

Software Development

ART or ENGINEERING?
The "real" thing 😊😊🎉

Agenda

- ES@Pesc
- Software Development
- Software Engineering
 - Process
 - Project
- Special note: Ethics

SE@PESC

Profa. Ana Regina - Software Processes, MPS.Br (Retired-2022)

Profa. Claudia Werner - Software Reuse, Software Ecosystems and SE Education

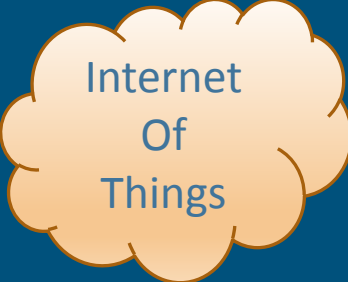
Prof. Claudio Miceli - Internet of Things (IoT), Smart Grid and Security

Prof. Guilherme Horta Travassos - Empirical Software Engineering and Evidence-based Software Engineering

Prof. Toacy C. de Oliveira - Software Process Representation and Analysis, Process Mining and BPM

Increasing Demand


- ❑ Software Systems are reshaping society.....
- ❑ People...
 - ❑ Are highly connected
 - ❑ Take care of their own stuff
 - ❑ Buy tickets, do banking, get paid, find places, book hotels
 - ❑ Demand more and more information (awareness, transparency)
- ❑ Organizations (Companies, Governments, NGOs,...)...
 - ❑ Are also highly connected
 - ❑ Need to do more with less (be efficient)
 - ❑ Need to be transparent and responsible
- ❑ Both people and organizations generate tons of information!
- ❑ Things need software 😊



