

# How we Build Software

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March, 2019

The IBM logo, consisting of the word "IBM" in its signature blue serif font inside a white rectangular box.

Watson Health™



## Agenda

Introduction

Project lifecycle

– Vision

– Plan

– Develop

– Deliver

– Support

– Manage Evolution

Key considerations

Summary

# Introduction



- **Me**
  - Máire Regan, MSc Advanced Software Engineering, UCD 2012 (and BSc Computer Applications, DCU 2004)
  - 14+ years in software industry, 13 years in Cúram Software, 7+ years in IBM
  - Technical Team Lead for IBM Watson Care Manager
- **IBM**
  - Over 100 years old, operates in 170+ countries, 350,000+ employees, annual revenues approx. \$79.6 billion.
- **Watson Health**
  - Our purpose is to improve lives and give hope by delivering innovation to address the world's most pressing health challenges through data and cognitive insights.
- **Watson Care Manager**
  - SaaS offering, business application used to manage care across clinical, human services and judicial organizations.

# Project Lifecycle

# Project

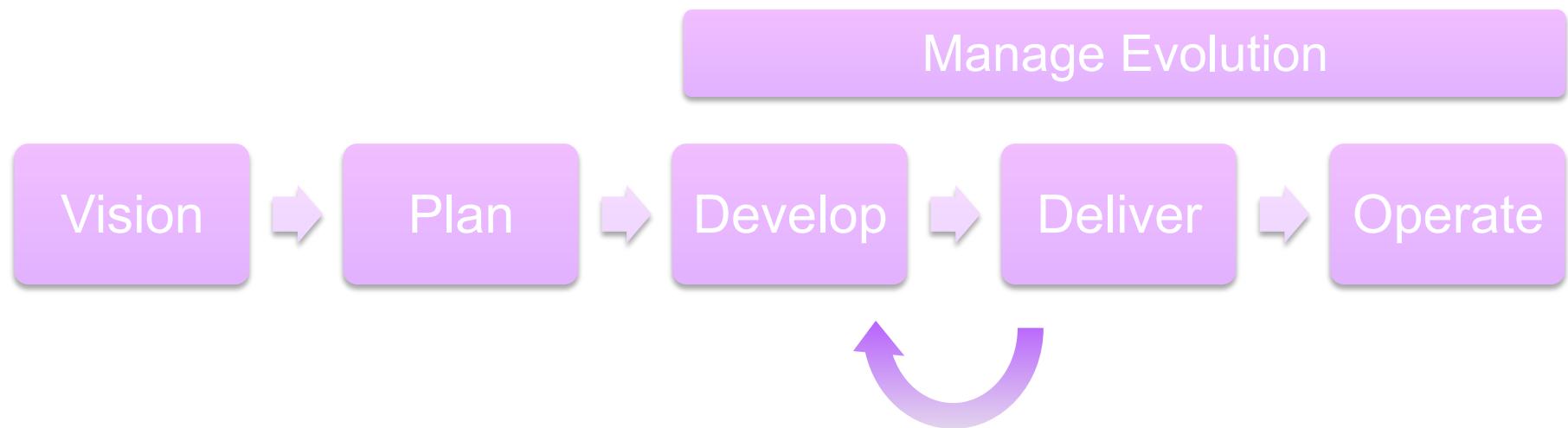
- **More than software**

- A successful project is about more than the software, its about
  - Having the right offering
  - Getting it to market
  - Selling it
  - Operating it
  - Supporting it
  - Evolving it

- **More than engineering**

- A successful project team draws on many professions/disciplines
  - Offering Management, Project Management, Business, Design, Test, Operations, Support, Sales & Marketing, Pricing, Legal, Compliance....

