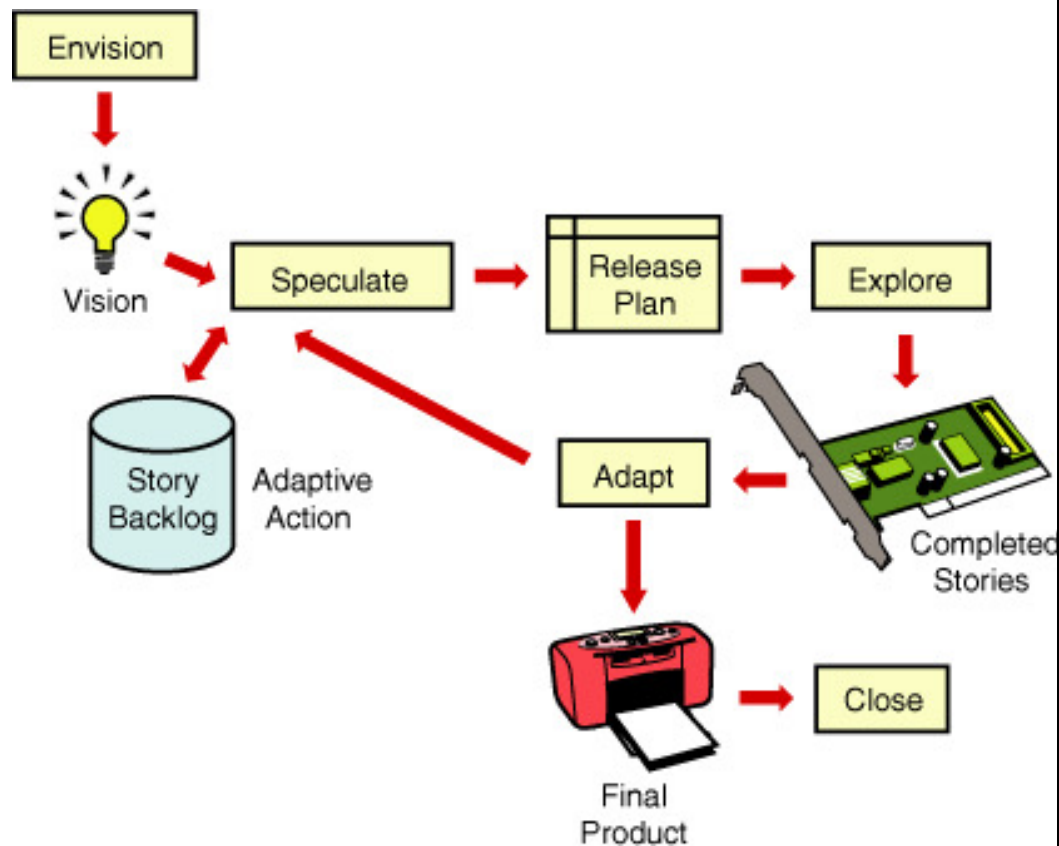
BITS Pilani, Pilani Campus

Why Agile Projects Work Better …

- Some key areas where agile approaches are superior to traditional project management methods:
  - **Project success rates: The risk of catastrophic project failure falls to almost nothing on agile projects.** Agile approaches of prioritizing by business value and risk ensure early success or failure. Agile approaches to testing throughout the project help ensure that you find problems early, not after spending a large amount of time and money.
  - **Scope creep: Agile approaches accommodate changes throughout a project, minimizing scope creep.** On agile projects, you can add new requirements at the beginning of each sprint without disrupting development flow. By fully developing prioritized features first, you prevent scope creep from threatening critical functionality.
  - **Inspecting and adaptation**: Agile project teams — armed with **frequent feedback from complete development cycles and working, shippable functionality** — can improve their processes and their products with each sprint.

Ref: Agile Project Management for Dummies - Mark C. Layton John Wiley & Sons - 2012

Agile Project Management Framework

Agile Delivery Framework (APM)