Internet
Of
Things



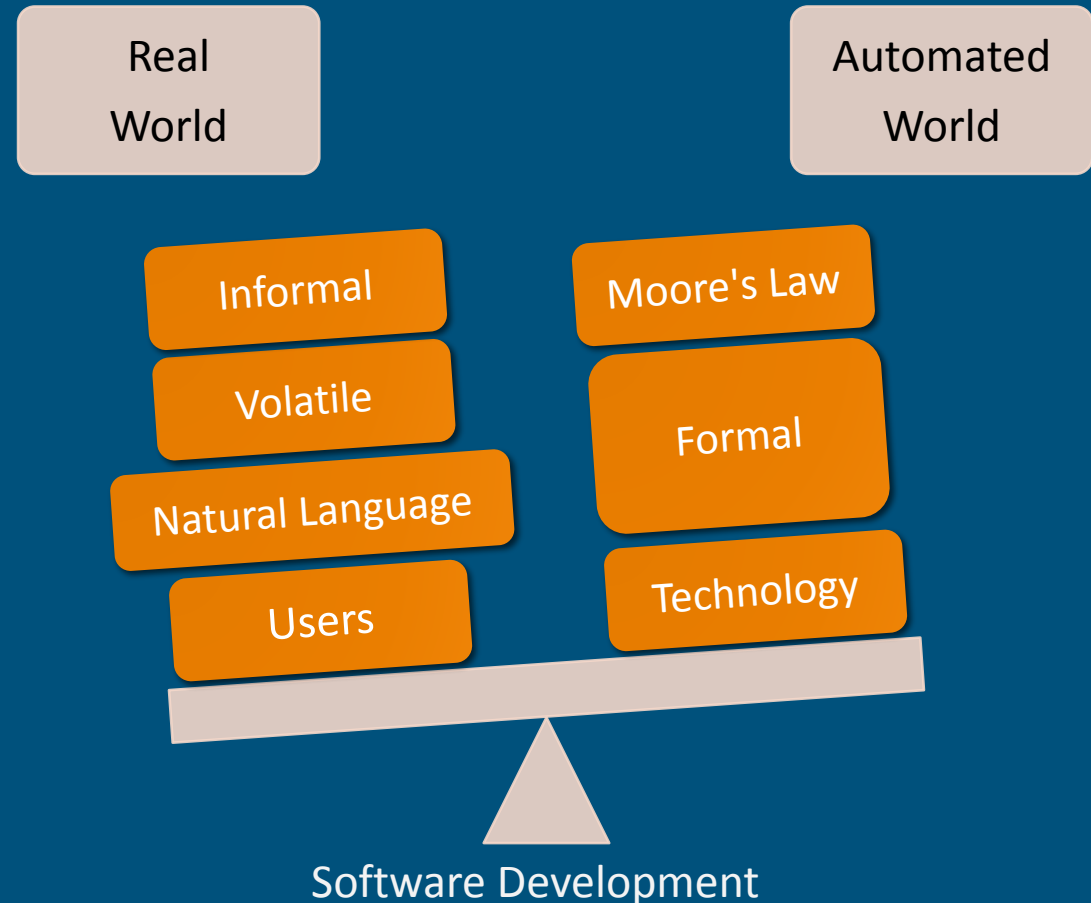
Smart
Things



Wearable
Things

Software Development: Context

In practice, Software Development practitioners battle between the "Real World" and the "Automated World" to create bespoke (semi-)automated systems that usually mimic real world procedures.



Who is winning?

CHAOS RESOLUTION BY AGILE VERSUS WATERFALL

SIZE	METHOD	SUCCESSFUL	CHALLENGED	FAILED
All Size Projects	Agile	39%	52%	9%
