Project Management for IT Projects: part 2

INNOVATIVE PROJECTS

LESSON 9-May 21st 2025

CASE STUDIES

Mario Salano

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Course agenda (part 2:INNOVATIVE PROJECTS)

1. INNOVATION AND METHODOLOGIES
2. AGILE CONCEPTS
3. AGILE METHODOLOGIES OVERVIEW WITHOUT SCRUM
4. SCRUM
5. LEAN
6. DESIGN THINKING
7. VALUE DRIVEN DELIVERY
8. STAKEHOLDERS,TEAMS,ADAPTIVE PLANNING
9. **CASE STUDIES**
10. EXERCISES
11. CONTINUOUS IMPROVEMENT
12. REVIEW

OBJECTIVE:**STUDENTS SUPPORT,**FACING THE REAL WORK LIFE OF TODAY

THE WORLD IS MORE AND MORE **“PROJECTIZED”.**

PROJECT MANAGEMENT WITH ITS BASIC CULTURE BECOMES A

FORMIDABLE ASSET

CONSIDERATIONS ON PROJECT MANAGEMENT

- One of the most used definitions is the one put forward by the Project Management Institute in the PMBOK (A Guide to the Project Management Body Of Knowledge - PMBOK), which defines a project

A <u>TEMPORARY</u> EFFORT TO <u>CREATE A</u> <u>UNIQUE</u> PRODUCT/ SERVICE

Projects have always been done since ancient times,

much more rarely than today, in a projectized world

In the reconstruction after the Second World War methodologies proved increasingly necessary

- **1969**: after months of conversations between Jim Snyder and Gordon Davis, a decision was taken to form a new organization to provide a means for project managers to associate, share information and discuss issues

- A meeting in Georgia sealed the birth of the Project Management Institute

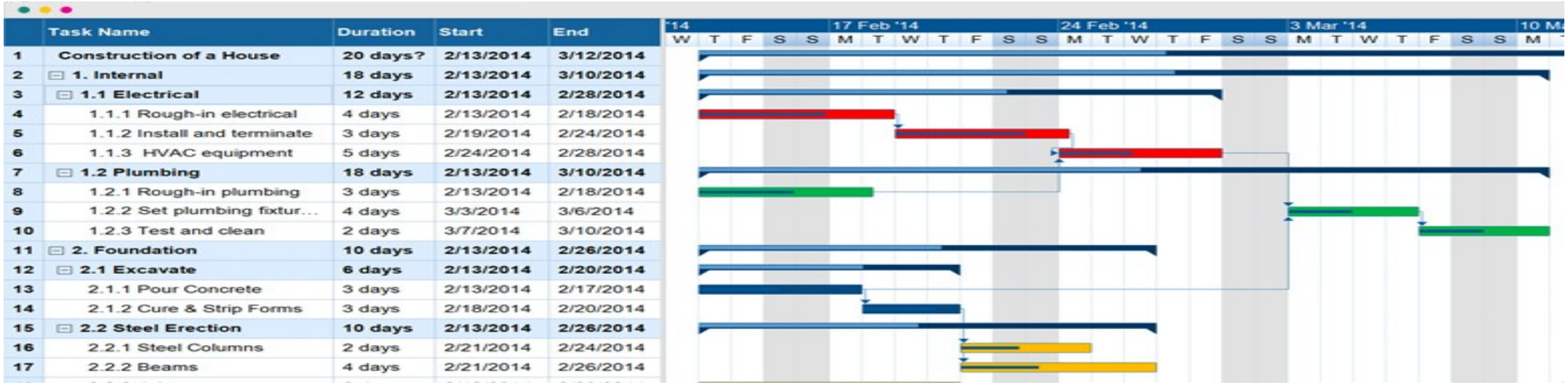
- Shortly thereafter, articles of incorporation were signed in Pennsylvania, by the founders of PMI: James Snyder, Eric Jenett, Gordon Davis, E.A. "Ned" Engman and Susan C. Gallagher.

PROJECT MANAGEMENT HISTORY

4 periods :

- Before 1958 ✉ GANTT in 1910
- 1958 to 1979 ✉ CPM and PERT
- 1980 to 1994 ✉ COMPUTER ANALYSIS
- 1995 to present ✉ AGILE