The departure from traditional phase names—such as Initiate, Plan, Define, Design, Build, Test—is significant.
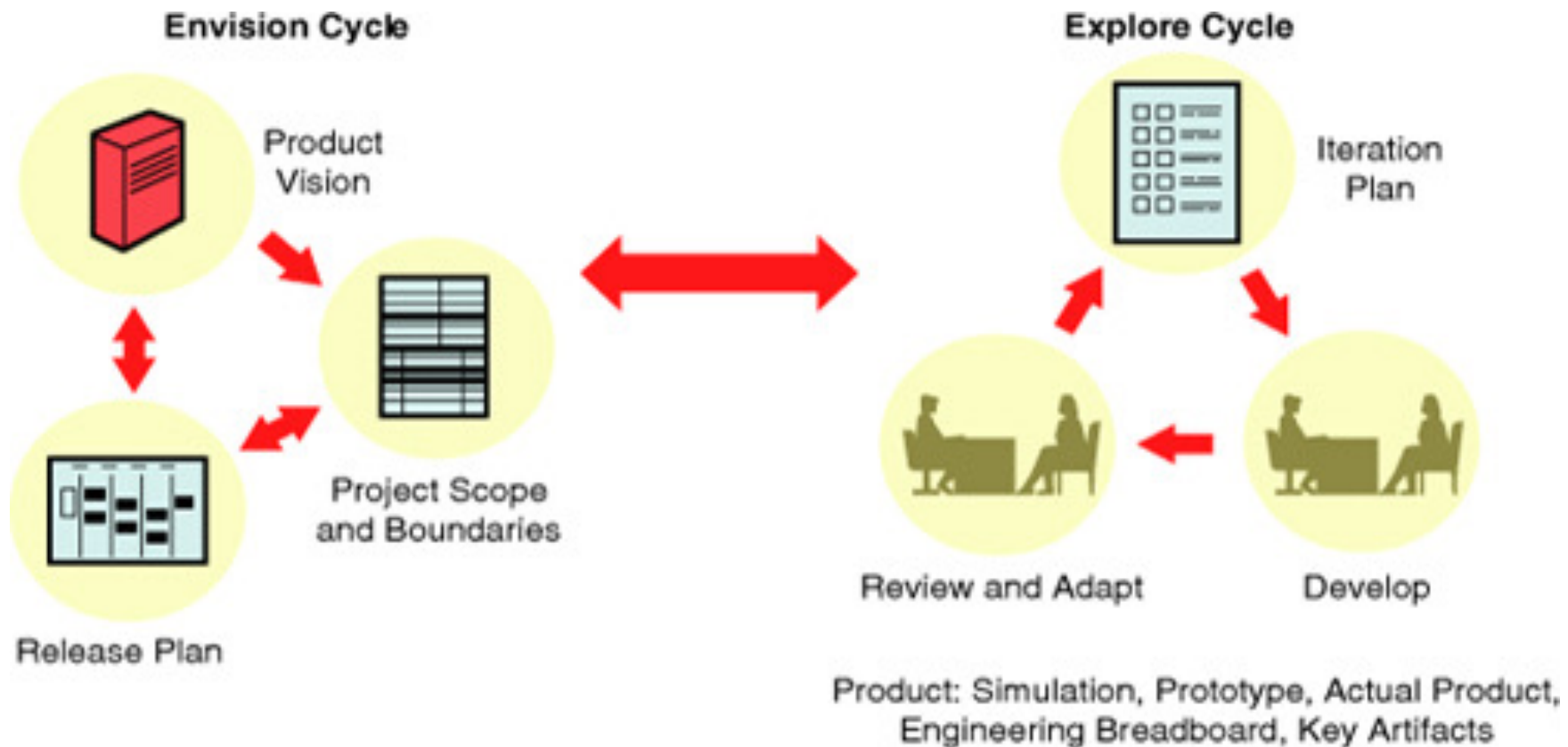
1. **Envision:** Determine the product vision and project objectives and constraints, the project community, and how the team will work together
2. **Speculate:** Develop a capability and/or feature-based release plan to deliver on the vision
3. **Explore:** Plan and deliver running tested stories in a short iteration, constantly seeking to reduce the risk and uncertainty of the project
4. **Adapt:** Review the delivered results, the current situation, and the team's performance, and adapt as necessary
5. **Close:** Conclude the project, pass along key learnings, and celebrate.

APM's Envision and Explore Cycles

Envision Cycle

Product Vision

Project Scope and Boundaries

Release Plan

Explore Cycle

Iteration Plan

Review and Adapt

Develop

Product: Simulation, Prototype, Actual Product, Engineering Breadboard, Key Artifacts

Benefits & Challenges of Agile Methods

Corporate World - Challenges and Inefficiencies

- Most organizations (Small/Large/Public/Private/Startup) share the same core challenges and inefficiencies, including:
  - Missed (or rushed) deadlines.
  - Budget blow-outs
  - Overworked and stressed employees.
  - Knowledge silos.

- Technology innovations and Agile approaches that have enabled them: (IT & Manufacturing industries)
  - Genuinely create more efficient work environments, to consistently manage their work within allocated budgets, and to regularly deliver high business-value (and high-quality) outputs on time.