	Waterfall	11%	60%	29%
Large Size Projects	Agile	18%	59%	23%
	Waterfall	3%	55%	42%
Medium Size Projects	Agile	27%	62%	11%
	Waterfall	7%	68%	25%
Small Size Projects	Agile	58%	38%	4%
	Waterfall	44%	45%	11%

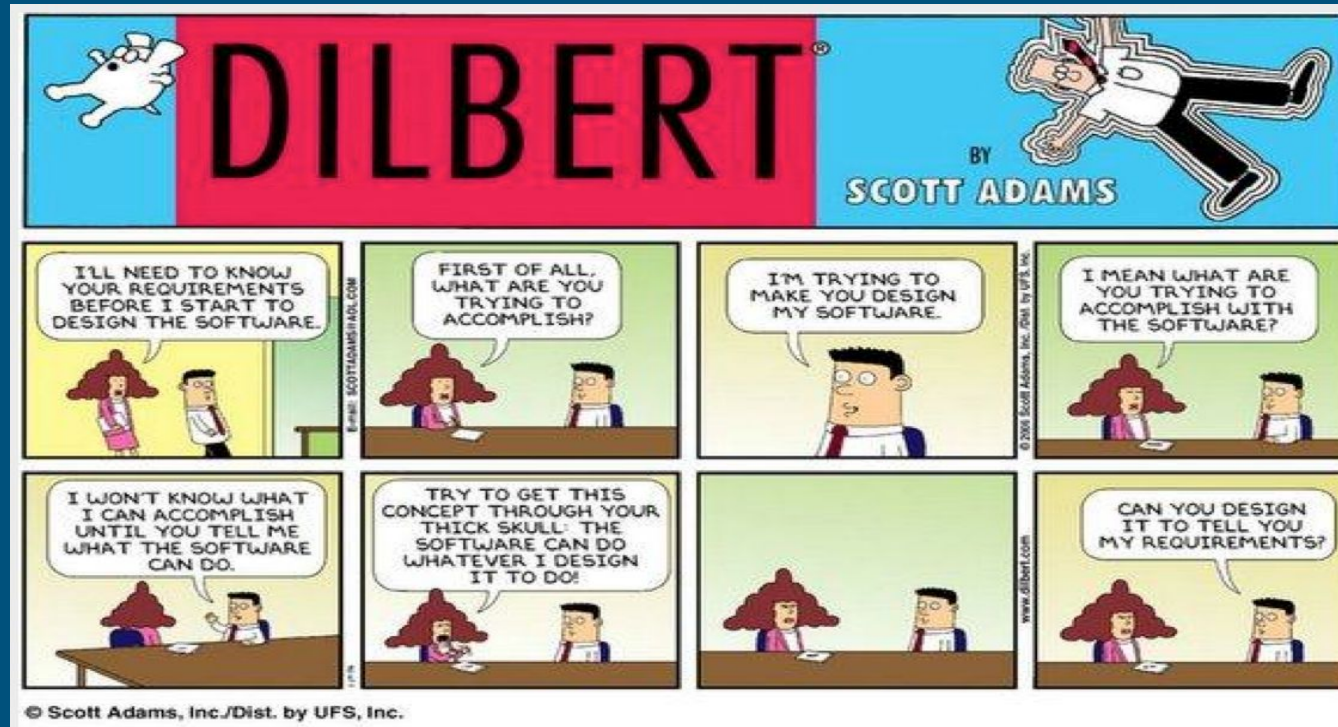
The resolution of all software projects from FY2011-2015 within the new CHAOS database, segmented by the agile process and waterfall method. The total number of software projects is over 10,000.