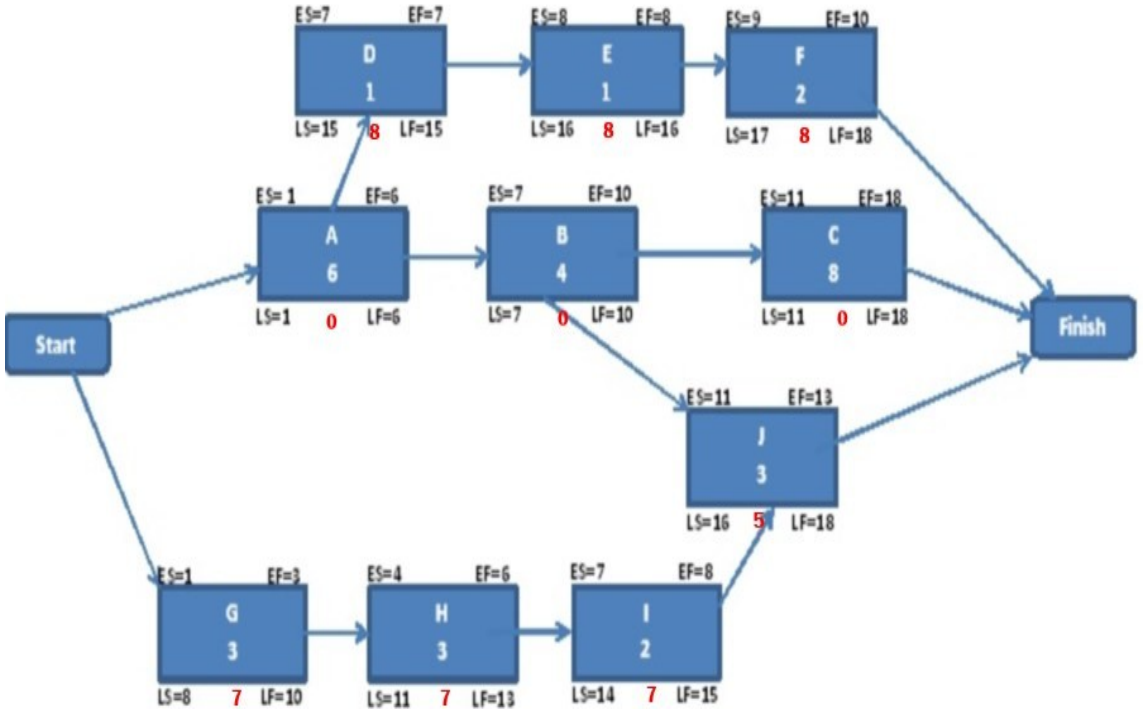
GANTT 1910

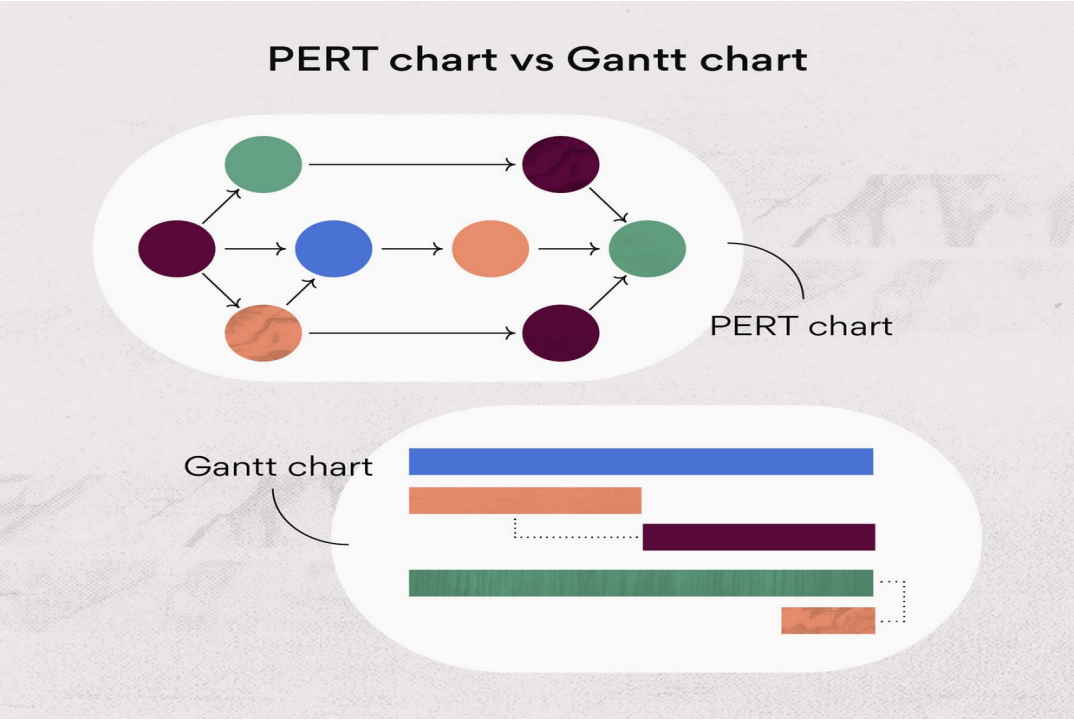


	Task Name	Duration	Start	End
1	Construction of a House	20 days?	2/13/2014	3/12/2014
2	1. Internal	18 days	2/13/2014	3/10/2014
3	1.1 Electrical	12 days	2/13/2014	2/28/2014
4	1.1.1 Rough-in electrical	4 days	2/13/2014	2/18/2014
5	1.1.2 Install and terminate	3 days	2/19/2014	2/24/2014
6	1.1.3 HVAC equipment	5 days	2/24/2014	2/28/2014
7	1.2 Plumbing	18 days	2/13/2014	3/10/2014
8	1.2.1 Rough-in plumbing	3 days	2/13/2014	2/18/2014
9	1.2.2 Set plumbing fixtur...	4 days	3/3/2014	3/6/2014
10	1.2.3 Test and clean	2 days	3/7/2014	3/10/2014
11	2. Foundation	10 days	2/13/2014	2/26/2014
12	2.1 Excavate	6 days	2/13/2014	2/20/2014
13	2.1.1 Pour Concrete	3 days	2/13/2014	2/17/2014
