Proudly sponsored by the DoD, IUP and LBI/LTI

CYBERSECURITY WORKSHOP

October 3 & 10, 2020

Planned Activities

- Introduction to the CySP Program
- Hands-on activities using the Raspberry PI
- Guest speaker presentations by security experts
- Hands-on phishing exercise using PHP
- Hands-on SQL injection activities using PHP and MySQL

Workshop Details

9:00 a.m. to 3:00 p.m
each Saturday

Held Virtually via Zoom

Please visit
www.iup.edu/dodscholarship
for more information

- Space is limited, please act now!
- Open to all interested students and faculty.

REGISTRATION INFORMATION

LTI Students: Email perrys@laurel.edu
LBI Students: Email doljacl@laurel.edu

PARTICIPATION ADVANTAGES

- **Student participants receive a Raspberry Pi 4 Starter Kit with Fan Cooled Case**
- **Faculty participants receive a $500 stipend**

CYBER SECURITY WORKSHOP

PARTICIPATION ADVANTAGES

Offered at no cost!

Student participants receive a Raspberry Pi 4 Starter Kit!

Faculty participants receive a $500 stipend

Skills and knowledge for a growing career field!

REGISTRATION INFORMATION

LBI Students
Email doljacl@laurel.edu

LTI Students
Email perrys@laurel.edu

WORKSHOP DETAILS

October 3 & 10, 2020

The workshop is held over two consecutive Saturdays.

Held Virtually via Zoom

Please visit www.iup.edu/dodscholarship for more information

PROJECT PI'S

Dr. Waleed Farag
Director, Institute for Cybersecurity
Professor, Computer Science

Dr. Imran Ghani
Associate Professor, Computer Science

SPONSORED BY:

Department of Defense

Indiana University of Pennsylvania

**Laurel Business Institute
Laurel Technical Institute**

**Proudly Presented By:
DoD, IUP & LBI/LTI**

DoD CySP & CAPACITY BUILDING PROJECT INFO

WORKSHOP ACTIVITIES

DoD Cyber Scholarship Program

The DoD CySP is a federally supported program to encourage the recruitment of cyber talent to suport national infrastructure.

Under the leadership of the Project PI, Waleed Farag, IUP, along with a selected group of national universities, has been awarded funding in the 2019–20 academic year from the Department of Defense (DoD) in support of the Cyber Scholarship Program (CySP).

DoD CySP Capacity Building Project

In addition to the scholarship recruitment award, IUP received a Capacity Building award for a project titled "An Innovative Pedagogical Approach Based on Agile Methodology for Faculty Development in Cybersecurity".

The goal of this capacity building project is to find additional ways to recruit more students to enter the cybersecurity workforce. This goal will be achieved through a unique blend of faculty development, hands-on workshops, and the continued cultivation of relationships with local community colleges. As a result, this project will hold a number of workshops at surrounding Community Colleges.

Visit the DoD CySP page for more information

Introduction to the CySP Program

Hands-on activities using the Raspberry PI

Guest speaker presentations by security experts

Hands-on phishing exercise using PHP

Hands-on SQL injection activities using PHP and MySQL

WORKSHOP SCHEDULE - DAY 1   10/3/20

Time	Session
9:00 a.m. to 9:20 a.m.	**The DoD CySP, CAE program at IUP, and Cybersecurity Activities at IUP** Dr. Waleed Farag, Director, IUP Institute for Cybersecurity
9:20 a.m. to 9:30 a.m.	**BREAK**
9:30 a.m. to 11:30 a.m.	**Introduction to Agile Mindset and Scrum Methodology** Mr. Jeff Pulcini, Agile Coach and Project Manager
11:30 a.m. to 12:00 p.m.	**LUNCH BREAK**
12:00 p.m. to 1:20 p.m.	**Hands-on Session: Raspberry Pi and Security Applications** Dr. Waleed Farag, Director, IUP Institute for Cybersecurity
1:20 p.m. to 1:30 p.m.	**BREAK**
1:30 p.m. to 2:50 p.m.	**Hands-On Session: Hands-on Workshop using PHP and MySQL** Dr. Imran Ghani, Associate Professor of Computer Science, IUP

WORKSHOP SCHEDULE - DAY 2   10/10/20

Time	Session
9:00 a.m. to 10:50 a.m.	**Methods to Decompose & Address System Cyber Security Threat Risk** Mr. Nigel Wright, Technical Program Manager, Uber
10:50 a.m. to 11:00 a.m.	**BREAK**
11:00 a.m. to 12:00 p.m.	**Hands-on Session: Group Research Study Session on the Importance of 5C's in Agile teams** Dr. Imran Ghani, Associate Professor of Computer Science, IUP
12:00 p.m. to 12:30 p.m.	**LUNCH BREAK**
12:30 p.m. to 1:40 p.m.	**Hands-on Session: Hands-on Phishing Exercise using PHP** Dr. Imran Ghani, Associate Professor of Computer Science, IUP
1:50 p.m. to 2:00 p.m.	**BREAK**
1:50 p.m. to 3:00 p.m.	**Hands-on Session: Hands-on SQL Injection Exercise using PHP/MySQL** Dr. Imran Ghani, Associate Professor of Computer Science, IUP

CYBERSECURITY WORKSHOP

U.S. DEPARTMENT OF DEFENSE

INDIANA UNIVERSITY OF PENNSYLVANIA

LAUREL BUSINESS AND TECHNICAL INSTITUTES

Proudly Presented By: DoD, IUP & LBI/LTI

INDIANA UNIVERSITY OF PENNSYLVANIA

CYBERSECURITY WORKSHOP

OCTOBER 3 & 10, 2020

Welcome!

We are so excited that you have chosen to participate in the DoD, IUP and LBI/LTI sponsored cybersecurity workshop. Provided in this packet, you will find:

- Workshop Schedule

- Activity and Lab Information

- Resources to continue your learning and expand your knowledge of cybersecurity and programming after the workshop has concluded

We look forward to increasing your knowledge of cybersecurity, and hope you have a thought provoking and rewarding experience.

Sincerely,

Dr. Waleed Farag
Director, IUP Institute for Cybersecurity, Professor of Computer Science, and DoD CySP Program Director

SESSION DESCRIPTIONS – DAY 1

INTRODUCTION TO DOD CYSP, CAE AT IUP, AND IUP CYBERSECURITY ACTIVITIES

Presenter: Dr. Waleed Farag, Program Director for IUP DoD CySP, Director of the IUP Institute for Cybersecurity, and Computer Science Professor at IUP.

Description: Introduction of various aspects of cybersecurity education at IUP and opening remarks for workshop participants.

INTRODUCTION TO AGILE MINDSET AND SCRUM METHODOLOGY

Presenter: Mr. Jeff Pulcini, Agile Coach and Project Manager

Description: Agile is a mindset and Scrum is perhaps the most popular methodology or framework employed. The goal of this interactive session is to introduce Agile as a philosophy, Scrum as a methodology/framework, the roles of those on the Scrum Team, and the ceremonies that are part of the process. Along the way we'll talk about how Agile differs from conventional methodologies and the benefits it brings..

HANDS-ON SESSION: RASPBERRY PI AND SECURITY APPLICATIONS

Presenter: Dr. Waleed Farag

Activity: Participants will learn how to assemble and operate their Raspberry Pi 4 kits, in addition to various cybersecurity related activities. Students will also learn secure coding techniques, writing their own code using Python and Java programming languages.

HANDS-ON WORKSHOP USING PHP AND MYSQL

Presenter: Dr. Imran Ghani, Associate Professor of Computer Science at IUP

Activity: In this Hands-on session, all participants will practice PHP and MySQL. This workshop will prepare participants to understand Phishing attack and SQL Injection to be done on Day 2. In this session, we will create front-end HTML forms for client, send data from HTML forms to Server for processing and save it in DB tables. We also create Tables schema and data entry in MySQL DB. We also select data from DB and display it to client.

SESSION DESCRIPTIONS – DAY 2

METHODS TO DECOMPOSE AND ADDRESS SYSTEM CYBER SECURITY THREAT RISKS

Presenter: Mr. Nigel Wright, Technical Program Manager, Uber

Activity: We will discuss ways to review an overall system, such as Hospital IT Infrastructure, Rail Signaling System, or Autonomous Vehicle, and evaluate the risks both present inherent operation and vulnerable to malicious attack. I will present some common industry cybersecurity attacks such as Stuxnet, the Tesla lane monitoring system hack, and others. We will then have an exercise reviewing a hypothetical physical / digital system (such as an Airport Security Theoretical System Design), we will give an overview of Kanban processes for program management. Finally, we will separate into three to four groups and use this mechanism in breakout rooms (using "t-shirt sizing" planning with post-it notes) to evaluate how to prioritize development to mitigate cybersecurity risks...

GROUP RESEARCH STUDY ON THE IMPORTANCE OF 5C'S IN AGILE TEAMS

Presenter: Dr. Imran Ghani, Associate Professor of Computer Science at IUP

Activity: In this session, participants will be given research papers or topics related to 5 C's: Communication, Cooperation, Coordination, Collaboration, and Control. Participants will be divided into groups using Zoom breakout rooms. They will read that material, discuss and analyze challenges related to 5 C's. We will relate this discussion with Cybersecurity practices.

HANDS-ON PHISHING EXERCISE USING PHP

Presenter: Dr. Imran Ghani, Associate Professor of Computer Science at IUP

Activity: Phishing is a way to illegally acquire information such as usernames, passwords, and credit card details by masquerading as a trustworthy entity in an electronic communication (web site, email, etc). Those fake websites are hosted on compromised sites without the owner's permission and are sent to the victims using mailing scripts, hosted or not in the same server where the phishing page is. Phishing pages are often complex and rely on several files to run. They will be hosted on a specific directory resembling the phishing target. We will Phish a website to see how to capture user/password of a user.

HANDS-ON SQL INJECTION EXERCISE USING PHP / MYSQL

Presenter: Dr. Imran Ghani, Associate Professor of Computer Science at IUP

Activity: Many web developers are unaware of how SQL queries can be tampered with, and assume that an SQL query is a trusted command. It means that SQL queries are able to circumvent access controls, thereby bypassing standard authentication and authorization checks, and sometimes SQL queries even may allow access to host operating system level commands. In this workshop, we will create a legitimate but vulnerable website then we will see how it behaves in the context of SQL injection. We will then mitigate that SQL injection.

ADDITIONAL RESOURCES

Visit the following websites to learn more about our sponsors and increase your knowledge of cybersecurity.

Indiana University of Pennsylvania
www.iup.edu

Department of Defense
www.defense.gov

Laurel Business and Technical Institutes
www.laurel.edu

IUP DoD CySP Information
www.iup.edu/dodscholarship

IUP Institute for Cybersecurity
www.iup.edu/cybersecurity

Department of Homeland Security
https://www.dhs.gov/topic/cybersecurity

Hello!

About Nigel!

→ **Pittsburgher**
  Grew up south of Pittsburgh in California, PA. Parents are fans of British Rock!

→ **Breaking Computers Since 1989**
  The best way to fix something is to break it first!

→ **Working on Robot Cars!**
  Previous roles involved creating product lines for Automated Rail Signaling

Agenda

Hour 1

- Cyber Security in Industrial Systems
- System Analysis 101
- Examples of System Exploits
- Identifying & dealing with Risks & Vulnerabilities
- Speed Reading with Program Management Techniques

<10 Minute BREAK>

Hour 2

- Exercise & Group Work
    - Overview of an example of Theoretical Airport Security System Design by generating set of Risks
    - Group Exercise
    - Group Review of Exercise

How are you feeling today?

—

Agenda;

Cyber Security in Industrial Systems
System Analysis 101
Examples of System Exploits
Identifying & dealing with Risks & Vulnerabilities
Speed Reading with Program Management Techniques

What is an industrial system?

Knowledge of Industrial Systems?

Extremely knowledgeable

Not knowledgeable at all

Neutral

Industrial Control System (def)

Industrial control system (ICS) is a collective term used to describe different types of control systems and associated instrumentation, which include the **devices**, **systems**, **networks** , and controls used to operate and/or automate industrial processes.

Industrial Control System (def)
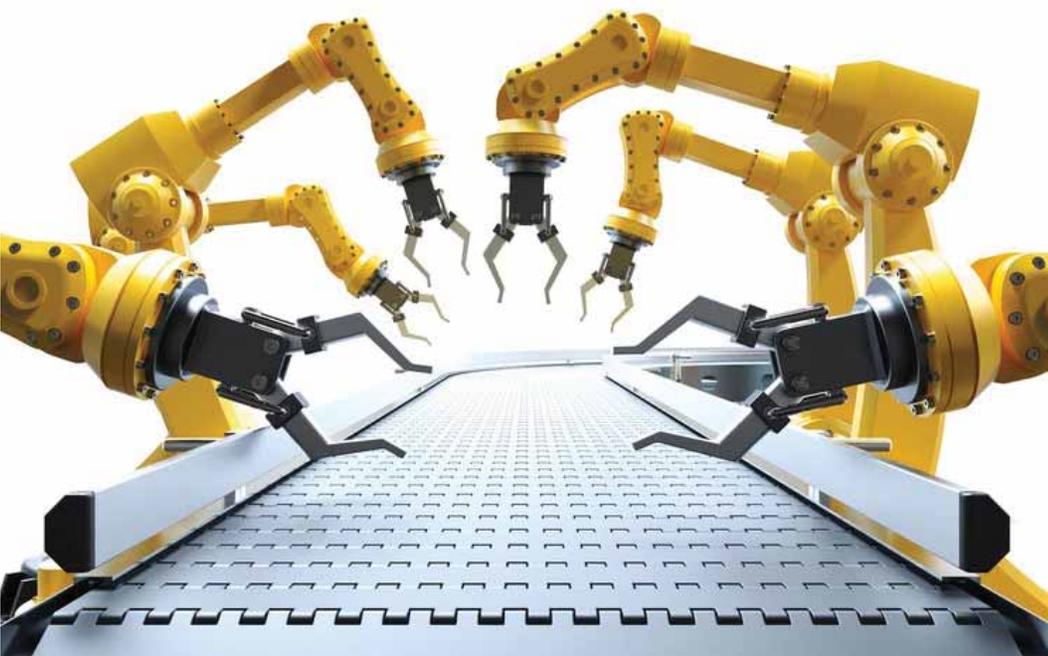
Made up of *many* items, each with it's own design life, update cycle, and iterations.

Used by highly skilled and non skilled technicians.