Why developing software is so complex ?

USER VS TECHNOLOGY VS "US"

User!

It might be not so obvious to understand their needs... ..and their domains (banking, insurance, HR, education, logistics, healthcare, etc..).



Technology!

Client Side Options



+Technology

Server Side Options



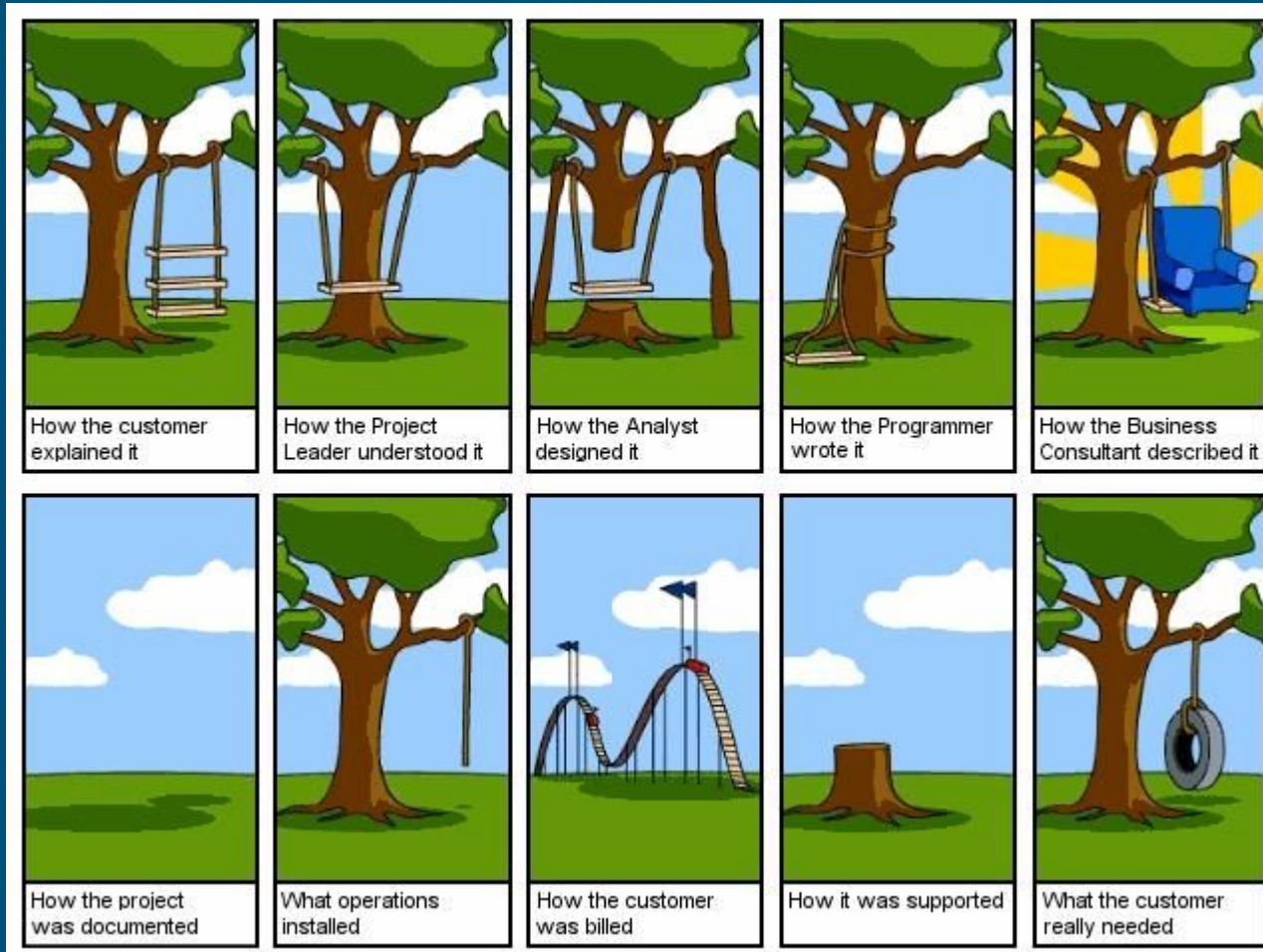
Deployment Options



CI/CD Options

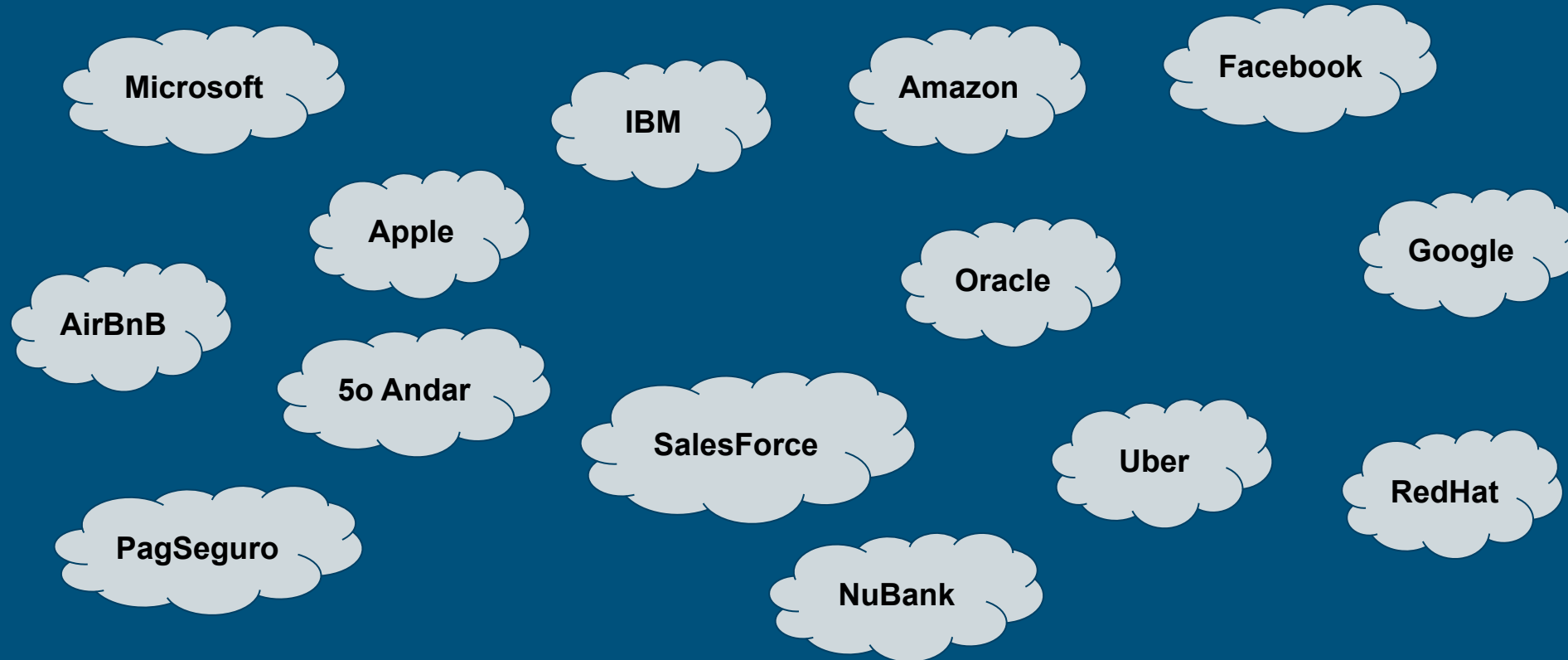


Us!!



Project Leader
Analyst
Programmer
Business Consultant
Operations

It's not all lost!!!