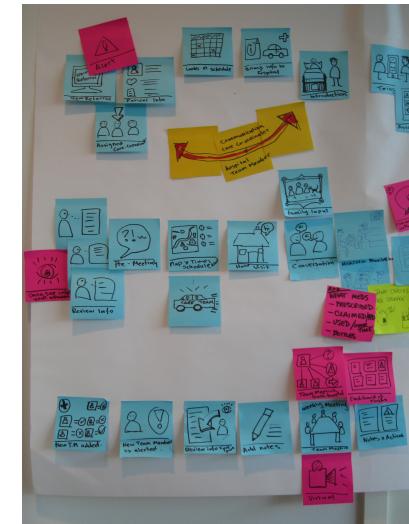
# Lifecycle



# Vision

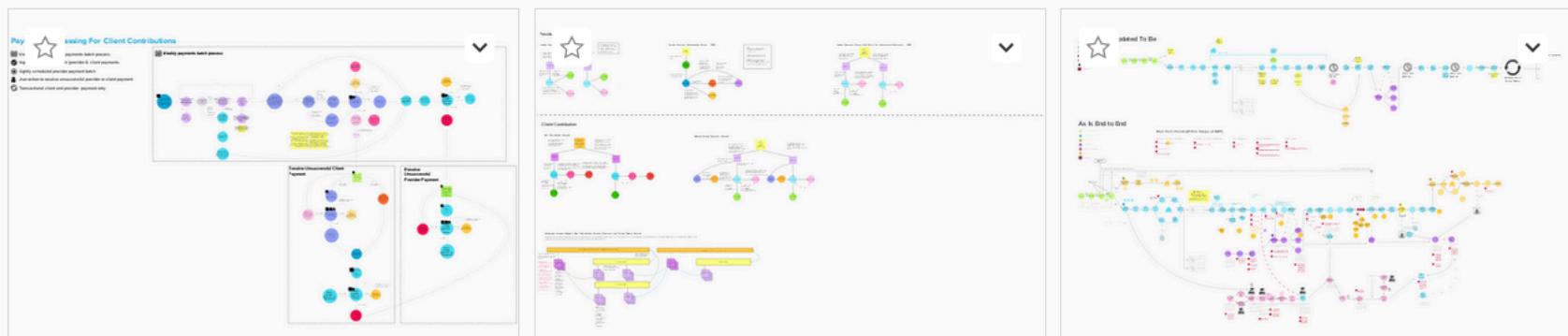
IBM has a process called called Design Thinking

- Design thinking is human centered, what do the users need?



## Vision

Record and expand our vision in tools such as [Mural](#)



## Work on the Technical Foundation

- What high level technical activities are needed?
- Understand and expand on the architectural risks

## Plan

- From the vision to a set of activities recorded in RTC
  - EPICs (theme's, sub-hills)
  - Features (user identifiable features)
  - Milestones (something we can demo end to end)
  - Stories (achievable in a development sprint)
- This process also includes Test, Documentation (Information Development) and Deployment.
- Architectural review carried out at this stage.

# Plan – Architecture Review

Plan Matrix

Perspectives/View Points	Functional	Information	Concurrency	Development	Deployment	Operational
Accessibility	Low	Low	Low	Low	Low	Low
Availability & Resilience	Medium	Low	Low	Medium	Low	Low
Development Resource	Medium	Low	Low	High	Low	Low
Evolution	High	Low	Medium	Medium	Medium	Medium
Internationalization	Low	Low	Low	Low	Low	Low
Location	Low	Low	Low	Low	Low	Low
Performance and Scalability	Low	Low	Low	Medium	Low	Low
Regulation	Medium	Medium	Low	Low	Low	Low
Security	Medium	Low	Low	Medium	Low	Medium
Usability	Low	Low	Low	Low	Low	Medium

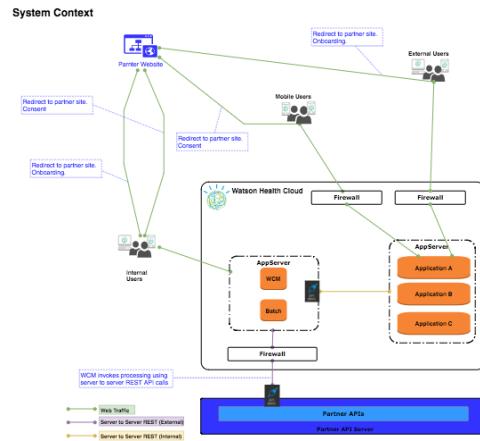
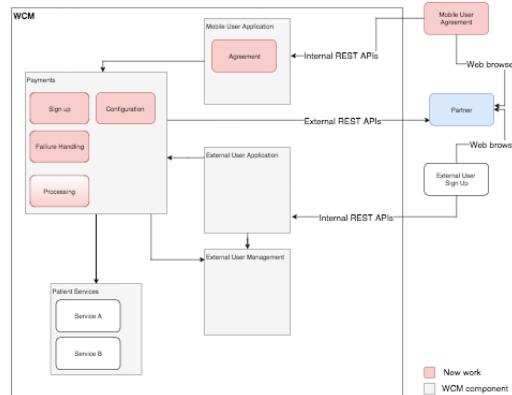
Please use the highlights: Low Medium High to indicate level of risk

21

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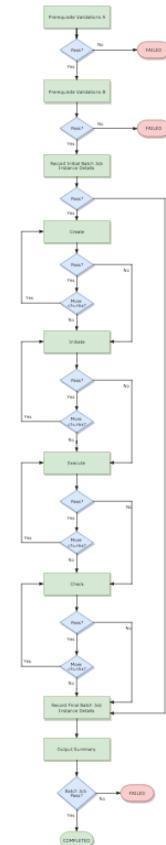
IBM Confidential

High Level Functional Components

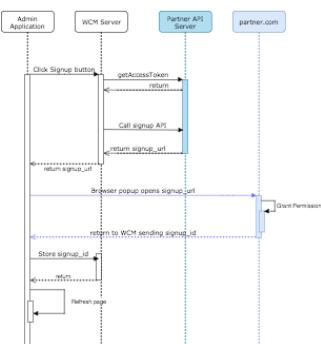


Batch Job Flow

This shows the steps and decision points for the flow through the batch job.