14	2.1.2 Cure & Strip Forms	3 days	2/18/2014	2/20/2014
15	2.2 Steel Erection	10 days	2/13/2014	2/26/2014
16	2.2.1 Steel Columns	2 days	2/21/2014	2/24/2014
17	2.2.2 Beams	4 days	2/21/2014	2/26/2014

- The most popular way of showing activities displayed against time.
- On the left is a list of the activities and along the top is a time scale.
- Each activity is represented by a bar reflecting activity start, duration, end

CPM and PERT (1958-1979)





- CPM is a method for determining the minimum duration of a project by identifying the critical activities that characterize it
- PERT is a statistical method of determining the timing of project activities.

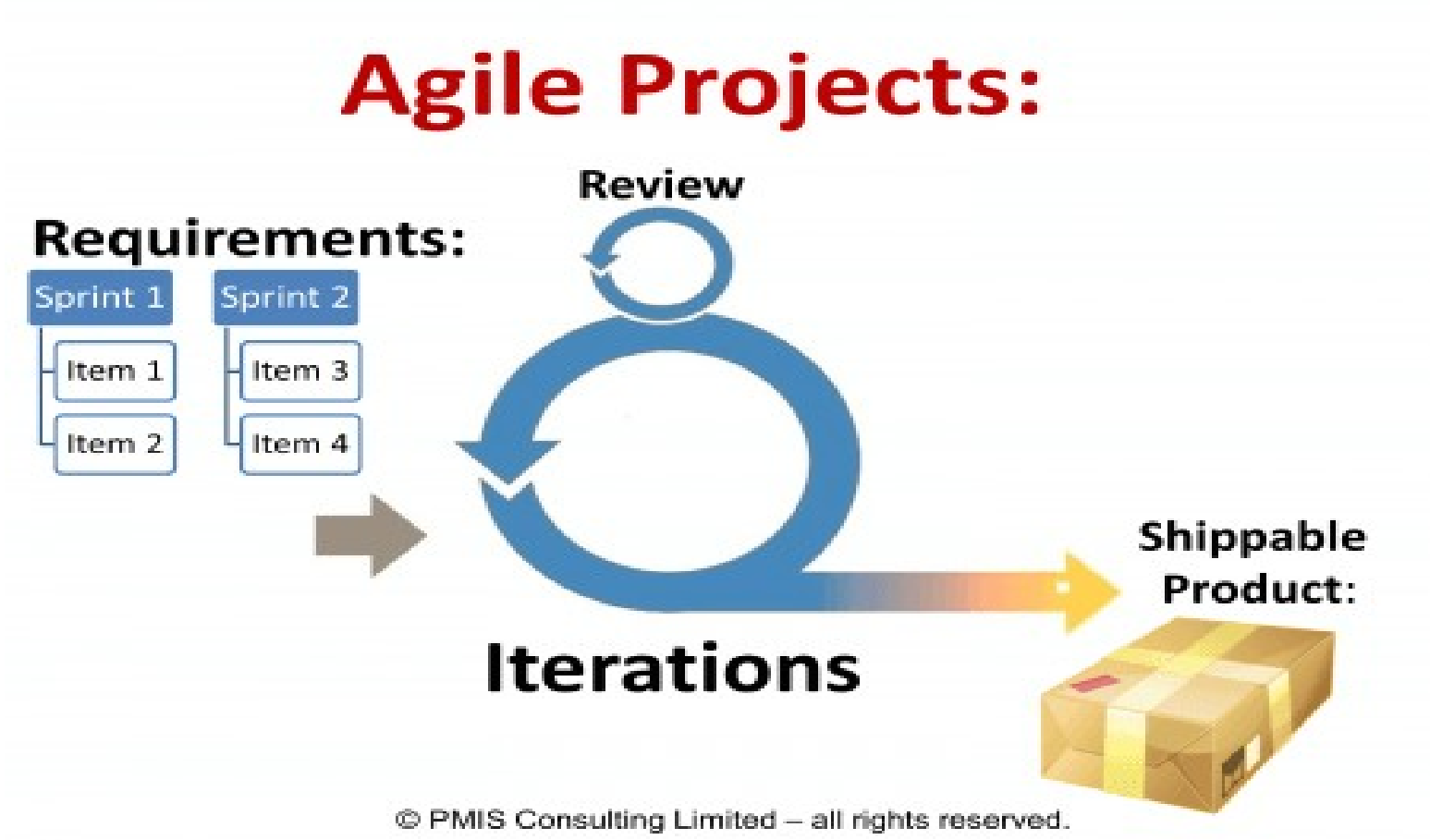
It assumes the determination of optimal, probable and pessimistic estimate values