The Solution!!

Software Engineering — According to IEEE's definition, software engineering can be defined as the application of a **systematic, disciplined, quantifiable** approach to the development, operation, and maintenance of software, and the study of these approaches; that is, the application of engineering to software.

- systematic: *def.* done or acting according to a fixed plan.
- disciplined : *def.* showing a controlled form of behavior or way of working.
- quantifiable : *def.* express or measure the quantity.

The Solution in practice 😊

1. Apply Divide and Conquer
2. Apply Abstraction
3. Gather a bunch of well educated and experienced people with different skills and backgrounds...and don't forget the users!!!
4. Understand, Implement, Test, Document, Deploy an increment (set of divided bits)
5. Goto 1 until run out of budget or the boss says it is done!

Do all this with a plan in mind!!!

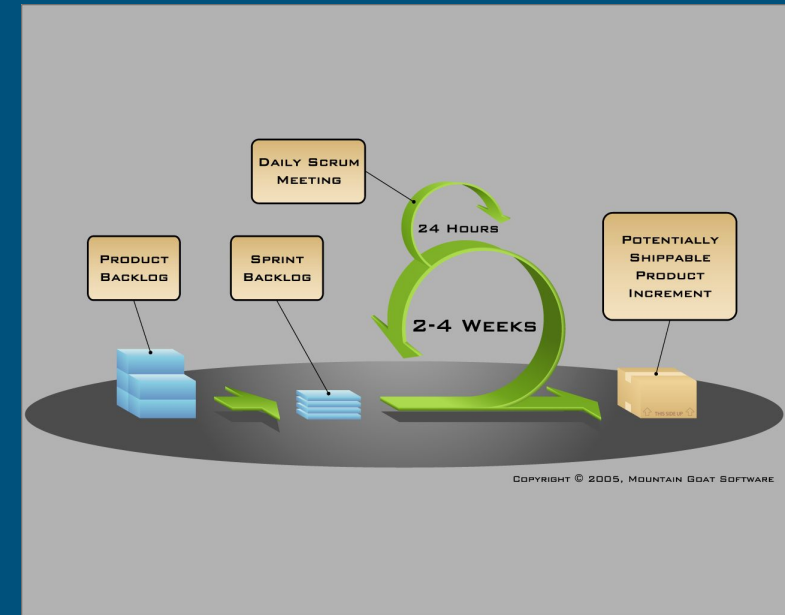
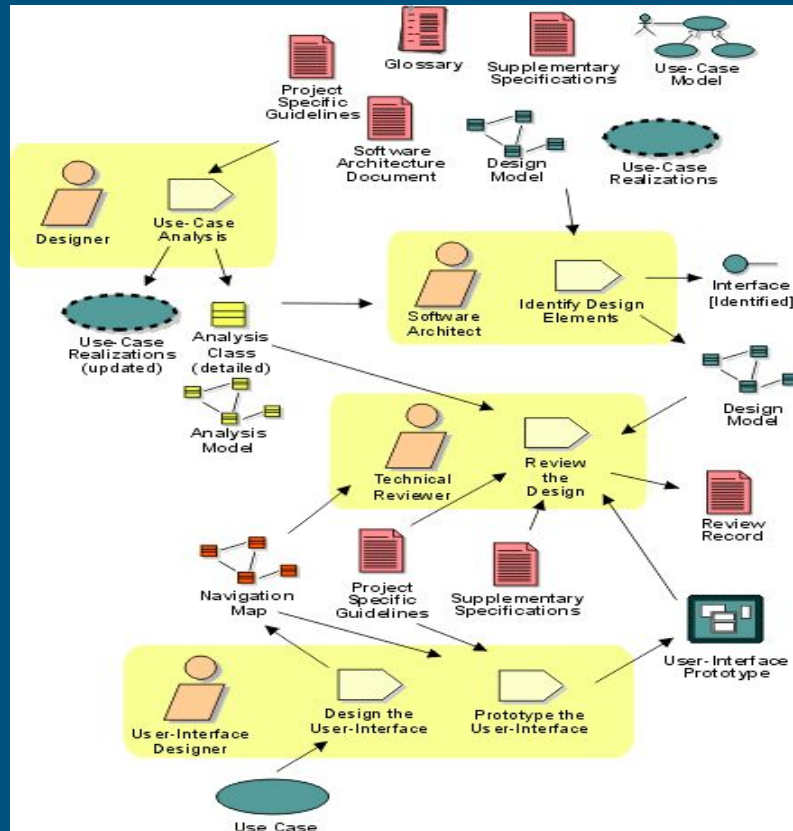
Software Development Processes