Sign Up Flow



## Develop

- Continuous delivery with 2 week sprints, and release to production after every 2<sup>nd</sup> sprint.
- Developers use a variety of tools such as:
  - RSA (UML)
  - Eclipse (IDE)
  - H2 & DB2 (Databases)
  - Liberty & Tomcat (App Servers)
  - Postman (REST)
  - Chrome Developer Tools
  - Chef
  - Docker
  - Kubernetes



# Develop

- Developers work in languages such as:
  - Java
  - Java Script (React, Node.js and others)
  - SQL
  - Gradle & Groovy
  - Ruby
  - Python
  - Shell scripting



## Develop – quality checks

- A selection of automated tools and processes are used to ensure the quality of our code:
    - Junit
    - Mockito
    - Checkstyle
    - PMD
    - FindBugs
    - SonarQube
    - Custom policing
    - Code reviews
- The screenshot shows the SonarQube interface with the following sections:

  - Test Summary:** Displays 495 tests, 0 failures, 1 ignored, and a duration of 13m56.34s, with a 100% successful rate.
  - CheckStyle Audit:** Designed for use with CheckStyle and Ant. It shows a summary table with 234 files, 0 errors, 28 warnings, and 2 infos.
  - Code Smells:** Two notifications are shown:
    - The Cyclomatic Complexity of the method "validateDisplayOfSections" is 14 which is greater than 10 authorized. (Code Smell, Major, Open, Not assigned, 14min effort, Comment)
    - Move this "else" on the same line that the previous closing curly brace. (Code Smell, Major, Open, Not assigned, 1min effort, Comment)
  - Project Overview:** Shows Lines of Code (6.3k), Bugs (1), Vulnerabilities (0), Code Smells (42), Coverage (91.8%), and Duplications (0.8%).
  - File Structure:** A treemap visualization of the project's file structure, color-coded by category.

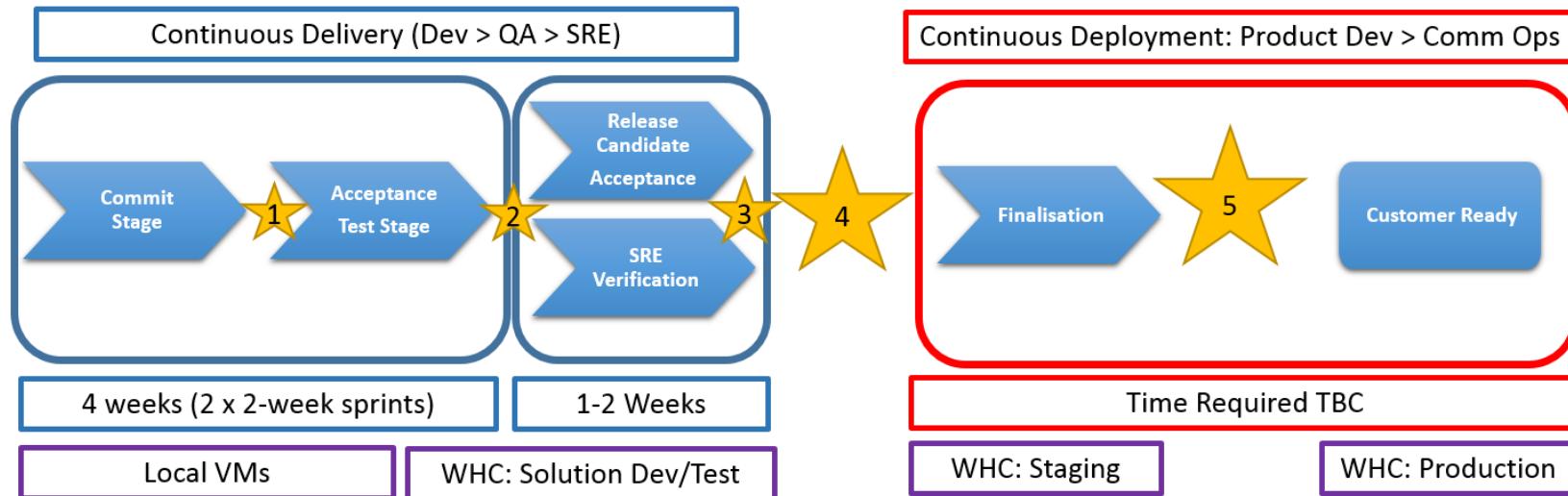
## Develop – internal testing and demo

- When a developer delivers a feature it goes through a number of automated phases:
  - Upgrade builds
  - Policing builds
  - Integration builds
  - Deployment to a VM
- Then passes to quality team for
  - Feature testing
  - Test automation
  - Business verification
  - System verification testing
- Milestone demos
  - With internal stakeholders
  - With sponsor users