Low -> No Tolerance for Failures
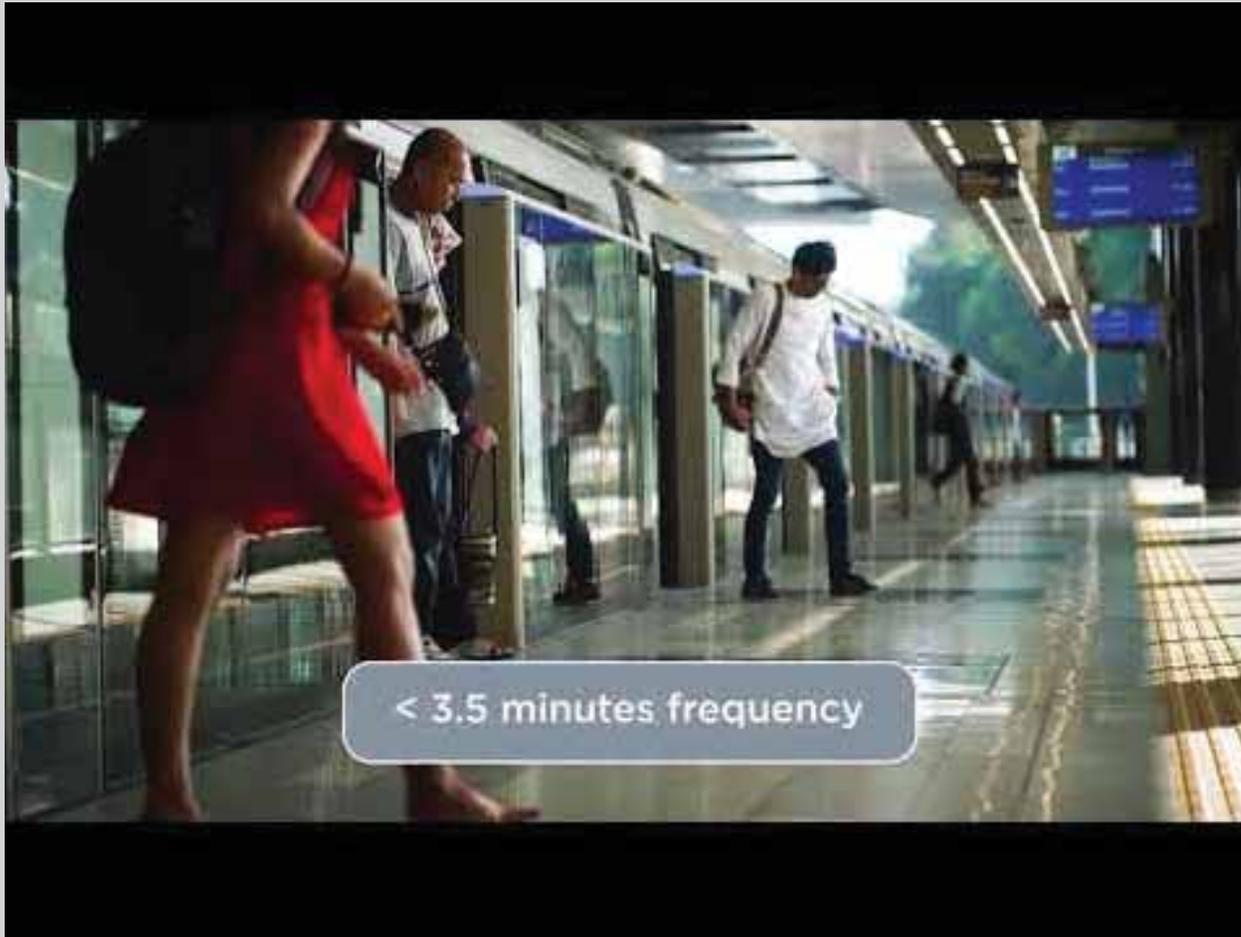
What type of cyber security risks would be present in this system?

Networking

Misuse

Unintended design

Malware

Zero-day exploit

Man in the middle

It depends

Systems Engineering
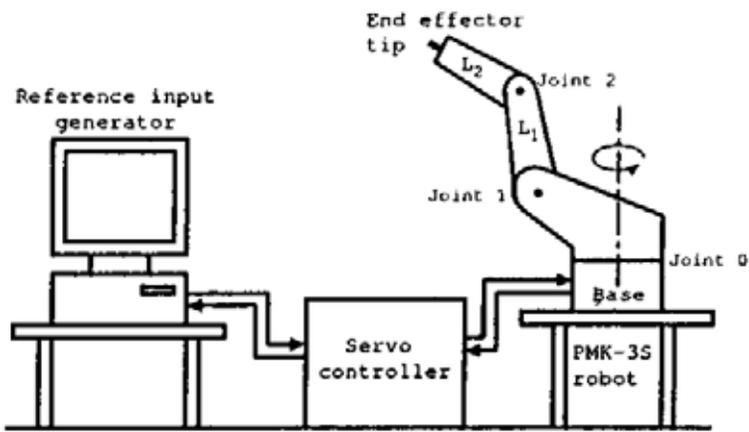
(a)
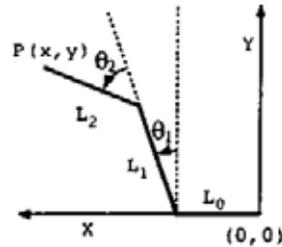
(b)

Systems engineering is an interdisciplinary field of engineering and engineering management that focuses on how to design and manage complex systems over their life cycles.

Systems Engineering & Cybersecurity

(a)

(b)
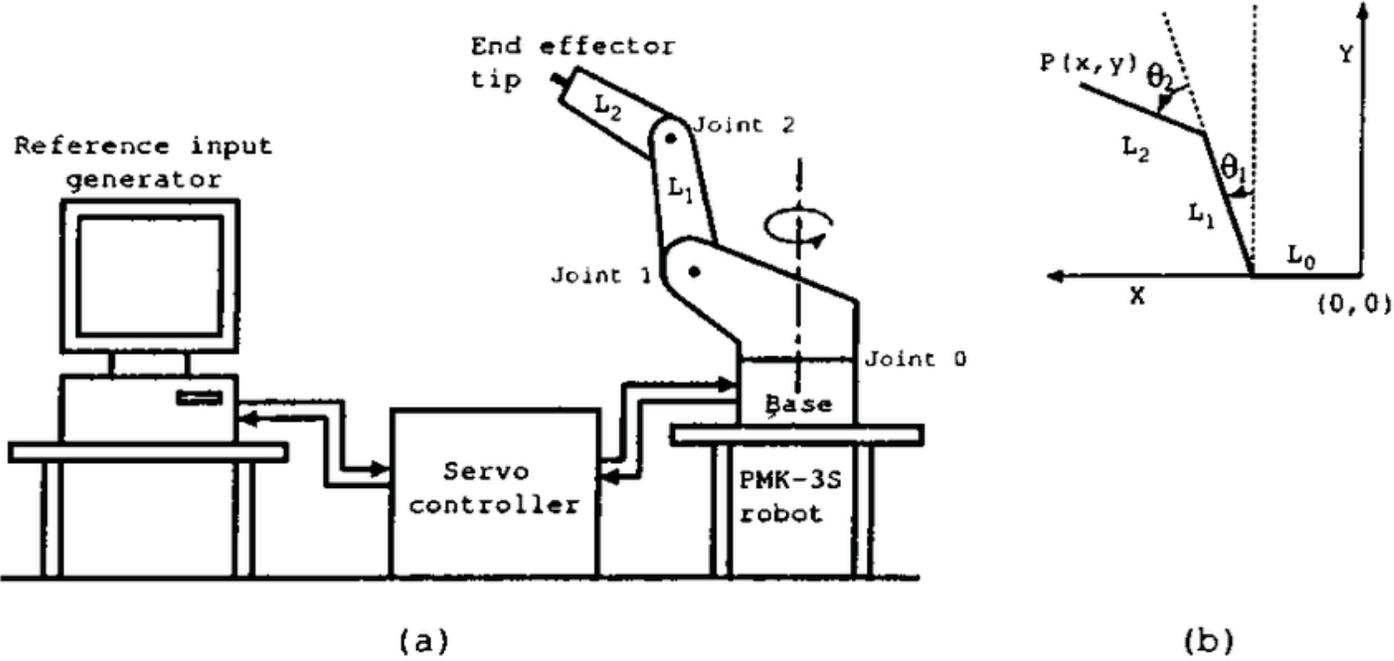
What is vulnerable in this diagram?

—

Agenda;

Cyber Security in Industrial Systems
System Analysis 101
Examples of System Exploits
Identifying & dealing with Risks & Vulnerabilities
Speed Reading with Program Management Techniques

Decomposing a System
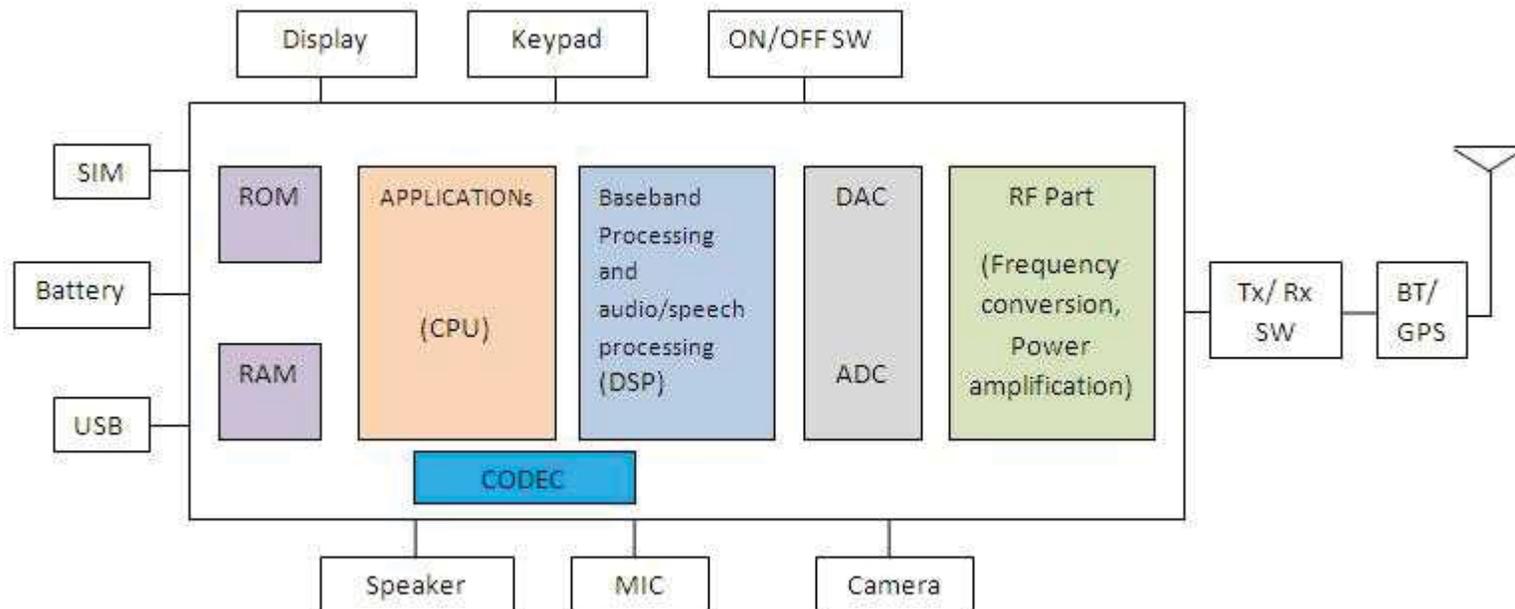
Inputs

Coal

Air

Limestone

Cooling water

Coal-fired power plant

Outputs

Electricity

Flue gas (with CO_2)

Gypsum

Fly ash, bottom ash

Cooling water

Decomposing System

What is this System?

_

Agenda;

Cyber Security in Industrial Systems
System Analysis 101
Examples of System Exploits
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Speed Reading with Program Management Techniques

Malicious actors vs. Bad Design

Stuxnet

→ Stuxnet is a malicious computer worm, first uncovered in 2010

→ Targets SCADA systems and is believed to be responsible for causing substantial damage to Iran's nuclear program.

→ Although neither country has openly admitted responsibility, the worm is widely understood to be a jointly built American/Israeli cyberweapon

How did STUXNET get in?

A
COMPUTER
VIRUS

STUXNET
STUXNET
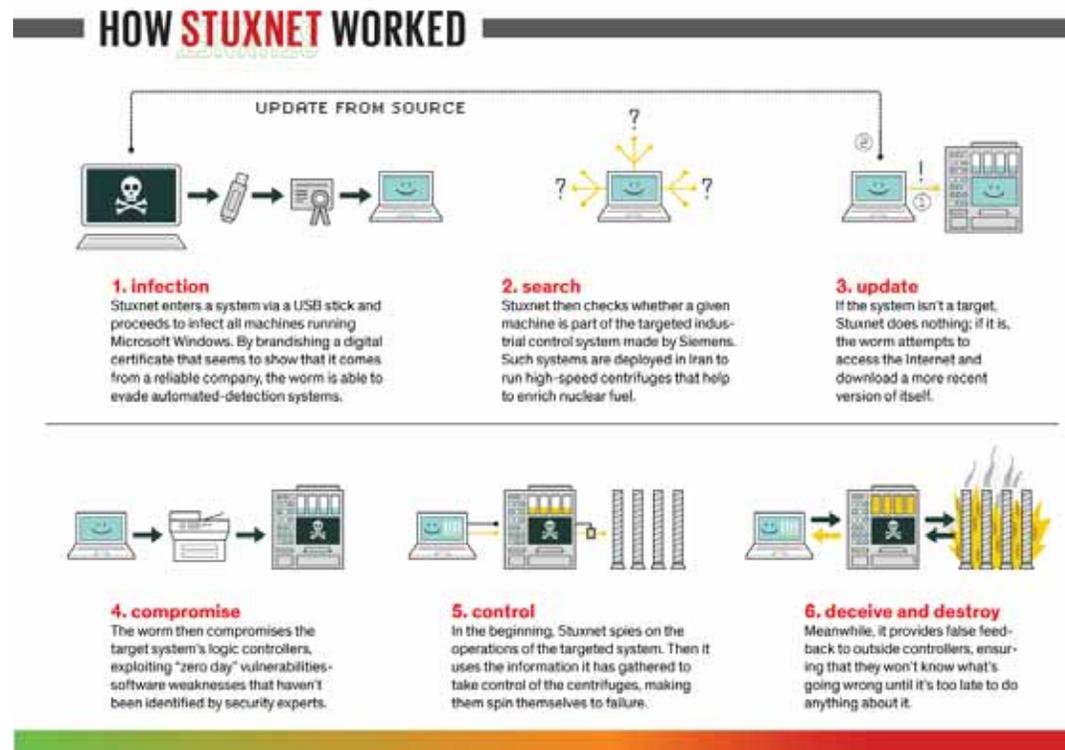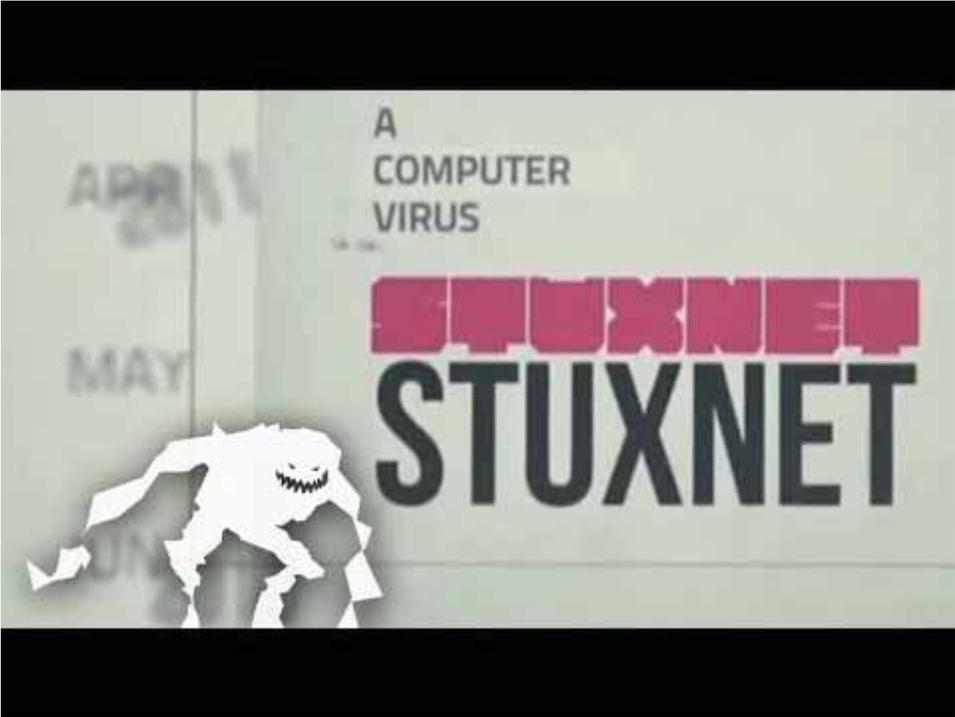
2003 Cascading Blackout

- ➔ The Northeast blackout of 2003 power outage through United States, and the Canadian

- ➔ August 14 –28, 2003, beginning just after 4:10 p.m. EDT. Some power was restored by 11 p.m.