COMPUTER ANALYSIS (1980-1994)

- **The process of determining the aspects of a project .**
- It helps in identifying whether the project is as expected and in the budget.
- By a project analysis, the current or future problems that occur during the project can be identified.

AGILE (1995 to PRESENT)

Iterative approach to delivering a project throughout its **life cycle**.



PM EVOLUTIONS

- Earlier project management innovations include the Gantt chart around 1910
- Modern project management is considered to start in 1958, characterized by the development of CPM and PERT methods.
- **NASA and the Apollo programs contributed to the advancement of project management, mandating use of work breakdown structure, CPM, PERT, and other tools**.
- Computer analysis started in the 1970s, but was much more common since1980s
- The first lightweight methodologies were developed in the 1980s in response to the growing needs of software developers.
- Agile Manifesto defined values and principles underlying modern Agile methodologies.

BEFORE 1958

- Project managers couldn’t benefit from project management methods
- Instead, it’s assumed the project’s success depended on random factors like the talent of individual project members

- Throughout history, project management was considered just another skill, rather than its own discipline..

1958-1979

Historians agree the modern project management era began around this time

- The role of project manager was becoming more important in itself, rather than as part of the chief engineer’s job.
- Techniques like CPM and PERT continued to be improved
- Until the 70s, project management was still applied primarily in defense, construction, and aerospace industries.
- However, throughout the 70s it was applied more widely in other areas.
- The 70s also saw the development of some tools we now considered essential, such as WBS

1980-1994

- In the 1980s, project managers began to develop new attitudes to project risk management.
- Instead, more time was spent planning complex projects from the start, using new methods to anticipate and avoid risks.
- Software engineering was becoming useful in every field.
- Software projects might be very complex, but not have large teams.
- In 1986, PMI would go on to issue an expanded version in the first edition of the PMBOK

1995 to PRESENT

- The modern age is defined by the Internet, as true in project management as anywhere.
- The access and connectivity it allows, have transformed methods for organizing and performing work.
- In 2001 the Agile Manifesto was published, outlining a new philosophical approach and new techniques
- Concepts from project management have begun to shape business strategy overall, benefiting strategic management.

APOLLO AND THE MOON

The most lasting legacy of Apollo was an improved understanding of how:

1. to plan,
2. to coordinate
3. to monitor the myriad activities that were the Apollo building blocks

PROJECT MANAGEMENT EVOLUTIONS and FIGURES FROM ANTIQUITY TO END OF 1800

1. 2504BC: The pyramid of Giza-Egypt;230 meters long,137 meters high, 3 million stone blocks,30,000 working people. Each block weighed between up to 8 tons
2. 475BC:The Great Wall of China to protect Chinese cities from the Huns. Today: a wall of 8,851 km. The walls are 7.8 meters high and upto 5 meters wide.
3. The Brooklyn Bridge (1883) - It was the first bridge supported by steel cables, the longest in the world, 1054 m. To date, about 144,000 vehicles cross the bridge every day

PROJECT MANAGEMENT EVOLUTIONS and FIGURES FROM 1914

1. 1914 The Panama Canal revolutionized shipping by connecting the Atlantic to the Pacific. Currently, more than 15,000 boats cross the canal every year.
2. 1937 The Golden Gate Bridge to connect San Francisco to the bay. A total of 130000 km of cables. The 2 km of bridge have to face heavy wind and risk of earthquakes.
3. 1994 Channel Tunnel to Great Britain without a boat. A length of over 50 km,a depth of 76 meters.13,000 people (engineers, technicians,workers) took 6 years to build.
4. Dubai Tower,828 meters high, the tallest building in the world since 2010. 163 floors for over 300000 m2

2020 SAN GIORGIO BRIDGE (FORMER MORANDI)

- Small masterpiece of Project Management in terms of scope, cost and mainly of time that was the main expectation of everyone
- The work designed by the star architect Renzo Piano was built in record time
- 1000 workers were employed worked non-stop 24 hours a day, 7 days a week.
- In total, the new bridge cost 202 million between the design and construction parts, while 19 million was spent on the demolition of what remained of the old Morandi

2020 SAN GIORGIO BRIDGE

- The San Giorgio Bridge is supported by 18 reinforced concrete piers and is composed of a steel deck, designed by Renzo Piano with the shape of the keel of a ship, with a continuous girder of a total length of 1067 meters divided into 19 spans
- .