A screenshot of the IBM Watson Care Manager software interface. On the left, there's a sidebar with a patient profile for "Laurie Thompson" (Female, 64 years old). The main area shows a "Plan" tab with a "Activities" section. It displays various goals and services: "Personal Budget: 200" (Total Spent: 14.50, Total Remaining: 175.50), "Transport Assistance" (Poor), "Home Care Services" (Poor), "Healthy Coping" (Satisfactory), "Substance Management" (Poor), and "Physical Activity" (Excellent). Below these are sections for "Services 1 open" (e.g., "Home Help" from "Jay's Homecare" with status "Pending") and "Laurie's Actions 4 open" (e.g., "Contact the patient's PCP to discuss concerns and/or con..." due in 3 days).

# Deliver



## Events & Checkpoints:

- 1: Automated development test gates (nightly)
- 2: Release Candidate published (internal to ABPD)
- 3: Release Candidate quality checkpoint – internal prep for handshake
- 4: Product Development to Commercial Operations Handshake
- 5: Deployment Readiness Review

## Operate

- Watson Care Manager has a dedicated Operations team (CommOps) whose full time job is to manage our software in production.
- Production access is restricted, due to things like HIPPA legislation in the US, and we need to be aware of other privacy and security legislation that applies across other jurisdictions.
- Software is handed over to CommOps, and they upgrade each of our live customers, and provision new customers.
- Other responsibilities include:
  - logging
  - security monitoring
  - performance monitoring
  - backup services
  - recovery service



Elasticsearch



Kibana



Logstash



IBM QRadar

# Operate

- In addition to releasing a new version of the product, we need to tell our customers what's new and how to use it.
  - New IBM Knowledge Centre releases
  - Known issue documentation
  - New product demo videos
  - Show and tell with our services teams who will be working directly with our customers

The screenshot shows the IBM Knowledge Center interface for the IBM Watson Care Manager. The top navigation bar includes the IBM logo, 'IBM Knowledge Center', 'Home > IBM Watson Care Manager >', 'Table of contents', and 'Change product'. The main title is 'IBM Watson Care Manager Documentation'. Below the title, a welcome message reads: 'Welcome to the IBM Watson® Care Manager product documentation, where you can find information about how to administer and use IBM Watson Care Manager.' The page is divided into three main sections: 'Getting started' (with sub-links for 'Product overview', 'Getting started with configuration', 'Getting started with care management', and 'Getting started with supervising'), 'Common tasks' (with sub-links for 'Configuring Watson Care Manager', 'Care Management', 'Supervising', 'Integrating', and 'IBM Watson Care Manager Community Service Payment'), and 'Reporting' (with a link to 'IBM Watson Care Manager Reporting').

## Operate

- Support
  - Support organizations (L1/L2/L3)
  - Common IBM structures and processes:
    - Service Requests (SR)
    - Problem Management Records (PMR)
    - Critical Situations (CritSits)
  - What's an Issue, what's a Defect...?
    - Who has the knowledge to respond?
    - How can we change things to reduce the rate of issues?
    - What happens when things go badly wrong?



## Manage Evolution

- Scheduled releases (monthly)
- Separate streams for parallel development (as needed)
  - Means separate ‘instances’ of: Vision, Plan, Develop, Deploy, Support
  - Merging of streams
- Check-points for
  - Legal clearances (open source use, export regulations, third party licenses, privacy legislation)
  - Security review (new network routes needed, secure coding standards adhered to, etc.)
  - Patentable Content (26 years as leading recipient of US patents - [link](#))
  - Translation and globalization of content



## Key considerations

- Scale: Doing it once in isolation is one thing, but each release has its own 'copy' of this life cycle.
  - Today, one version is running, the next is on-route to production and the next is in development.
- Everything is moving, all the time
- More people, means more 'lost' time managing and communicating among them
  - Communication structures have a huge effect on the software you produce

## Summary

- IBM is a very large company
- There are processes, standards and checkpoints to support standardization
- But, each project is an 'instance' of all these things.
- A project is more than software and needs more than engineering and engineers
- No matter what the size of the organisation, the life-cycle, process and distinct disciplines are still needed.
- Though sometimes you need to learn that the hard way!

## References

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  - Sonoma County – <https://www.youtube.com/watch?v=H3yJyAMutcA>
  - Montgomery Drug Court - [https://mediacenter.ibm.com/media/0\\_1eb8v7gj](https://mediacenter.ibm.com/media/0_1eb8v7gj)

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