- ➔ Most did not get their power back until two days later. In other areas, it took nearly a week or two for power to be restored.

- ➔ At the time, it was the world's second most widespread blackout in history,

2003 Blackout

What would be your first response?

Tesla Lane Monitoring

➔ Tesla Model S comes with Advanced Lane Assistance Systems with their 2014 release.

➔ Uses the front facing cameras and computer vision system to recognize the lanes.

➔ The system beeps and the steering wheel vibrate, alerting the driver of an unintended lane change.

How do we design against adversarial use?

Agenda;

Cyber Security in Industrial Systems
System Analysis 101
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As an engineer you need to embrace **risk** based thinking!

Focus your efforts on those that are most needed!

International Space Station
Probability of No Impacts From a > 1 cm Ø Debris

Impact Risk

Low   High
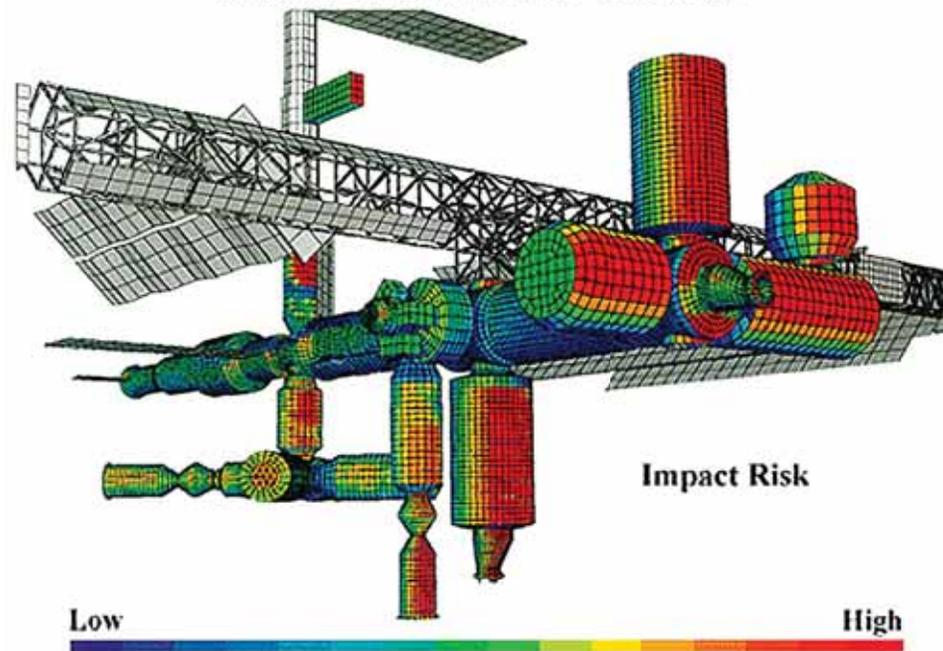
Everyday elements can be misused, have exploits and present vulnerabilities!

What is this?

What types of screwdriver misuse can you think of?

Risk: Design Misuse!
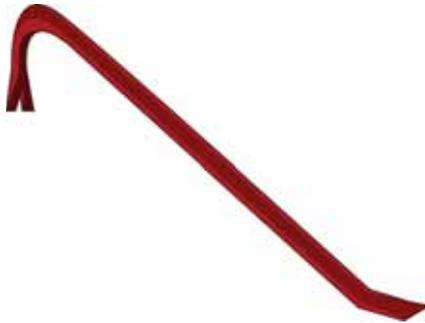
Marketplace Misuse!

_

Agenda;

Cyber Security in Industrial Systems
System Analysis 101
Examples of System Exploits
Identifying & dealing with Risks & Vulnerabilities
Speed Reading with Program Management Techniques

Examples of Project's you've worked on?

Program Management 101
What is a project?

What is a project?

Large body of work with specific deliverables	Constraints driven **Basic;** Time, Quality, Cost 6(+ Risk, Opportunity, Scope)	Collection of stakeholders

Like it or not, you have all worked on a project in your life?
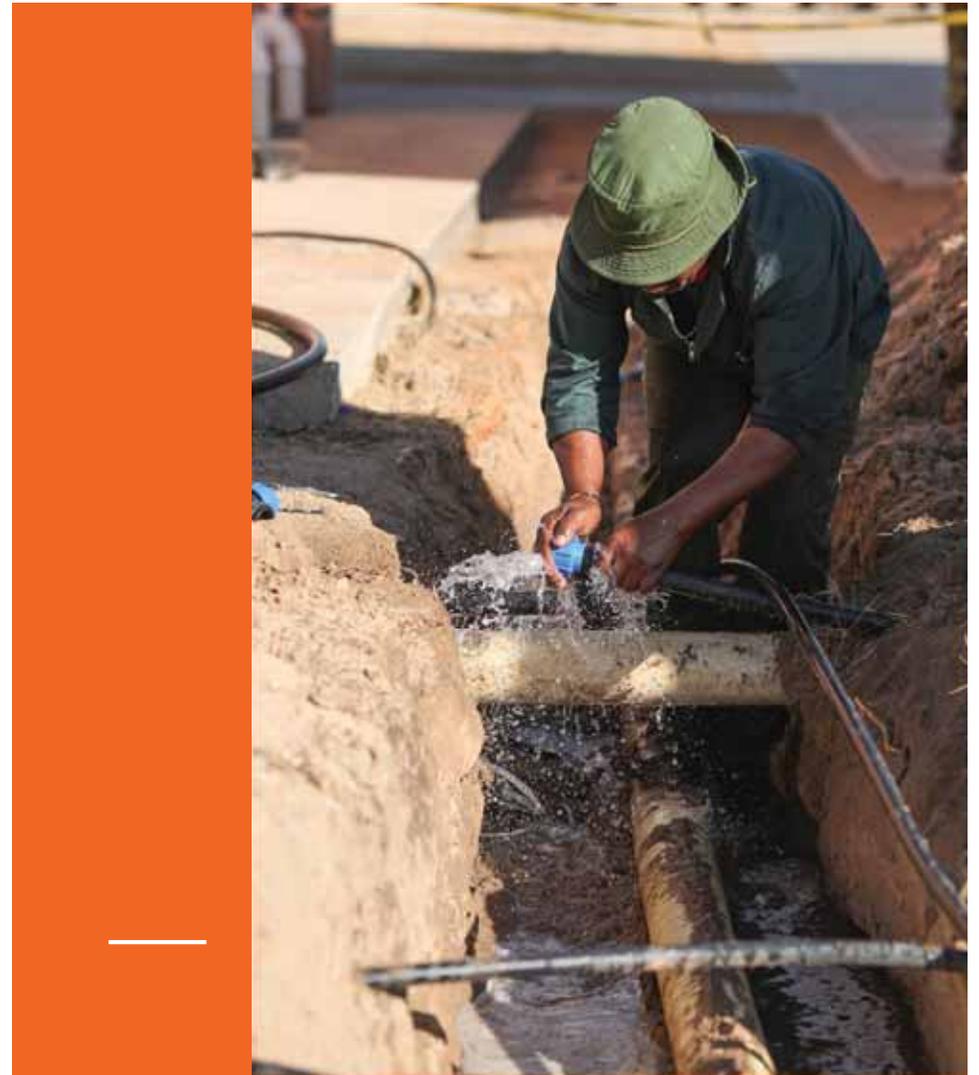
Waterfall vs. Agile Project Methods

–
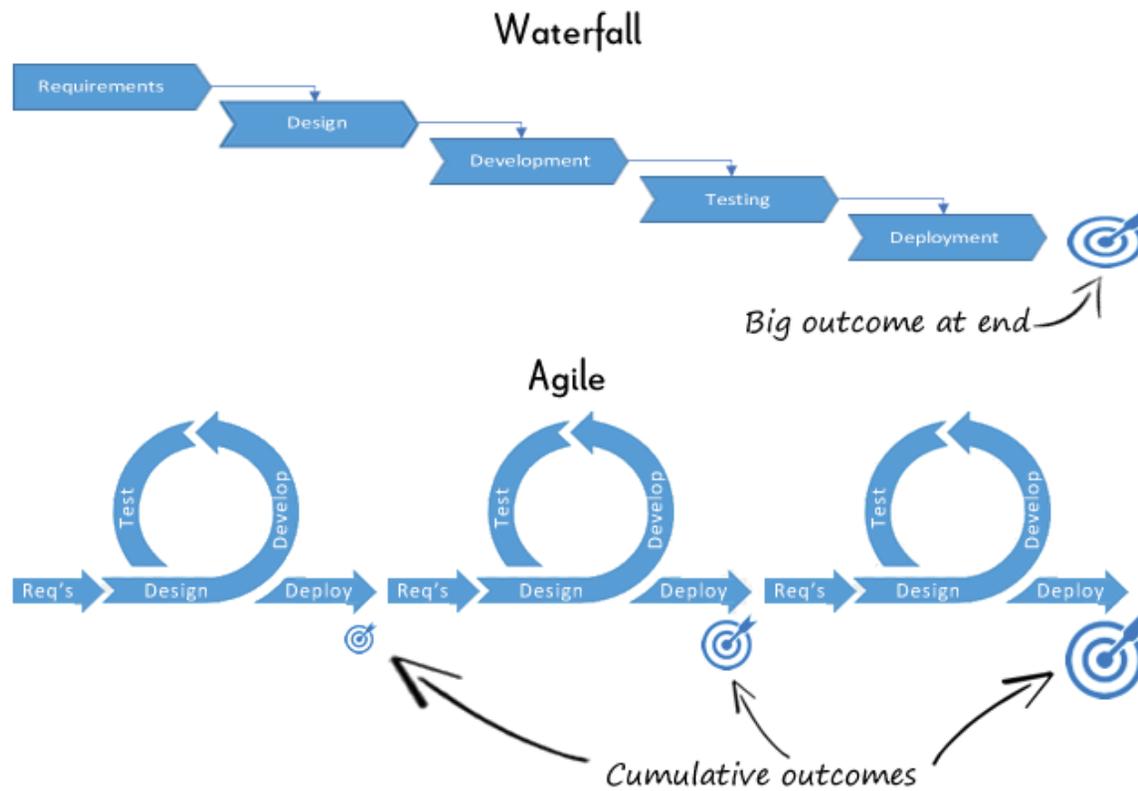
Not all projects are equal!

Some are sprints, some are marathons. The constraints will inform your management approach
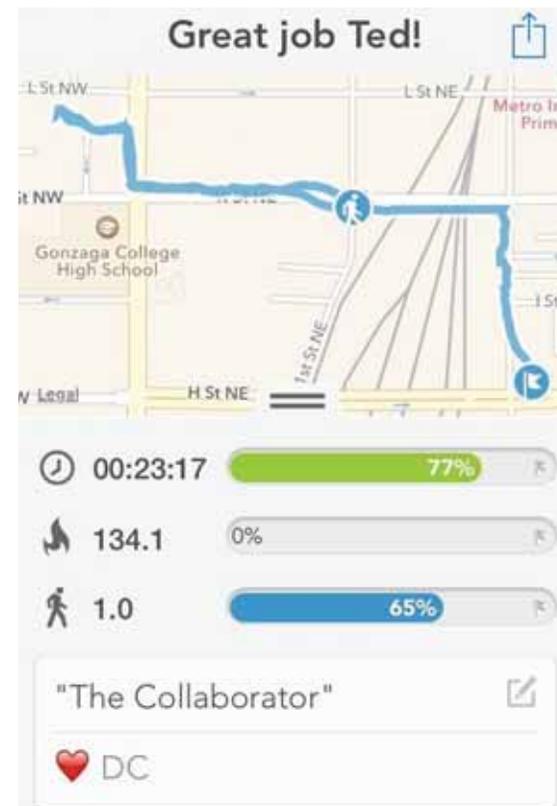
What methodology would you use?

Project:
Create a calorie tracking app
for seniors

Constraints;
Duration: 9 Weeks
Budget; $1,000
Quality; 1 Demo with Investors

Which Methodology PT 1

Waterfall

Agile

What methodology would you use?

Project:
Upgrade existing steel
chemistry reporting system

Constraints;
Duration: 15 Weeks
Budget; $100,000
*Quality; 0 Missed Reports for
initial production run (100
coils of steel)*

Which Methodology PT 2

Agile

Waterfall

Kanban

Kanban (看板) (signboard or billboard in Japanese) is a scheduling system for lean manufacturing and just-in-time manufacturing (JIT). Taiichi Ohno, an industrial engineer at Toyota, developed kanban to improve manufacturing efficiency. Kanban is one method to achieve JIT.The system takes its name from the cards that track production within a factory.

Kanban became an effective tool to support running a production system as a whole, and an excellent way to promote improvement. Problem areas are highlighted by measuring lead time and cycle time of the full process and process steps. One of the main benefits of kanban is to establish an upper limit to work in process inventory to avoid overcapacity.