A software process is a set of interrelated **activities** and **tasks** that transform **input work products** into **output work products**. At minimum, the **description** of a software process includes required inputs, transforming work activities, and outputs generated.

-Swebok, 2014

Software Development Processes (SDPc) attempt to represent common and successful practices that together facilitate how software systems are built or maintained. Processes typically come from independent "entities" such as ISO, CMM, MPS.Br and SCRUM Manifesto or from companies such as the Rational (Rational Unified Process).

Example – A Process

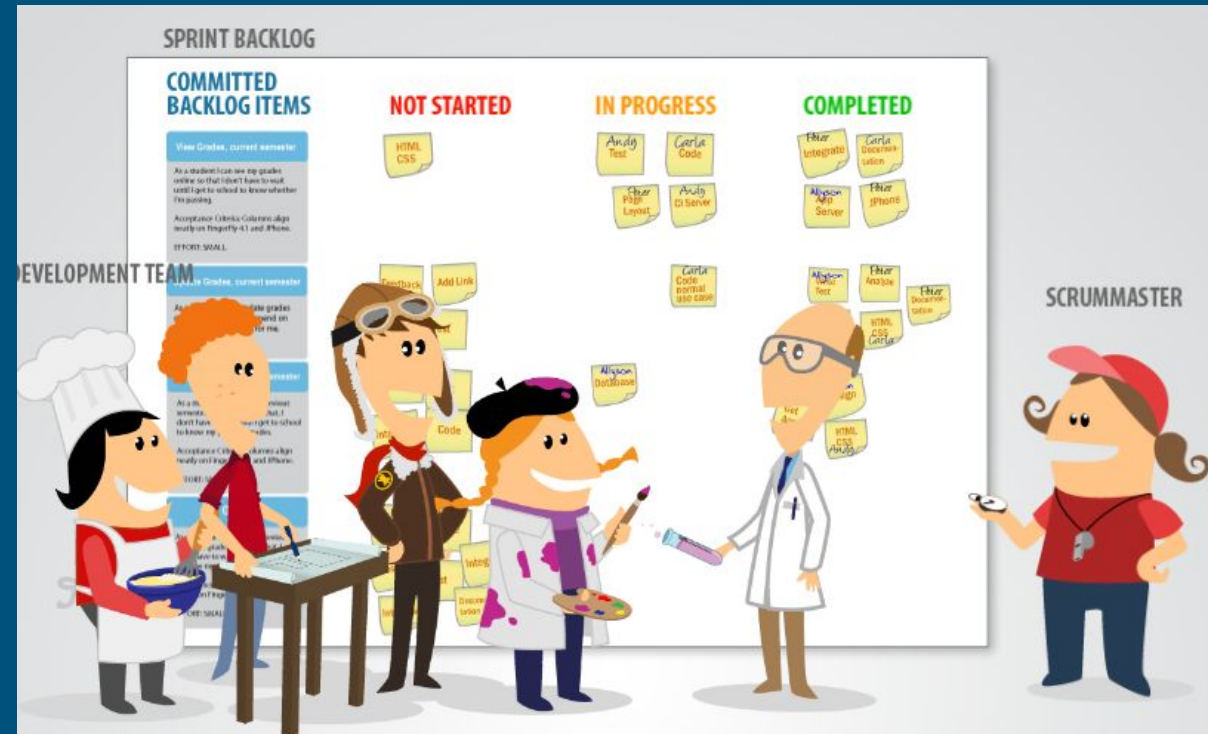
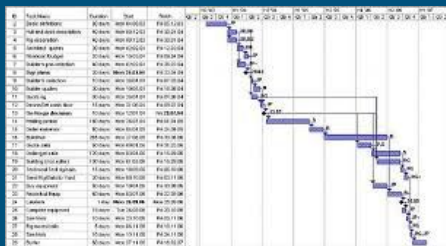
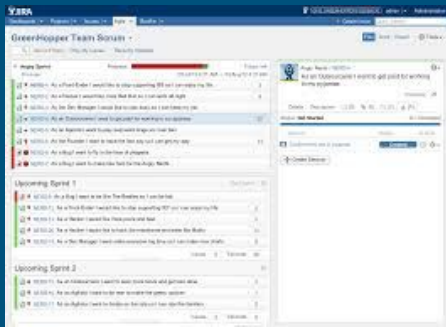


Software Development Projects

Software Development **Projects (SDPj)** using Software Engineering principles and concepts:

- Leverage on **plans** (to be systematic)
- Measure (time, budget, satisfaction, errors, etc.) what is happening
- Control (execution, implementation,...) what is happening
- ...and...
- Gather volatile and unstable information from users and the like (manuals, procedures, laws, etc.)
- Convert informal information to formal representations (NL => UML, BPMN, Java,)
- Add technology to the mix (web, mobile, tv, cloud, etc.)

Example – A Plan in SDPjs



A special note: Ethics!!!!

Everybody seems to be talking about :

"The Social Dilemma"!!!

Artificial Intelligence

Internet of Things

CryptoCoins

ChatGPT (LLMs)

Art or Engineering?

Software Development is still a mix of Art and Engineering, and it will stay like this as long as people play the central role.

AgileKip - A "small engineering" example

AgileKip - Intelligent Process Automation Platform

A code generation toolkit to support developing systems that automate business processes.

<https://agilekip.github.io/site/>

<https://agilekip.github.io/pap-documentation/>

Take aways

- Creating Modern Software Systems is hard.
 - ◆ It involves several participants, with different skill sets.
 - ◆ It involves ever changing technology.
 - ◆ It involves discovering domains that engineers are not used to.

- Software Engineering is about organizing how software is built and maintained.
 - ◆ It defines practices on how information should flow between participants (engineers, customers, stakeholders, etc.).
 - ◆ It defines responsibilities that should be followed (manager, scrum master, tester, etc.).
 - ◆ It defines a workflow (or a ritual) to organize collaborative work.

Take aways

Software Engineering is not a silver bullet but working in an organized way typically outweighs working in an ad-hoc manner.



Thanks

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