Benefits of Agile

Methods/Approaches/Practices/Techniques

- ***Responsive planning***: involves breaking down long-term objectives into shorter delivery cycles; and then *adapting* ongoing work (and funding) based on the outcomes of each delivery cycle.

- ***Business-value-driven work***: involves prioritizing work in accordance with the amount of primary and secondary business value that each activity is likely to bring to the organization.

Benefits of Agile

Methods/Approaches/Practices/Techniques …

Hands-on business outputs: involves regularly inspecting outputs firsthand in order to determine whether business requirements are being met – and whether business value is being delivered for the organization.

Direct stakeholder engagement: involves actively engaging internal and external customers throughout a process to ensure that the resulting deliverables meet their expectations.

Benefits of Agile

Methods/Approaches/Practices/Techniques …

Immovable deadlines: are fixed time commitments that encourage staff members to deliver regular ongoing value to the organization.

Management by self-motivation: involves using the power of self-organized teams to deliver outcomes under the guidance and oversight of the customer.

'Just-in-time' communication: replaces traditional corporate meetings with techniques for more effective communication and knowledge transfer (**Differ Commitment**)

Methods/Approaches/Practices/Techniques …

Immediate status tracking: provides tools that enable staff to keep others in the organization continuously aware of the status of the work that they are doing.

Waste management: involves maximizing the value of the organization's resources by reducing and, where possible, eliminating low business-value activities.

Constantly measurable quality: involves creating *active checkpoints* where organizations can assess outputs against both qualitative and quantitative measurements.
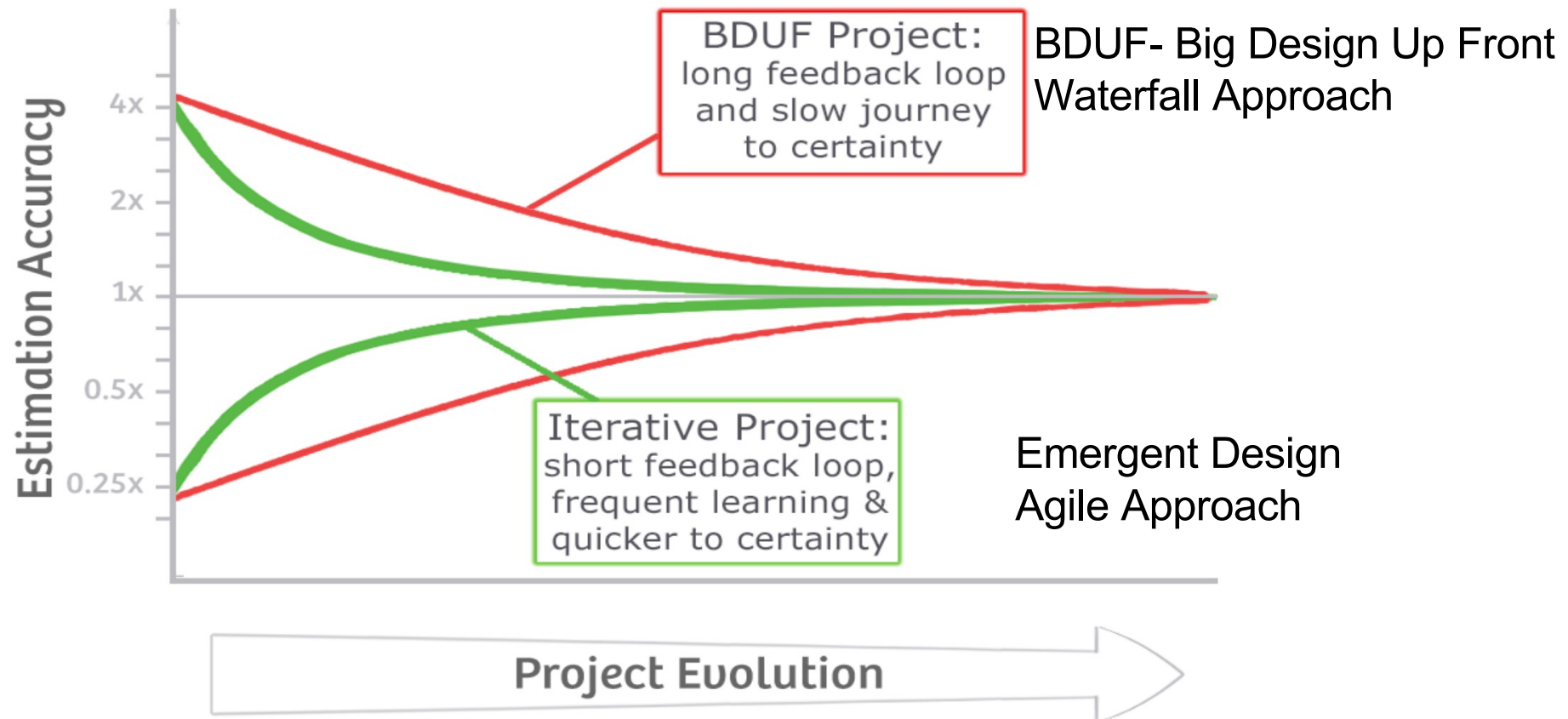
Benefits of Agile