Simplified Kanban Board
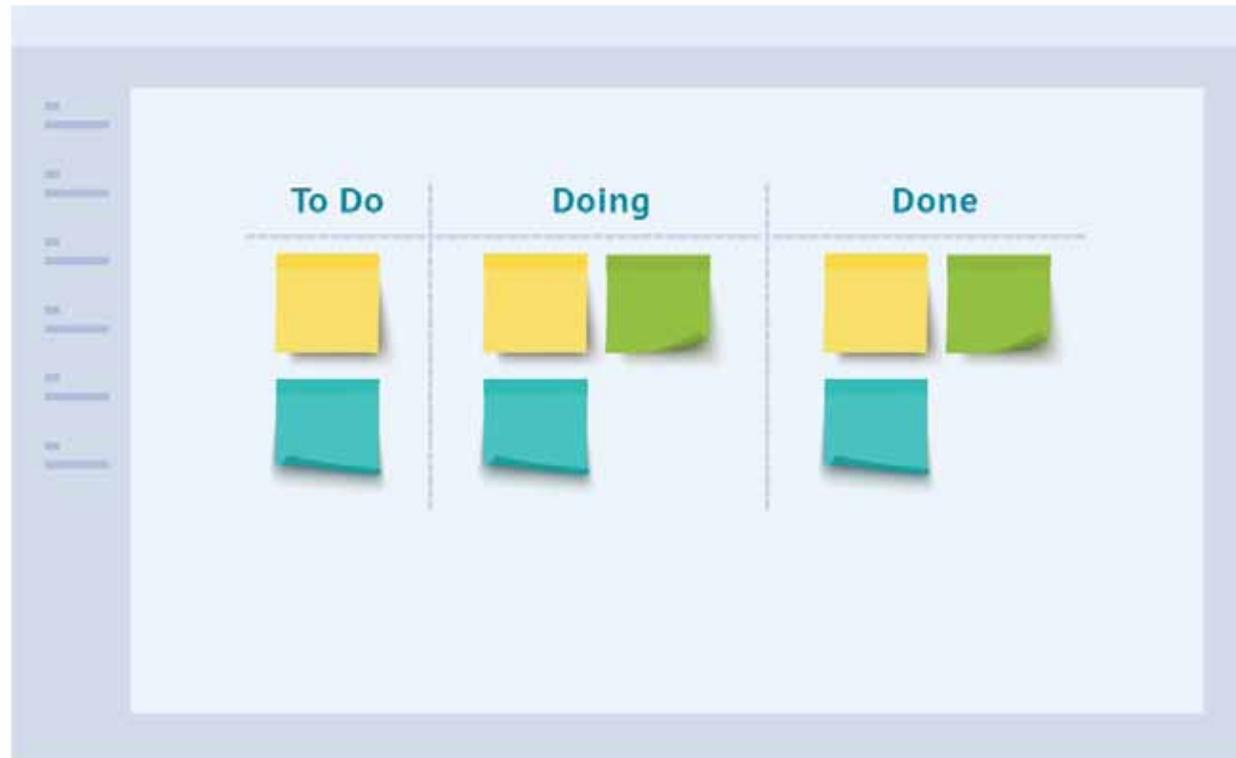
Kanban & you

Agenda

Hour 1

- Cyber Security in Industrial Systems
- System Analysis 101
- Examples of System Exploits
- Identifying & dealing with Risks & Vulnerabilities
- Speed Reading with Program Management Techniques
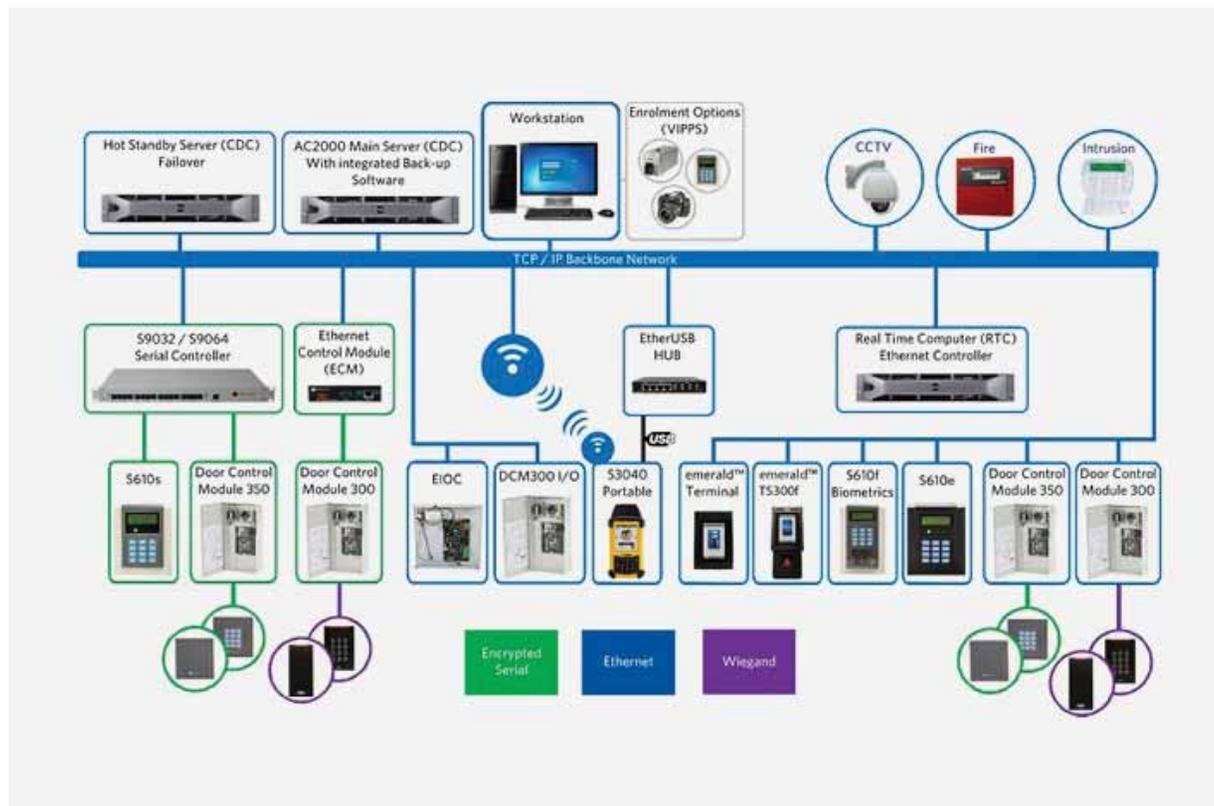
<10 Minute BREAK>

Hour 2

- Exercise & Group Work
  - Overview of an example of Theoretical Airport Security System Design by generating set of Risks
  - Group Exercise
  - Group Review of Exercise

Airport Control System   - System Decomp

Airport Control System   - Risk Generation

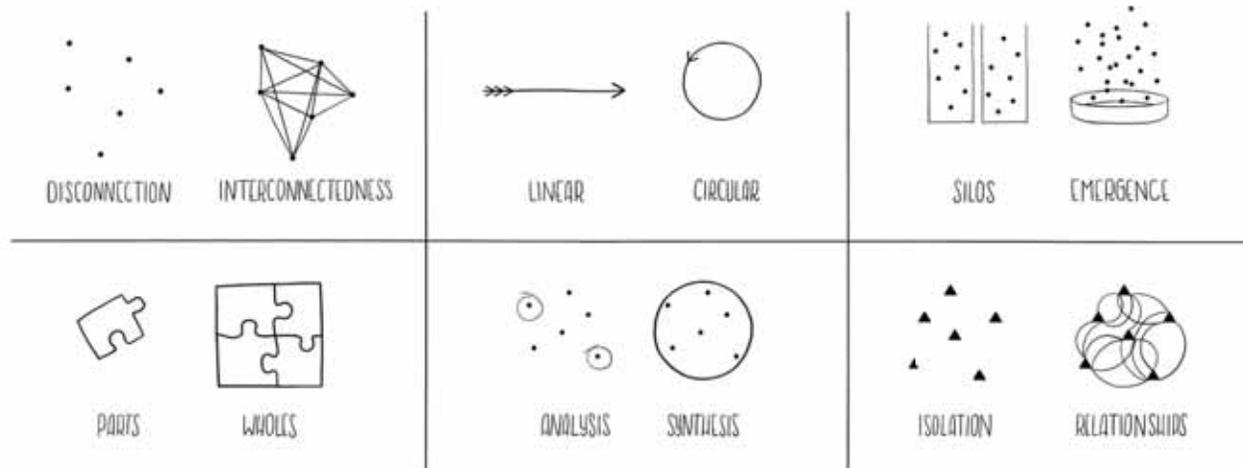# Airport Control System - Kanban Risk Priority

Templates /   [Group](#)

Airport Control System   - Kanban Risk Mitigations

Additional Reading   - Tools of a Systems Thinker

An Introduction to Agile/Scrum

Jeff Pulcini
Cyber Security Workshop
October 3, 2020

Today's Goals

- Give you the big picture, concepts, and keywords of Agile/Scrum

- Contrast Agile with traditional waterfall methods

- Answer why we should care?

Ground Rules

I'm not going to be rigorous in history or definitions.

I'm likely to make extreme statements to make the point.

We will talk software development, but Agile can be used for anything.

INTERACTIVE

CREDITS

Other portions are credited as appropriate.

Additional material by Jeff Pulcini

Mountain Goat Software, LLC

Problem Statement

Today, we need to…

- Produce products faster and for less

- Maximize the actual and perceived value we deliver

- Keep up with the pace of change in the market
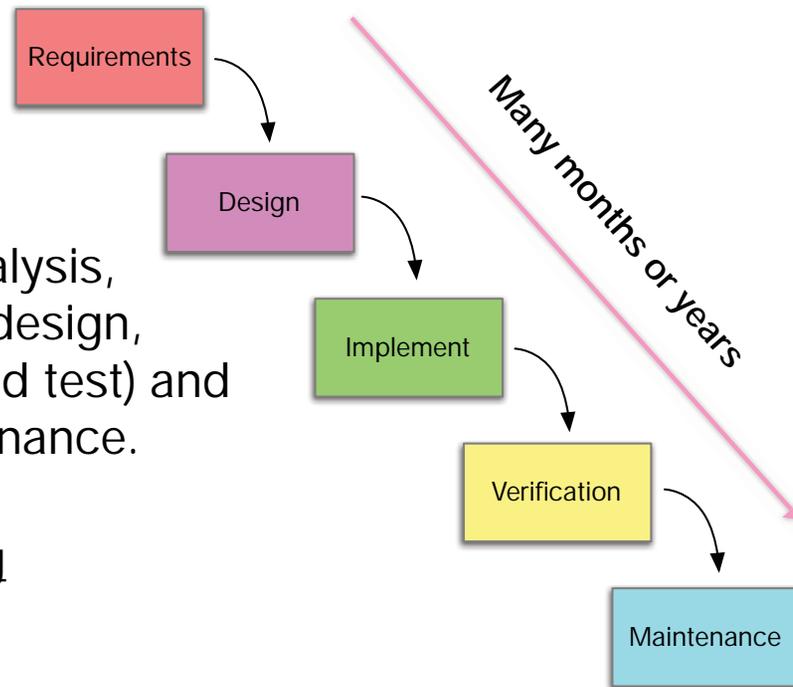
So, what's broken?
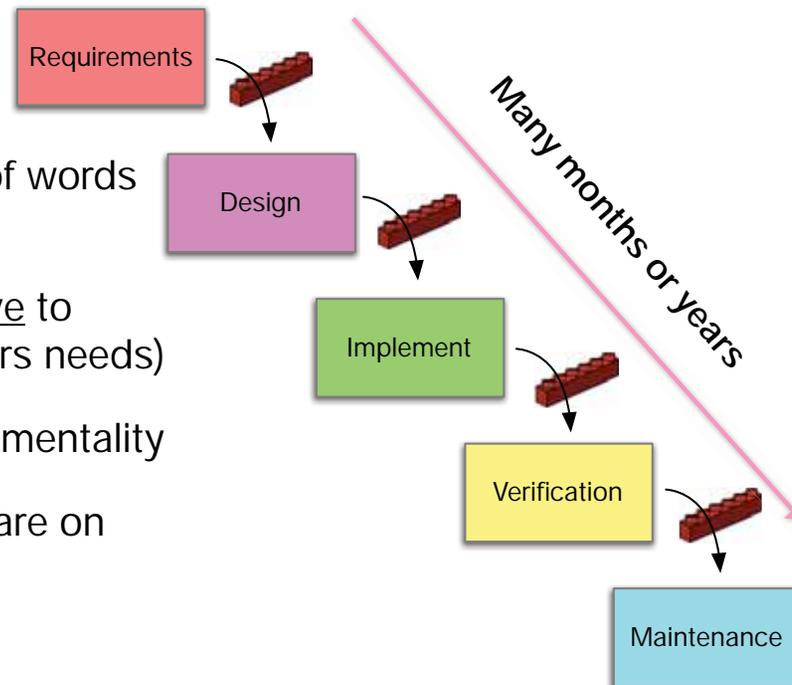
Answer:

Our philosophy

Waterfall Project Management Methodology

- A <u>step-wise</u> approach to product delivery

- It is a or <u>relay race</u> of analysis, requirements definition, design, Implementation (code and test) and then delivery and maintenance.

- Product delivery is a "<u>big bang</u>"/"<u>all or nothing</u>"

Downside of This Approach

- <u>Focus</u> is primarily <u>on process</u>, not people

- <u>Formal communications</u>, Lots of words on paper

- Rigid in execution. <u>Unresponsive</u> to changing markets (and thus users needs)

- Each step fosters a <u>them vs. us</u> mentality

- <u>Plan based</u> - We measure if we are on track, not what we have done

- <u>Long development cycles</u>

- **You know the least when you start**

Requirements

Design

Implement

Verification

Maintenance

Many months or years

Cone of Uncertainty

Example: Boeing's 787 Dreamliner was 5x more expensive and took twice as long to deliver than original estimates.