SAN GIORGIO BRIDGE

- The real technological innovations are represented by the installation of a special dehumidification system to avoid the formation of saline condensation and limit the damage from corrosion of the brackish air that comes from the Ligurian gulfs.

SAN GIORGIO

- Maintenance, the innovation is brought by the use of two robots, hooked to rails under the bridge, which will travel from one side to the other without interrupting traffic in order to make x-rays of the structure thus eliminating the inspection teams on site, aerial scaffolding, partial roadway block

SAN GIORGIO

- The operations of the two robots were then be integrated with the data collected by intelligent sensors capable of perceiving millimeter deviations.
- Finally, the element of environmental sustainability is ensured by the photovoltaic panels, which will produce the energy necessary for the functioning of the systems of the San Giorgio bridge

PERSONAL PROJECTS

BEFORE AWARENESS OF PM

1976 from AM a SCR

1977 from tubes to radiators

1979 7,5 MVA

1980 SC reactance

1984-87 motogenerators14KW

1983 transistor chopper 110 V

1992-95 digital multiple drives

PROGRESSIVE AWARENESS OF PM

1998-99 Electronic drive for market

2002-2004 Industrial Robot Control

2013 Charter for humanoid robot

2016 Branch Liguria for PMI

PERSONAL PROJECTS

BEFORE AWARENESS OF PM

- **Mainly a design effort assuming the project success depended on random factors like the talent of individual project members**
- **No stakehoders management**
- **No risk management**
- **Even poor budget**
- **Timing:ASAP**

PROGRESSIVE AWARENESS OF PM

Charter

Scope management

Team building

Iterations for software

Remote work

Hybrid agile-prescriptive

CASE STUDY

CONTROL SYSTEM FOR INDUSTRIAL ROBOTS (2004)

COMAU INDUSTRIAL ROBOT

INDUSTRIAL ROBOT LINE FOR CAR MANUFACTURING

BUILDING THE 500E car

CONTROL SYSTEM FOR INDUSTRIAL ROBOTS (2004)

SHORT STORY

- 1989 A very smart engineer (Mr Franzolini) started a collaboration with Comau (COnsorzio MAcchine Utensili) an Italian company, part of the Stellantis group, in Turin, in industrial automation.
- Comau creates technologies for the production vehicles, industrial robots,solutions,, dedicated machining centers
- Founded in 1973, it is present in 13 countries, with 9 production plants, 6 structures dedicated to the development of products and technologies and 5 centers focused on digital skills and technologies, with a total of about 4000 employees and more than 1200 registered patents.

COMAU and MOOG

- 1998 second generation of drives for Comau by MOOG
- 2002 Joint venture FIAT-FANUC, failed quickly as from management reasons
- 2004 Complete CONTROL SYSTEM FOR INDUSTRIAL ROBOTS by MOOG

MOOG

- **Over the last 70+ years, MOOG developed design and manufacture of the most advanced motion control products for aerospace, defense, industrial and medical applications,where precise control of velocity, force, acceleration and fluid flow are critical.**

- **The motion control portfolio has expanded to include all forms of actuation technology, sophisticated control electronics and software.**

- **Moog products reflect the culture where the opportunity to solve a challenging control problem is always welcomed.**

CASE STUDY

Story telling of the case study:

-new robot control performed in 2002-2004 for COMAU ROBOTICS

-the overhaul project included a complete series of drivers for 6-8 axes antropomorphic robots

CHALLENGING

Even with some challenging features (space and costs mainly) the development did not appear too much challenging with the exception of software development based on 2 innovative concepts:

1-POLE PLACEMENT CONTROL

2-INDUSTRIAL ETHERNET COMMUNICATION

AXIS CONTROLLER

Hardware

2 MICROPROCESSORS STRATEGY:

1. DSP for control loops (16 bit): Current, Speed, Position
2. MPC8245 for general control:The MPC8245 Integrated Host Processor supports applications where cost, space, power consumption and performance are critical requirements.

   Provides a high level of integration, significantly reducing system component cost

POLE PLACEMENT CONTROL

- Method employed in feedback control system theory to place the closed-loop poles of a plant in pre-determined locations in the s-plane.