Methods/Approaches/Practices/Techniques …

Rearview mirror checking: provides staff with tools for regularly monitoring and self-correcting their work.
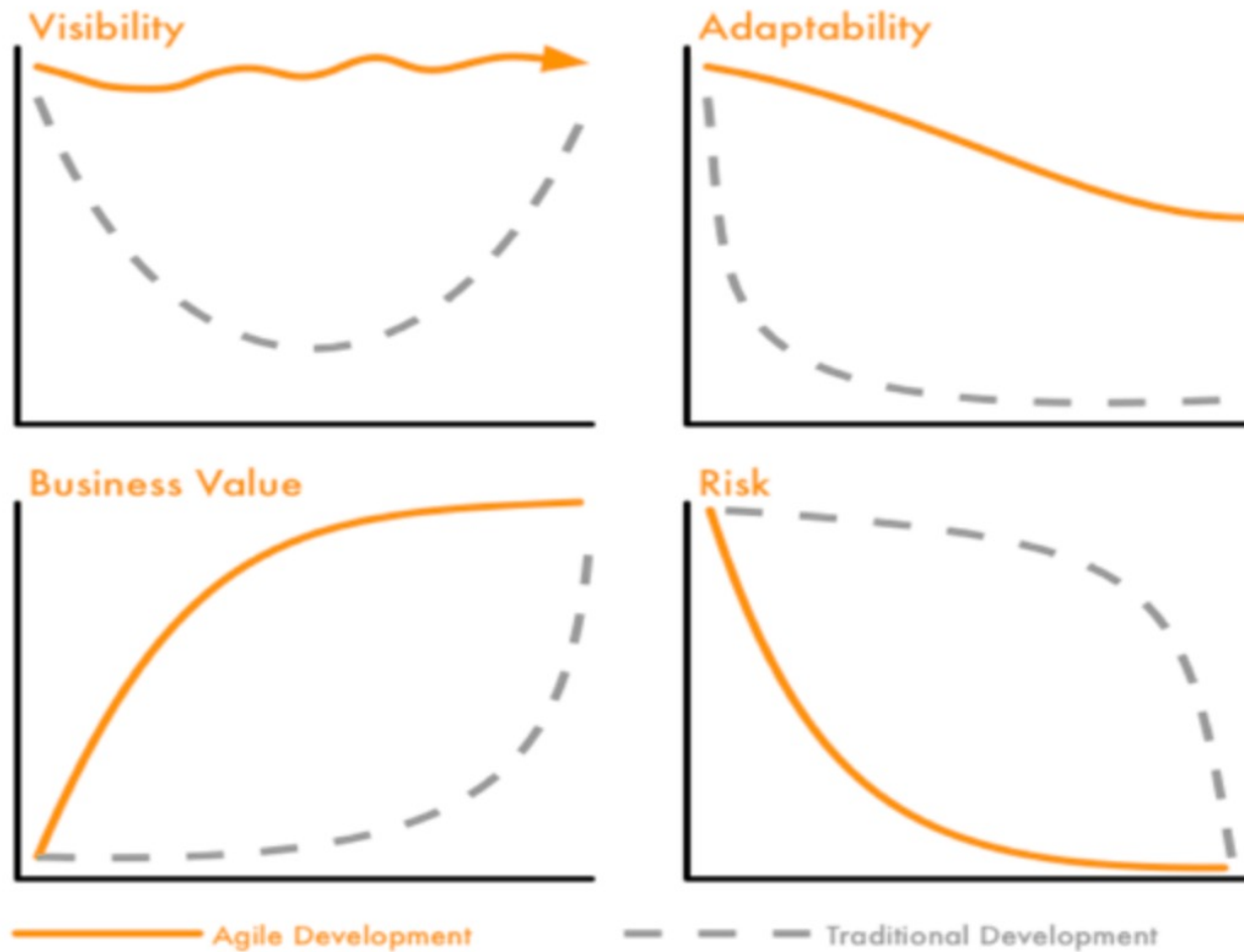
Continuous improvement: involves regularly reviewing and adjusting business activities to ensure that the organization is continuing to meet market and stakeholder demand.
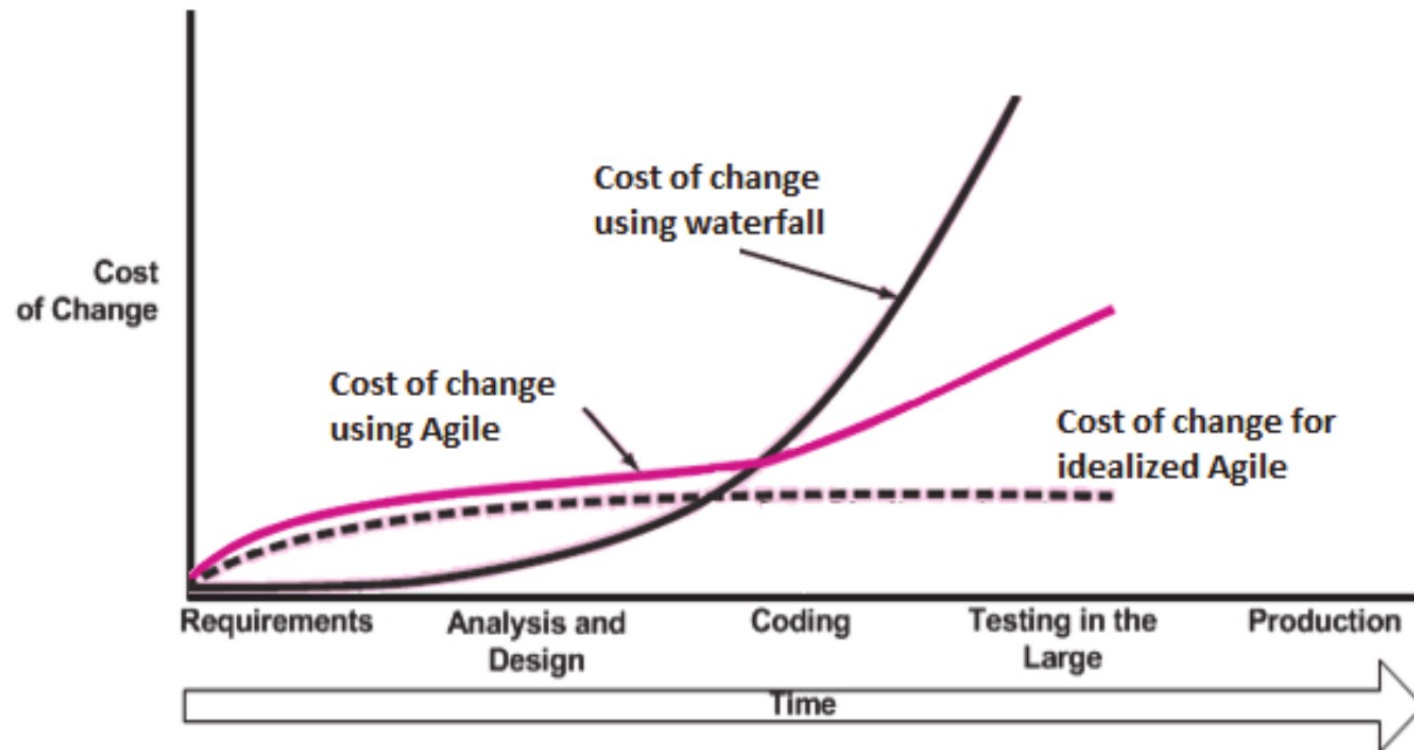
Cone of Uncertainty

BDUF Project:
long feedback loop
and slow journey
to certainty

BDUF- Big Design Up Front
Waterfall Approach

Iterative Project:
short feedback loop,
frequent learning &
quicker to certainty

Emergent Design
Agile Approach

Estimation Accuracy

4x
2x
1x
0.5x
0.25x

Project Evolution

Reference/: https://agilecoffee.com/wp-content/uploads/2016/12/07-cone-of-uncertainty.jpg

Other benefits of agile approach

Reference: https://www.beyond20.com/blog/when-to-use-agile-and-when-to-use-waterfall-when-managing-projects

BITS Pilani, Pilani Campus

Cost of change

Thank you