As described by Steve McConnel, Software Estimation: Demystifying the Black Art
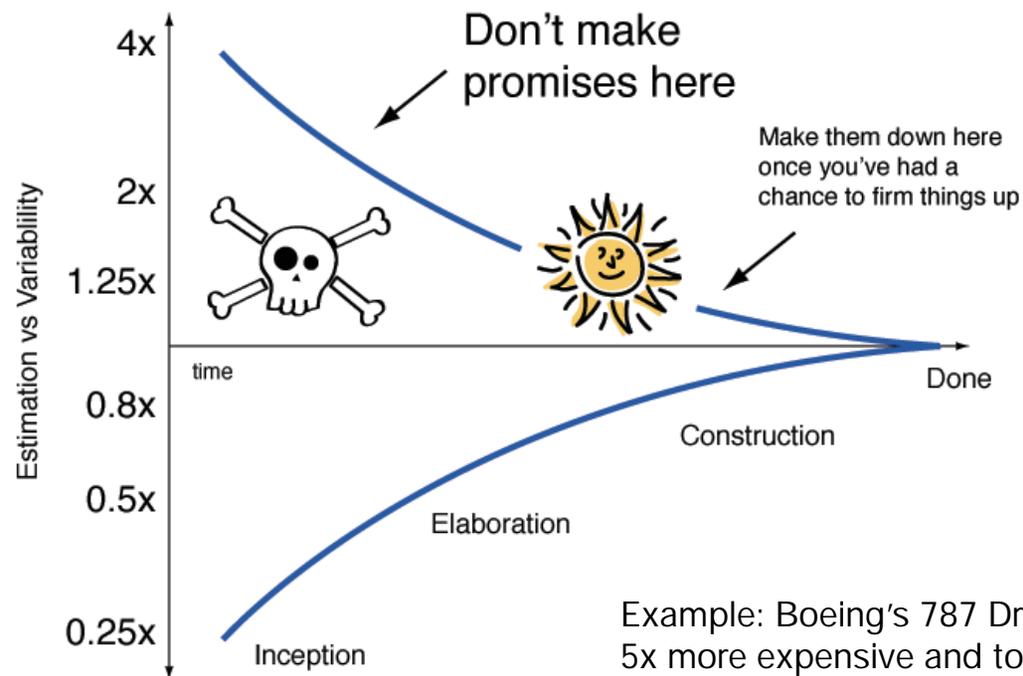
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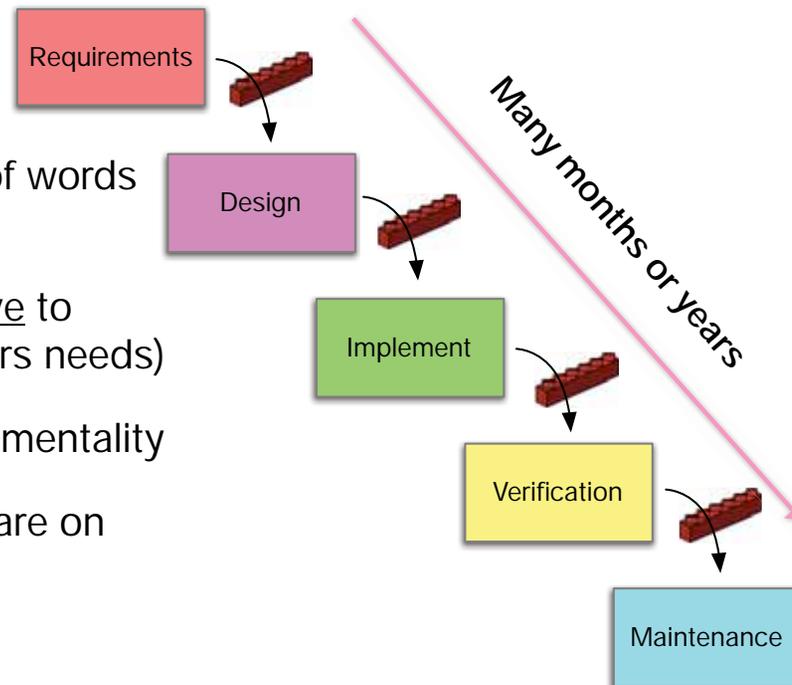
- **You know the least when you start**

Requirements

Design

Implement

Verification

Maintenance

Many months or years

Waterfall vs. Agile

THE WATERFALL PROCESS
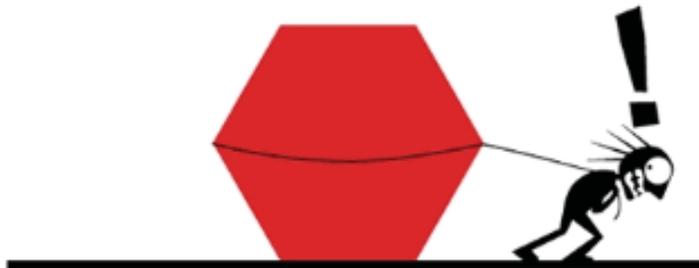
'This project has got so big,
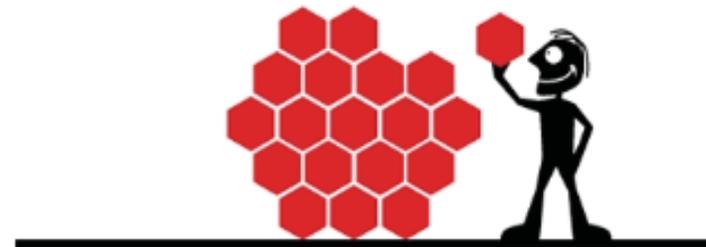I'm not sure I'll be able to deliver it!'

THE AGILE PROCESS

'It's so much better delivering this
project in bite-sized sections'

From various sources from the internet

Process Comparison

- At a **high level**, _both processes will deliver a product_

- The **difference** is in _weight, execution, philosophy, and value delivered_

- Waterfall is Command and Control - Agile is about communications and personal responsibility

- Agile and Scrum are Empirical Project Management

  - Based on Statistical Process Control (Shewhart and Deming) and Lean Manufacturing

  - Frequent Inspect and Adapt Cycles

A Quick Poll

I like to work…

1. By myself with specific, written requirements and/or process and not bothered with other people

2. By myself, but with general requirements and with access to others to discuss requirements, and issues

3. In collaboration a partner with access to a team associated with the project

4. In a large room with many people so I can overhear conversations

When I work, I like to:

1. Be told exactly what to do with little latitude for interpretation.

2. Be given a goal specific enough that I know where I am going, but allowing me flexibility in achieving that goal.

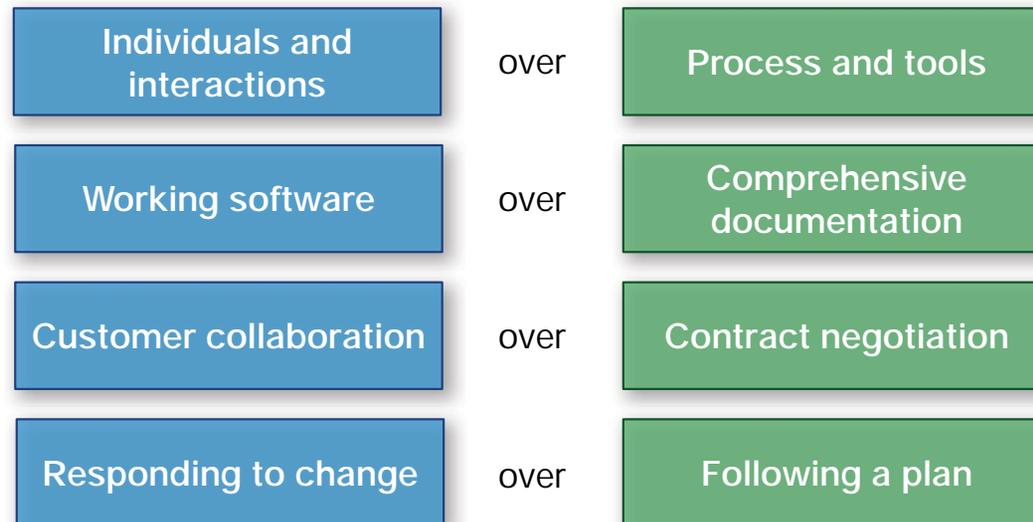# I have worked on the following types of projects:

1. Small personal projects
2. Medium to large personal projects
3. Small projects in a business
4. Medium projects in a business
5. Large projects in a business

Agile

A Philosophy to Change Our Mindset

The 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	Process 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 on the items on the right, we value the items on the left more."

Source: www.agilemanifesto.org

Leadership - Mission First, People Always?

In 2009, James Zenger published a fascinating survey of 60,000 employees […] Two of the characteristics that Zenger examined were results focus and social skills. […] if a leader was seen as being very strong on results focus, the chance of that leader being seen as a great leader was only 14%. […] If a leader was strong on social skills, he or she was seen as a great leader even less of the time — a paltry 12%

However, for leaders who were strong in both results focus and in social skills, the likelihood of being seen as a great leader skyrocketed to 72%.

Should Leaders Focus on Results, or on People?, Dr. Matt Lieberman, Harvard Business Review, December 27, 2013

12 Agile Principles

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 <u>not</u> 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.

Source: http://agilemanifesto.org/principles.html

Sequential vs. overlapping development

| Requirements | Design | Code | Test |
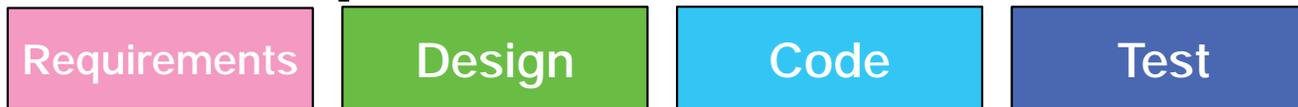
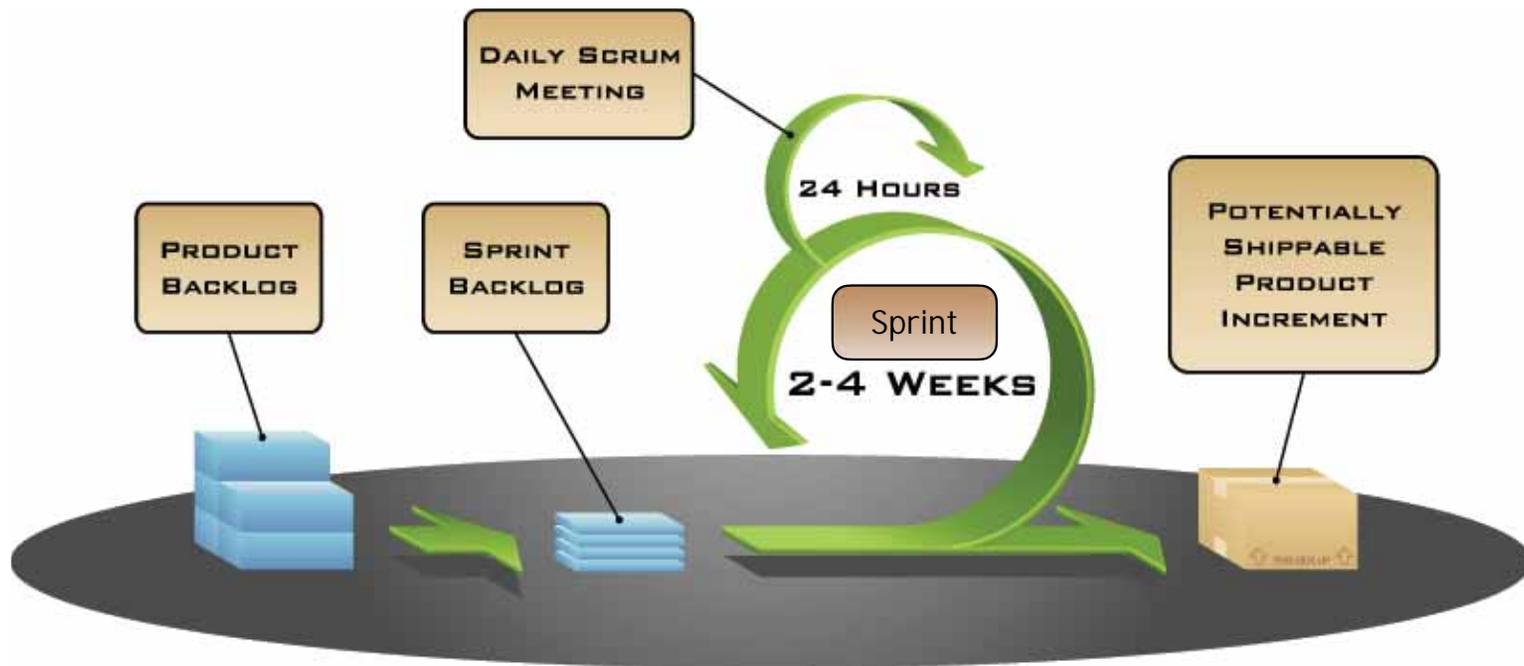**Rather than doing all of one thing at a one time...**

...Scrum teams do a little of everything all the time

Source: "The New New Product Development Game" by Takeuchi and Nonaka. *Harvard Business Review,* January 1986.
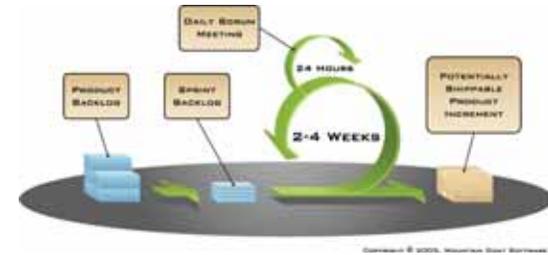
A Framework - Scrum

The Big Picture

Image available at www.mountaingoatsoftware.com/scrum

Characteristics

- Requirements are captured as items in a list of "product backlog"

- Product progresses in a series of short "sprints"

- Self-organizing teams

- No specific engineering practices prescribed

- Uses generative rules to create an agile environment for delivering projects

Generative Rules

- Think of the word "general". Dee Hock, former CEO of Visa said.

  "Simple, clear purpose and principles give rise to complex and intelligent behavior. Complex rules and regulations give rise to simple stupid behavior."

- Jim Donehey, former CIO of Capital One used four rules to help ensure everyone was working toward the same shared goals:

  - **Always align IT with the activities of the business**

  - **Use good economic judgment**

  - **Be flexible**

  - **Have empathy for the other in the organization**

Take a Break

The Big Picture
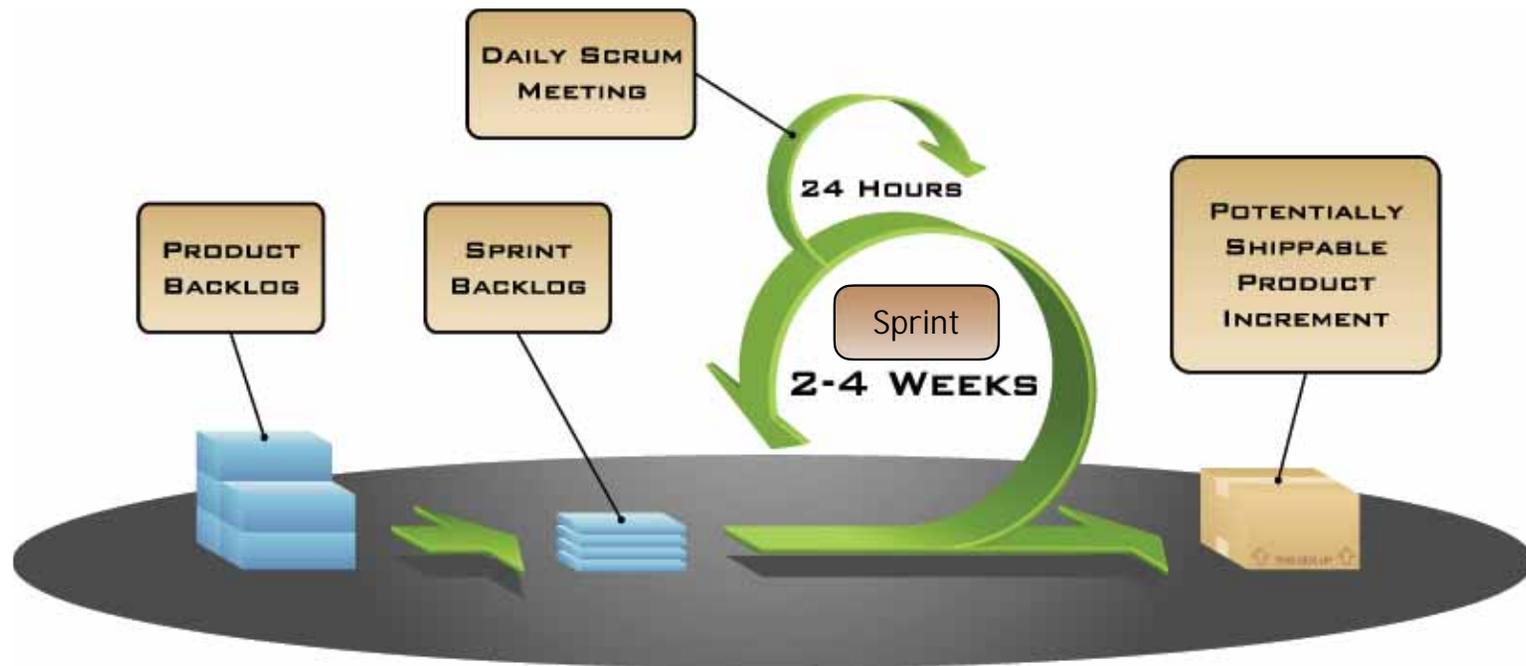
Image available at www.mountaingoatsoftware.com/scrum