  - Placing poles is necessary because the location of the poles corresponds directly to the eigenvalues of the system, which control the characteristics of the response of the system in **variable conditions**

POLE PLACEMENT CONTROL

- Alliance with Salvagnini which got a preliminary version of this method from the inventor
- Salvagnini is a worldwide leader of metal bending machines which also use industrial robots
- So a consortium was formed with 3 companies: COMAU,SALVAGNINI,MOOG

ETHERNET

Family of standardized technologies for local area networks

Marketed in 1980

Initially standardized in 1983 as IEEE 802.3

Widely used in industry, the Internet Protocol is commonly transmitted over Ethernet and therefore is considered one of the key technologies that make up the Internet

INDUSTRIAL ETHERNET

- Use of Ethernet in an industrial environment with protocols that provide determinism and real-time control.
- Protocols for industrial Ethernet include EtherCAT, PROFINET, POWERLINK, SERCOS III, CC-Link IE, and Modbus TCP.
- Our proprietary system was called ETHERSYNC

INDUSTRIAL ETHERNET

- **Industrial Ethernet refers to the use of standard Ethernet protocols with rugged connectors and extended temperature switches in an industrial environment, for automation**

- **Components used in plant process areas must be designed to work in harsh environments of temperature extremes, humidity, and vibration that exceed the ranges for information technology equipment intended for installation in controlled environments**

- **The use of fiber-optic Ethernet variants reduces the problems of electrical noise and provides electrical isolation.**

INDUSTRIAL ETHERNET

- Some industrial networks emphasized deterministic delivery of transmitted data, whereas Ethernet used collision detection which made transport time for individual data packets difficult to estimate with increasing network traffic.

- Typically, industrial uses of Ethernet employ full-duplex standards and other methods so that collisions do not unacceptably influence transmission times.

CHARTER OF COMAU 3 (3° generation of electrical robots after the first started in 1989)

- ***PROJECT CHARTER HIGH LEVEL***

1. GOALS (WHY), Motivations, Planned Income
2. WHAT, Descriptions, Differentiating&Consistency Idea, Magic Ingredient, Canvas of idea
3. APPROACH (HOW), Risks avoidance
4. MILESTONES (WHEN)
5. BUDGET (HOW MUCH): cost, planned income
6. STAKEHOLDERS&RESOURCES (WHO) Competencies, Customers, Competitors, Canvas of customers

DECISION OF HYBRID METHODOLOGY

The heavy presence of software development made me to decide for

a hybrid prescriptive-scrum methodology

TEAM

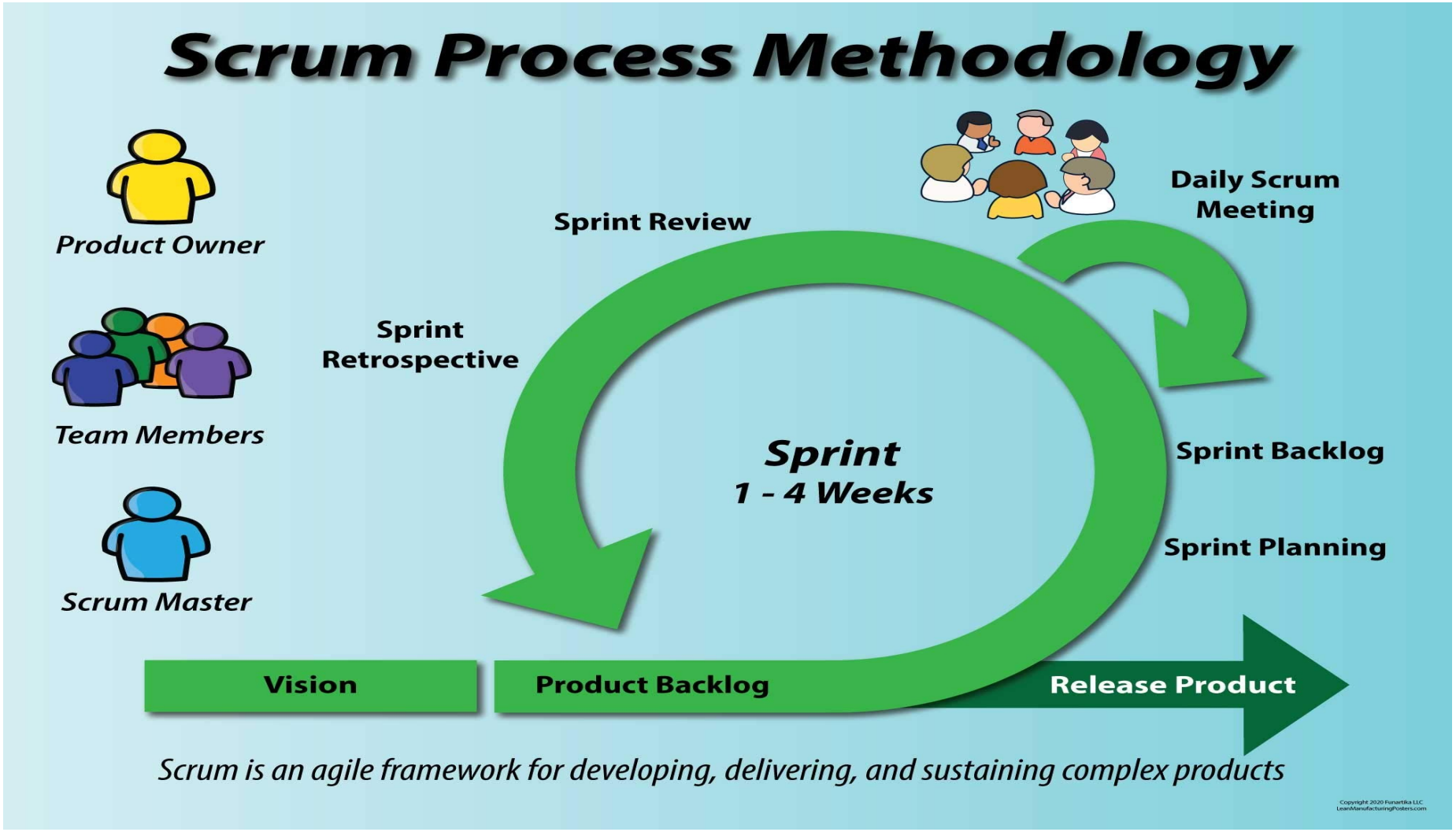
- 5 software engineers (2 in Casella, 2 in Salvagnini, 1 in Cork-Ireland)
- 3 Hardware engineers in Casella for power and control hardware
- 3 test engineers in Casella
- 2 document engineers