Scrum Details

Scrum Framework
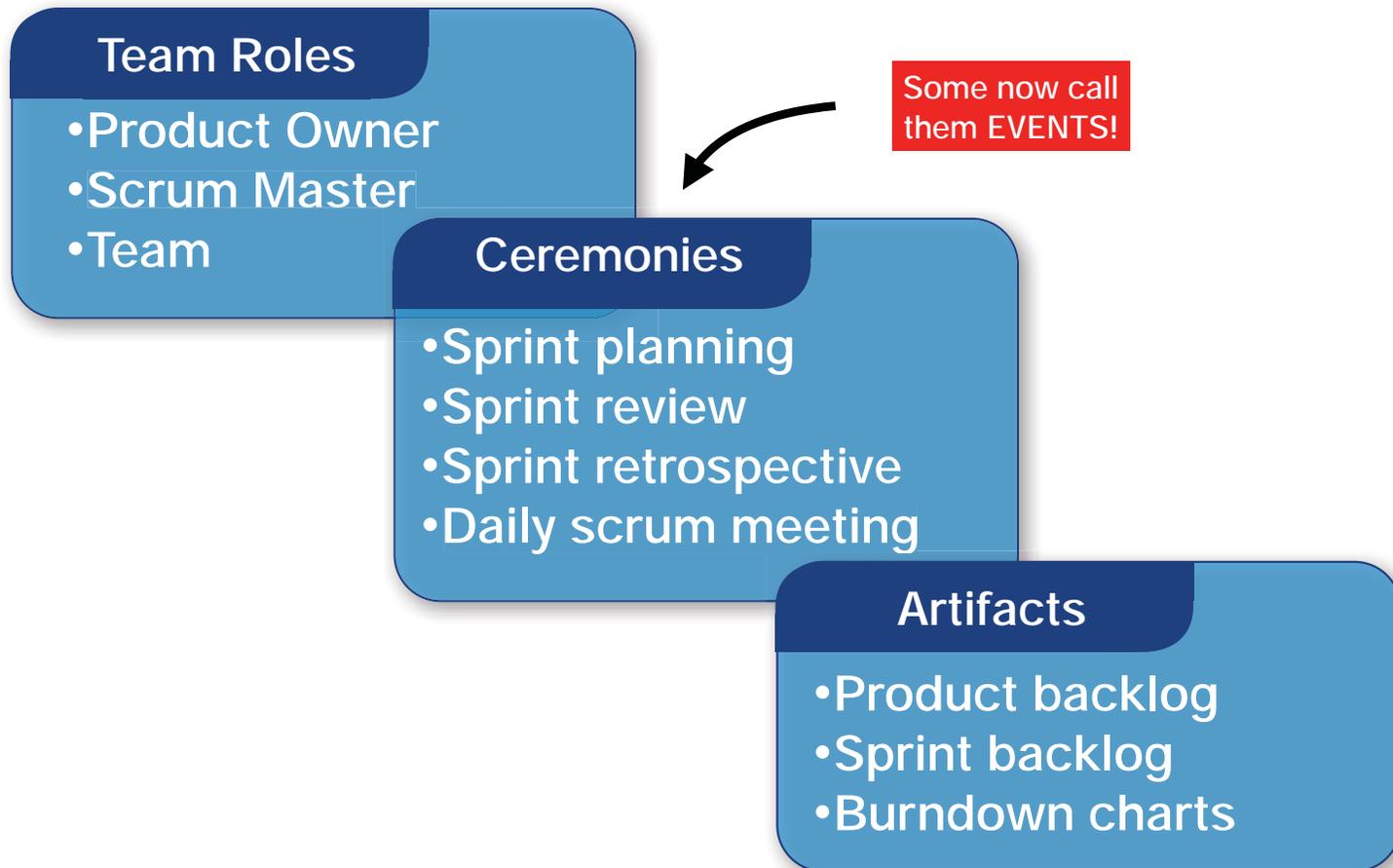
Team Roles
- Product Owner
- Scrum Master
- Team

Some now call them EVENTS!

Ceremonies
- Sprint planning
- Sprint review
- Sprint retrospective
- Daily scrum meeting

Artifacts
- Product backlog
- Sprint backlog
- Burndown charts

Scrum Framework

Team Roles

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Ceremonies

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Product Owner
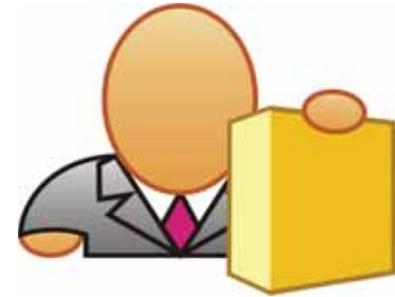
- Define the features of the product

- Decide on release date and content

- Be responsible for the profitability of the product (ROI)

- Prioritize features according to market value

- Adjust features and priority every iteration, as needed

- Accept or reject work results

The Scrum Master

- Represents management to the project
- Responsible for enacting Scrum values and practices
- Removes impediments
- Ensure that the team is fully functional and productive
- Enable close cooperation across all roles and functions
- Shield the team from external interferences
- The ScrumMaster differs from a Project Manager in that he does not exercise command and control

The Team

- Typically 5-9 people
- Cross-functional:
  - Programmers, testers, user experience designers, etc.
- Members should be full-time (no multi-tasking!)
  - May be exceptions (e.g., database administrator)
- Teams are self-organizing
  - Ideally, no titles but rarely a possibility
- Membership should change only between sprints

The Myth of Multitasking
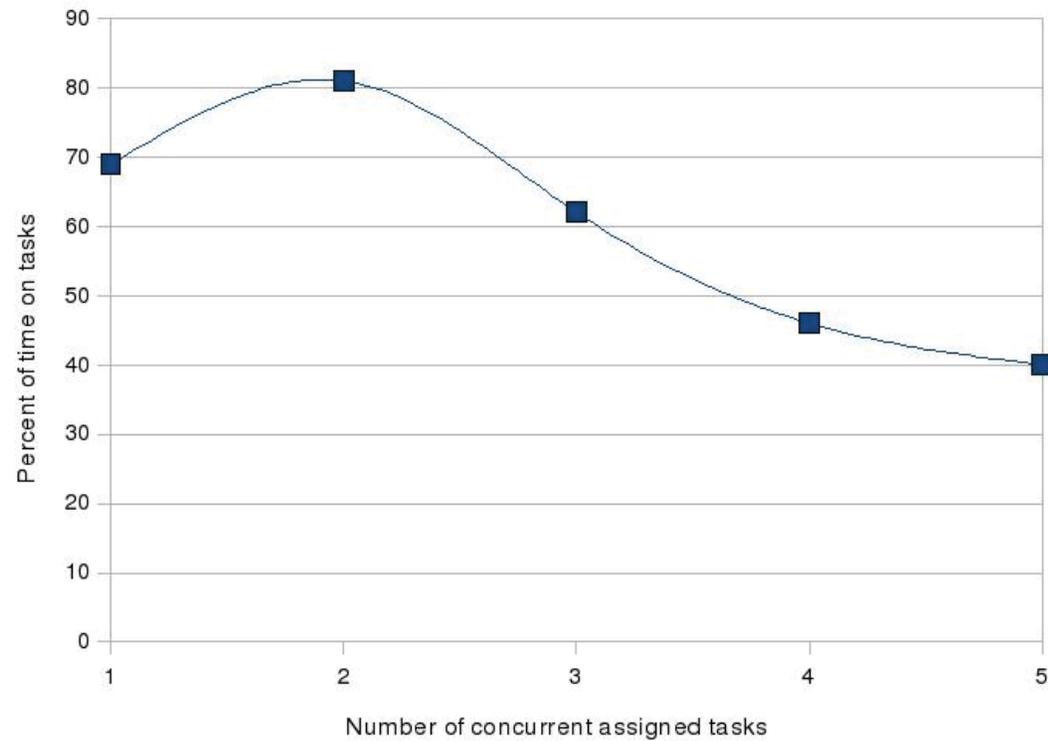
from a 1990's Harvard Study by Steven C.Wheelwright and Kim B.Clark

Testing Multitasking

1. Take paper and pen and prepare to write down the following in three columns HORIZONTALLY.

A	a	1	THEN
B	b	2	
C	c	3	

    -------continue until Z, z and 26---------

Z	z	26

2. Everybody turns on stop watch using their smart phone and begin

3. When done, record your time.

4. Reset stop watch and repeat the same exercise, BUT this time go VERTICALLY.
    Complete capital A to Z first, then go for a-z, and then 1-26.

5. When done, record your time.

Was There a Difference?

From Jeff Sutherland's book *Scrum: The Art of Doing Twice the Work in Half the Time*

Scrum Framework

Team Roles

- Product Owner
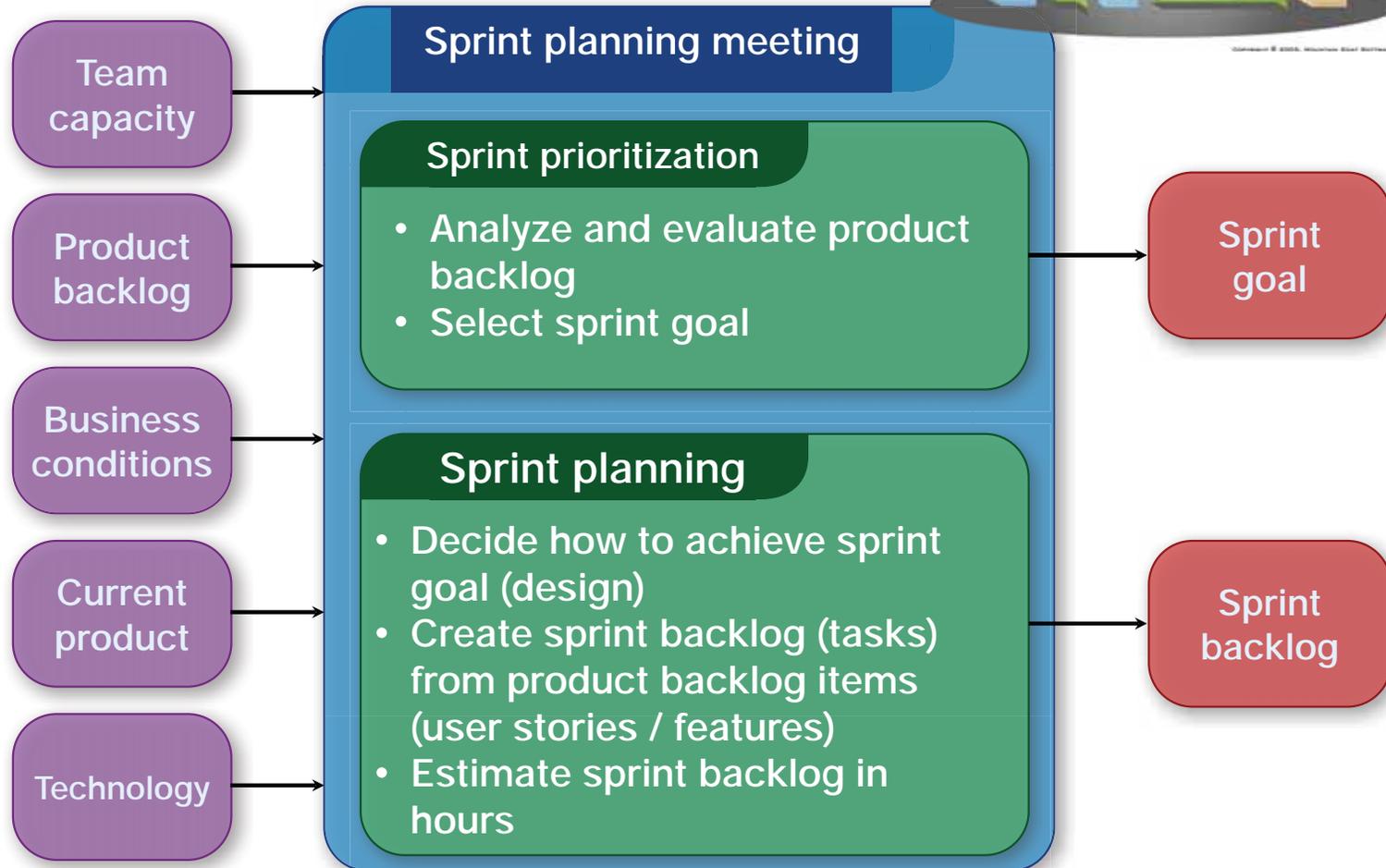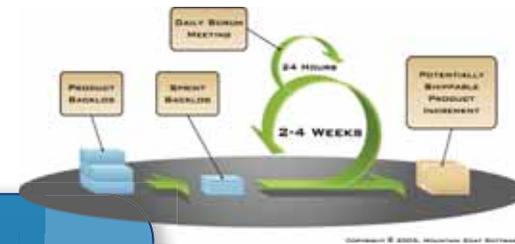- Scrum Master
- Team

Ceremonies

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Sprint Planning

Sprint planning meeting

Team capacity	→
Product backlog	→
Business conditions	→
Current product	→
Technology	→

Sprint prioritization

- Analyze and evaluate product backlog
- Select sprint goal

→ **Sprint goal**

Sprint planning

- Decide how to achieve sprint goal (design)
- Create sprint backlog (tasks) from product backlog items (user stories / features)
- Estimate sprint backlog in hours

→ **Sprint backlog**

The Sprint Goal

- A short statement of what the work will be focused on during the sprint

Life Sciences

Support features necessary for population genetics studies.

Database Application

Make the application run on SQL Server in addition to Oracle.

Financial services

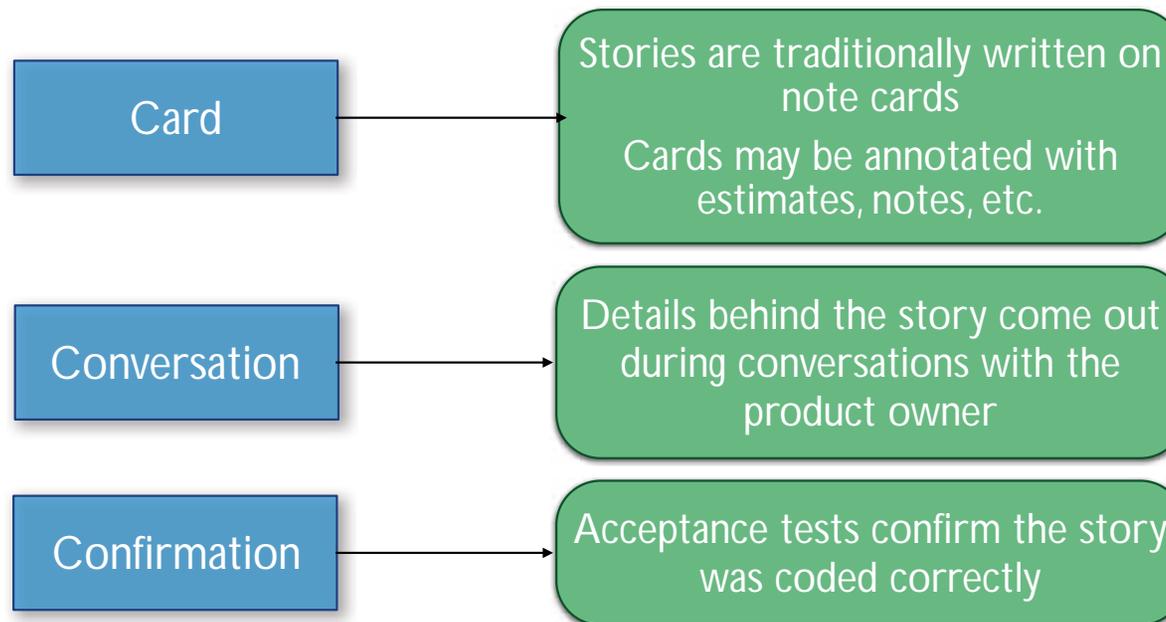Support more technical indicators than company ABC with real-time, streaming data.

User Stories

Who
What
Why

Feature #1 - Publish Trainings

As a manager
I want to publish trainings
In order to make them available to customers

What is a User Story

A user story describes functionality that will be valuable to either a user or purchaser of a system or software*

Card	→	Stories are traditionally written on note cards Cards may be annotated with estimates, notes, etc.
Conversation	→	Details behind the story come out during conversations with the product owner
Confirmation	→	Acceptance tests confirm the story was coded correctly

*Mike Cohn, User Stories Applied

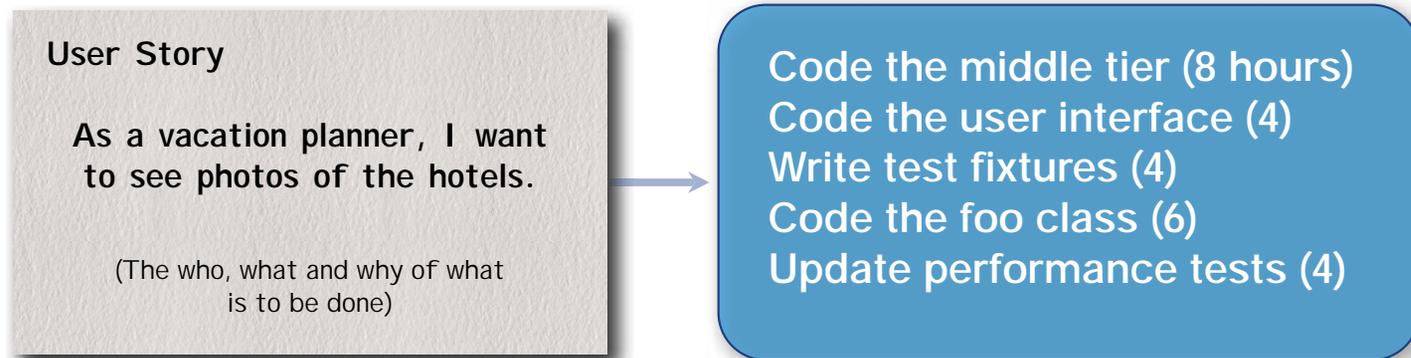Ron Jeffries http://xprogramming.com/articles/expcardconversationconfirmation/

Requirements Collection / User Stories
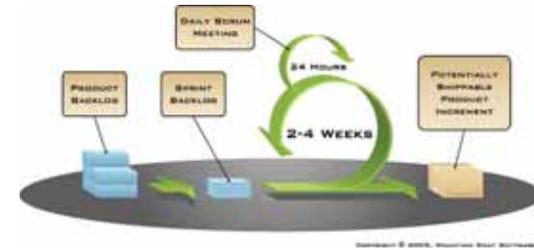
- **"Big Stories" to Small Stories**
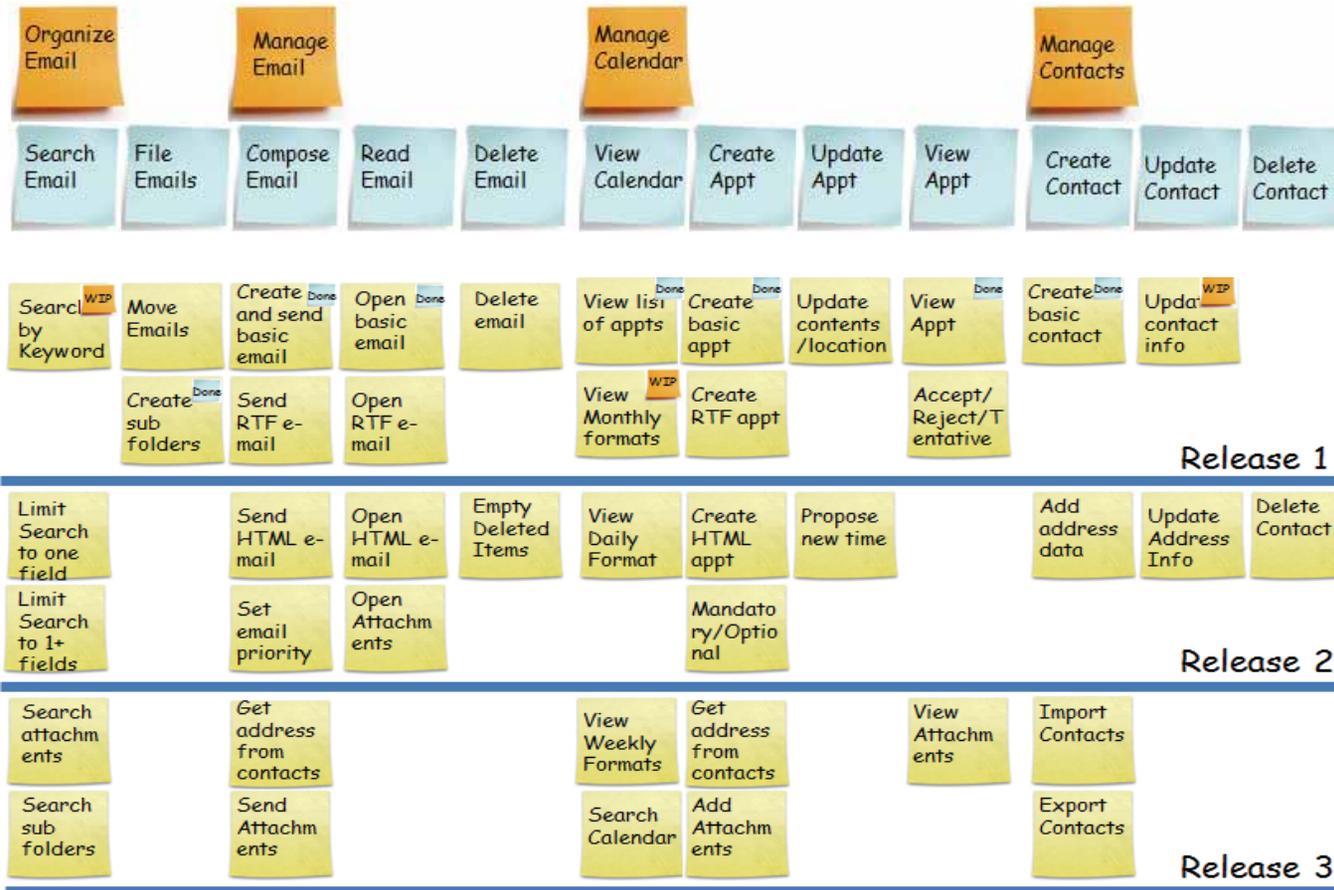
Sprint Planning

- Team selects User Stories from the product backlog they can **commit to completing**

- Sprint backlog is created

  - Tasks are identified and each is estimated (1-16 hours)

  - Done Collaboratively, not alone by the Scrum Master/ Product Owner

- High-level design is considered

User Story

As a vacation planner, I want to see photos of the hotels.

(The who, what and why of what is to be done)

Code the middle tier (8 hours)
Code the user interface (4)
Write test fixtures (4)
Code the foo class (6)
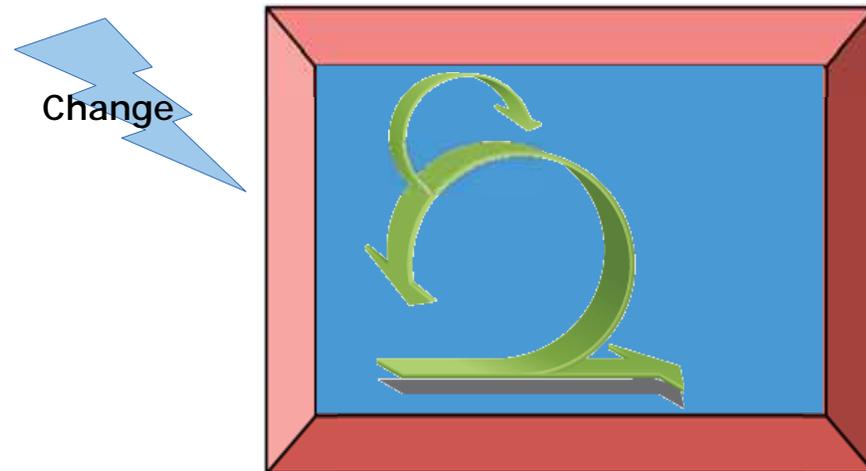Update performance tests (4)

Sprints

- Scrum projects make progress in a series of "sprints"

- Typical duration is 2–4 weeks or a calendar month at most

- A constant duration leads to a better rhythm

- Product is designed, coded, and tested during the sprint

No changes during a sprint

- Plan sprint durations around how long you can commit to keeping change out of the sprint

The Daily Scrum

- Parameters
  - Daily
  - 15-minutes
  - Stand-up
- Not for problem solving
  - Whole world is invited
  - Only team members, ScrumMaster, product owner, can talk
- Helps avoid other unnecessary meetings

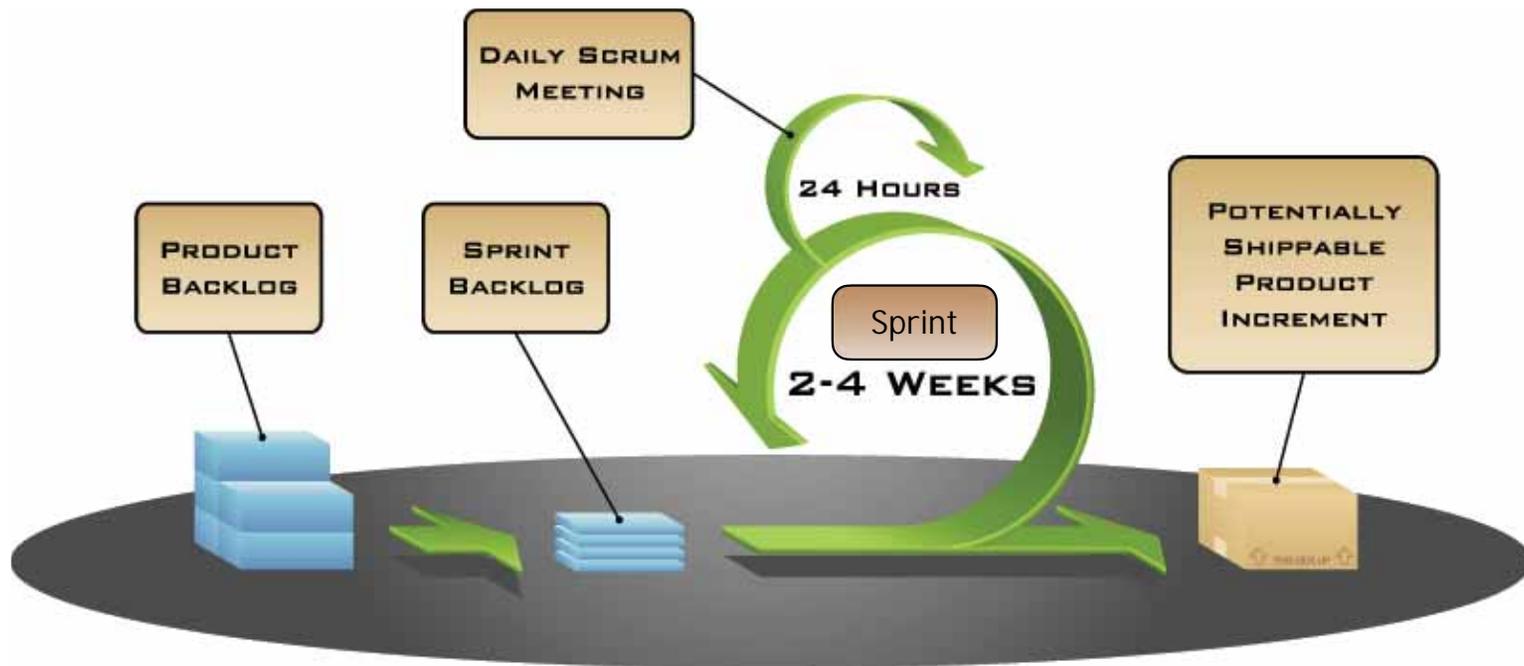# Everyone Answers Three Questions

1

What did you do yesterday?

2

What will you do today?

3

Is anything in your way?

- These are *not* status for the ScrumMaster
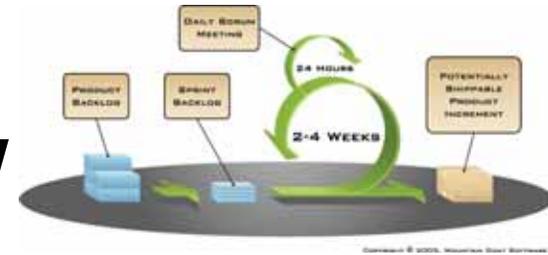- They are commitments in front of peers
- Transparency is key!

The Big Picture

DAILY SCRUM MEETING

PRODUCT BACKLOG

SPRINT BACKLOG

24 HOURS

Sprint

2-4 WEEKS

POTENTIALLY SHIPPABLE PRODUCT INCREMENT

Image available at www.mountaingoatsoftware.com/scrum

The Sprint Review

- Invite the world

- Whole team participates

- Informal

  - 2-hour prep time rule

  - No slides

- Team presents what it accomplished during the sprint

- Typically takes the form of a demo of new features or underlying architecture

Sprint Retrospective

- Periodically take a look at what is and is not working - Inspect and adapt!
- Typically 15–30 minutes
- Done after every sprint
- Whole team participates
  - ScrumMaster, Product owner, Team
  - Possibly customers and others

Start / Stop / Continue

- Whole team gathers and discusses what they'd like to:

Start doing

Stop doing

Continue doing

This is just one of many ways to do a sprint retrospective.