INTRODUCED SCRUM METHODS

A management framework was set with a team using self-organize and work towards the common goal.

We organized a set of meetings, tools, and roles for efficient project delivery.

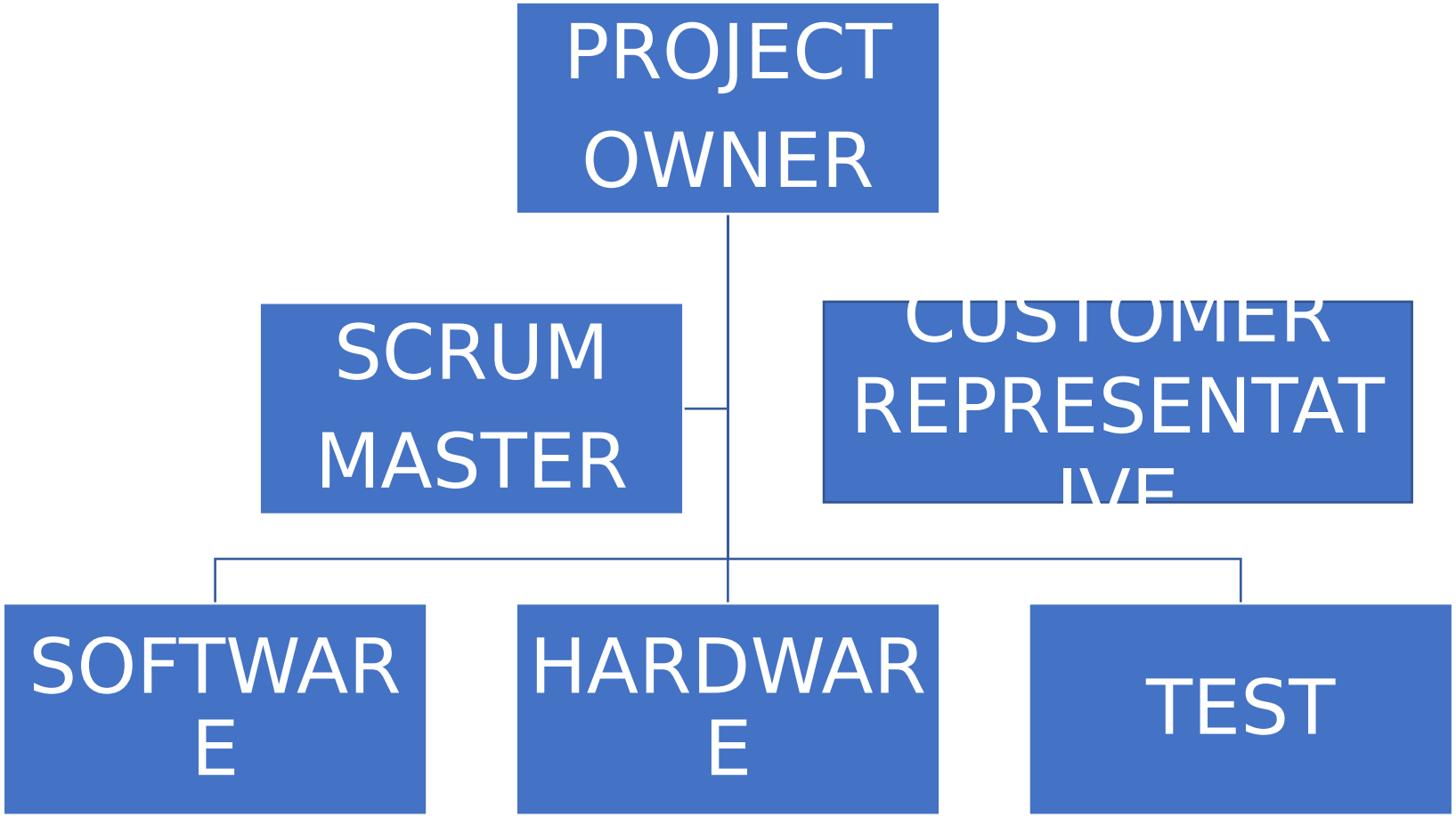
ALMOST SCRUM....