Scrum Framework

Team Roles
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- Sprint backlog
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Product Backlog

This is the product backlog

COPYRIGHT © 2005, MOUNTAIN GOAT SOFTWARE

- The requirements

- A list of all desired work on the project

- Ideally expressed such that each item has value to the users or customers of the product

- Prioritized by the product owner

- Reprioritized at the start of each sprint

A Sample Product Backlog

Backlog item	Estimate
Allow a guest to make a reservation	3
As a guest, I want to cancel a reservation.	5
As a guest, I want to change the dates of a reservation.	3
As a hotel employee, I can run RevPAR reports (revenue-per-available-room)	8
Improve exception handling	8
...	13
...	34

Sprint Backlog

This is the sprint backlog

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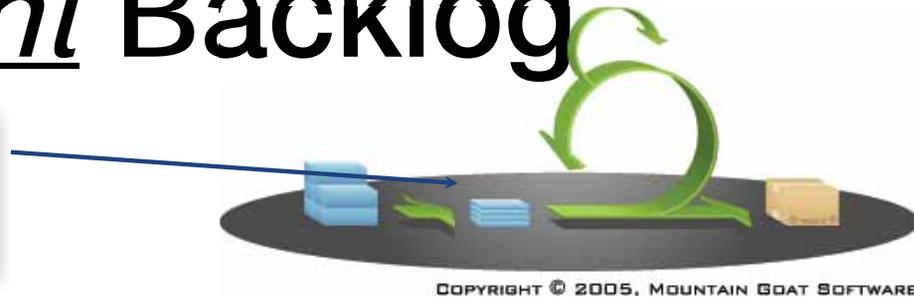
- One or more <u>Product</u> Backlog items make up the <u>Sprint</u> Backlog.

- The work is decomposed into tasks and hours.

- If work is unclear, define a sprint backlog item with a larger amount of time and break it down later.

- Individuals sign up for work - work is never assigned.

- Estimated work remaining is updated daily as more becomes known.

- Any team member can add, delete or change the sprint backlog.

A <u>Sprint</u> Backlog

Tasks	Mon	Tues	Wed	Thur	Fri
Code the user interface	8	4	8		
Code the middle tier	16	12	10	4	
Test the middle tier	8	16	16	11	8
Write online help	12				
Write the foo class	8	8	8	8	8
Add error logging			8	4	

Burndown Example

Tasks	Mon	Tues	Wed	Thur	Fri
Code the user interface	8	4	8		
Code the middle tier	16	12	10	7	
Test the middle tier	8	16	16	11	8
Write online help	12				
	44	32	34	18	8

Ideal ———
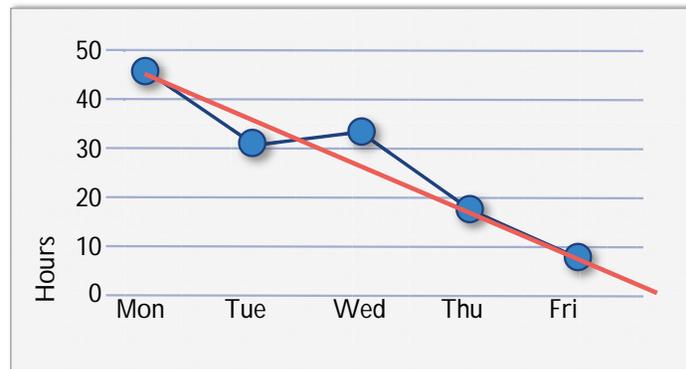
Review / Take Aways

Review / Take Aways

- Agile is a *philosophy* - a way of BEING Agile

- Scrum is a framework, method or process - a way of DOING Agile

- We defer to BEING Agile when we implement a framework, process or method, process

Review / Take Aways

- A leader is strong in both results focus and in social skills - Mission First, People Always

- Leaders like Generative Rules

- Remember to define ready and done

- Leader/friends don't let friends "multi-task"

Review / Take Aways

- Process is not bad, it just must be subservient to Agile Principles

- Scrum teams do a little of everything all the time

- We deliver functionality, not products - Bite size chunks vs. a Big Bang

Review / Take Aways

- The Product Owner is the ultimate authority in form, function and delivery

- The Scrum Master is assures we are BEING Agile and helps the team move forward

- The <u>team</u> is responsible and self organizing - we all may have roles, but in the end, we are a team of leaders

Review / Take Aways

- User Stories define functionality and promote discussion

- It is utter arrogance to try to predict the future - Cone of Uncertainty

- We first T-Shirt size and only define tasks and time at Sprint Planning

Review / Take Aways

- No Heroics! Sprints provide a sustainable cadence for EVERYONE.

- Transparency is paramount (Remember George Bernard Shaw)

- Inspect and Adapt!

Jeff Pulcini

Jeff.Pulcini@me.com

248-462-9794

2020 Pittsburgh PMI - PittAgile Gathering

PittAgileDay.com

Sign Up at:
https://pittsburghpmi.org/calendar?eventId=5939

Why do this?

Reasons for Adopting Agile
Success Rates

April 1, 2018

Bottom Line

- Agile projects are 2X more likely to succeed

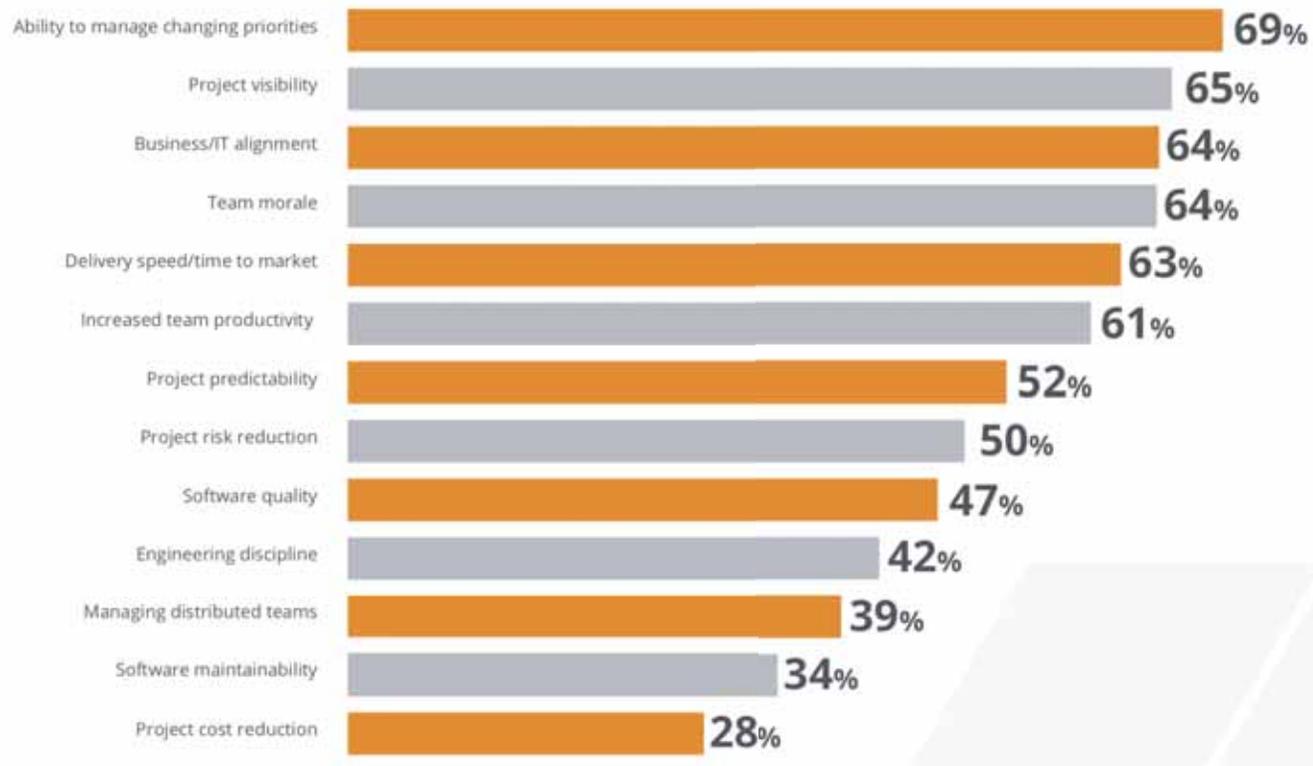- Agile projects are1/3 less likely to fail than waterfall projects

The Standish Group has conducted surveys of IT project success and failure rates every 2 years since 1994.

Source: Standish Group Chaos Study 2018

Reasons for Adopting Agile Shifts in Industry Attitudes

Changes from 2018 to 2019

• Less about increasing productivity (51% compared to 55%)

• More about improving team morale (34% compared to 28%)

• Less about reducing project risk (28% compared to 37%)

• More about reducing project costs (41% compared to 24%)

Benefits of Adopting Agile

Benefit	Percentage
Ability to manage changing priorities	69%
Project visibility	65%
Business/IT alignment	64%
Team morale	64%
Delivery speed/time to market	63%
Increased team productivity	61%
Project predictability	52%
Project risk reduction	50%
Software quality	47%
Engineering discipline	42%
Managing distributed teams	39%
Software maintainability	34%
Project cost reduction	28%

Source: 13th-annual-state-of-agile-report.pdf - 2019 - https://www.stateofagile.com/#ufh-c-473508-state-of-agile-report

Scrum has been used for:

- Commercial software
- In-house development
- Contract development
- Fixed-price projects
- Financial applications
- ISO 9001-certified applications
- Embedded systems
- 24x7 systems with
    99.999% uptime requirements
- The Joint Strike Fighter

- HR improvement projects
- Sales and Marketing projects
- Training and Education
- Video game development
- FDA-approved, life-critical systems
- Satellite-control software
- Websites
- Mobile phones
- Network switching applications
- ISV applications
- Some of the largest applications in use

Scrum Has Been Used By

- Microsoft
- Yahoo
- Google
- Electronic Arts
- High Moon Studios
- Lockheed Martin
- Philips
- Siemens

- Capital One
- BBC
- Intuit
- Nielsen Media
- First American Real Estate
- BMC Software
- Ipswitch
- John Deere

- Nokia
- Lexis Nexis
- Sabre
- Salesforce.com
- Time Warner
- Turner Broadcasting
- Oce

Agile Principles in Action

The Troubled HH60W Program

"The team had a moment whether we decided we're all in, and we're going to to do whatever it takes," Roper tells Aviation Week. "We're going to follow the rules, but we're going to slim them down to the minimum set necessary to keep us focused on delivering on time."

Will Roper, Air Force acquisition executive

The "old school" methods shaved 4 months from the deployment test program.

Aviation Week & Space Technology/October 28-November 10, 2019

Bonus Slides

6 Stories emphasize the user's goals not the system's attributes.

What are we building?

1. The product shall have a gas engine.
2. The product shall have four wheels.
   2.1. The product shall have a rubber tire mounted to each wheel.
3. The product shall have a steering wheel.
4. The product shall have a steel body.

Source: Adapted from *The Inmates are Running the Asylum* by Alan Cooper (1999).

Example Task Board

Story	To Do		In Process	To Verify	Done
As a user, I... 8 points	Code the... 9	Test the... 8	Code the... DC 4	Test the... SC 6	Code the... D... / Test the... SC 8 / Test the... SC / Test the... SC / Test the... SC 6
	Code the... 2	Code the... 8	Test the... SC 8		
	Test the... 8	Test the... 4			
As a user, I... 5 points	Code the... 8	Test the... 8	Code the... DC 8		Test the... SC / Test the... SC / Test the... SC 6
	Code the... 4	Code the... 6			
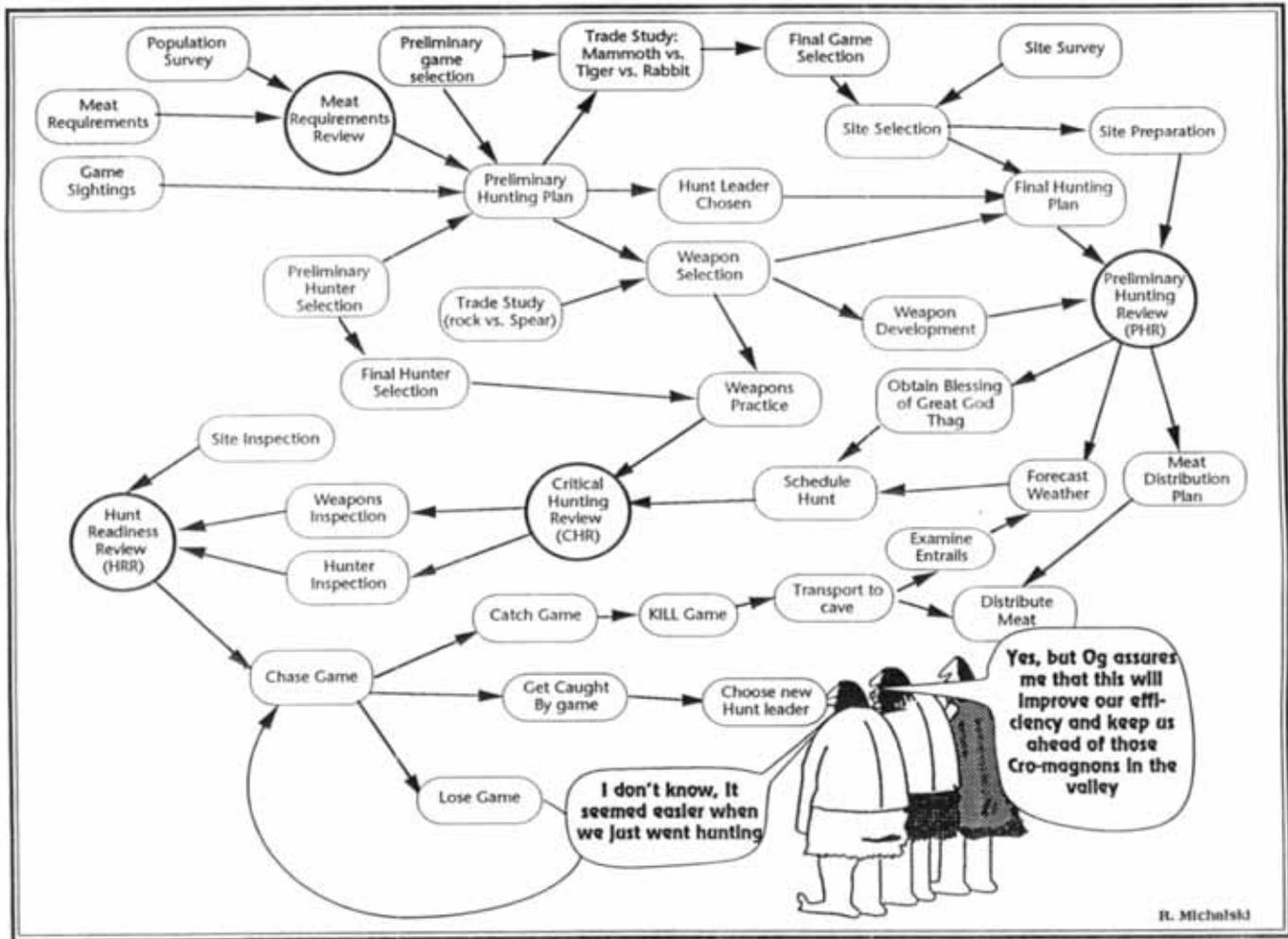
• Why the Neanderthals became extinct •