ROLES

- SCRUMMASTER (MYSELF)
- PRODUCT OWNER (CHIEF ENGINEER)
- CUSTOMER REPRESENTATIVE

1° LEVEL WBS


PROJECT OWNER
SCRUM MASTER
CUSTOMER REPRESENTATIVE
SOFTWARE
HARDWARE
TEST

ITERATIONS

1. SPECIFICATION AND SCOPE AGREEMENT: NOVEMBER 2001-JANUARY 2002
2. AGREEMENT SIGNATURE: FEBRUARY 2002
3. FIRST SOFTWARE SUPPLIED TO COMAU MOVING A ROBOT: APRIL 2002!!!!
4. ABOUT 20 ITERATIONS EACH ONE WITH DETAILED CUSTOMER COLLABORATION
5. NOISE PROBLEMS REMOVED WITH DETAILED SPREAD OF CAPACITORS
6. LITIGATION RELATED TO NOISE PROBLEMS
7. REMOVAL OF NOISE PROBLEMS WITH A REENGINEERING OF COMAU CABLING
8. 4 SUCCESSFUL PROTOTYPES MAY 2003
9. START PREPRODUCTION OF 16 SYSTEMS END OF 2004
10. DINNER PAID BY ME TO THE TEAM

TESTS

- In 3 locations:

- Casella
- Vicenza
- Torino

2 axes control

6-8 axes power control

SERVOMOTOR FOR ROBOTICS

LITIGATION:NOISE

- WE DEMOSTRATED THAT COMAU CABLING WAS REALLY A HIGH SOURCE OF NOISE ALSO IN COMPLIANCE TO EMI/EMC DIRECTIVES

TRUE OR FALSE?

1. **NASA and the Apollo programs contributed to the advancement of project management**
2. **MOOG provided Comau with an innovative way to cook pasta**
3. **3 greatest players in industrial robotics are Fanuc, ABB, Comau**
4. **The Great Wall of China used agile to be developed**

STATUS OF THE COURSE AFTER TODAY LESSON 8:

INNOVATIVE PROJECTS:STAKEHOLDERS,TEAMS,ADAPTIVE PLANNING

LESSONS 1,2,3,4,5,6,7,8,9

- INNOVATION&METHODOLOGY
- REQUIREMENTS
- ITERATION
- SPECIFIC AGILE METHODOLO
- LEAN START UP
- DESIGN THINKING
- VALUE DRIVEN DELIVERY
- PEOPLE
- REAL PROJECT:COMAU

NEXT LESSON 10

EXERCISES

LEARNT IMPORTANT CONCEPTS IN 9 LESSONS

1. **INNOVATION**
2. **AGILITY**
3. **VALUE DRIVEN DELIVERY**
4. **DELIVERABLE**
5. **EMPIRICAL PROCESS CONTROL**
6. **PRODUCT OWNER**
7. **TEAM**
8. **SCRUM-MASTER**
9. **SPRINT**
10. **DONE**
11. **LEAN**
12. **WASTE**
13. **CREATIVITY**
14. **DESIGN THINKING**
15. **VALUE DRIVEN DELIVERY**
16. **EAT YOUR DESSERT FIRST**
17. **MINIMUM VIABLE PRODUCT**
18. **STAKEHOLDERS,TEAM,ADA**

-Projects have always been done since ancient times

-4 periods for the evolution of PM

- Before 1958✉GANTT in 1910
- 1958 to 1979✉CPM and PERT
- 1980 to 1994✉COMPUTER ANALYSIS
- 1995 to present✉AGILE

-**San Giorgio Bridge**:masterpiece of PM in terms of scope,cost and mainly of time

THANKS! NEXT 10th LESSON:EXERCISES

- TIPS FOR THE EXAM:

POSSIBLE QUESTIONS:

-explain the 4 eras of Project Management

- CLOSING LESSON OF THE COURSE: MAY 30TH

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