FUTURE INTERNET MANUFACTURING

www.fitman-fi.eu

ricardo-a-pereira@ptinovacao.pt

FITMAN Project Presentation

FITMAN Factsheet & Beneficiaries

Project Full Name: Future Internet Technologies for MANufacturing

Strategic Objective: FP7-2012-ICT-FI

FI.ICT-2011.1.8: Use Case scenarios and early trials

Duration: 24 months

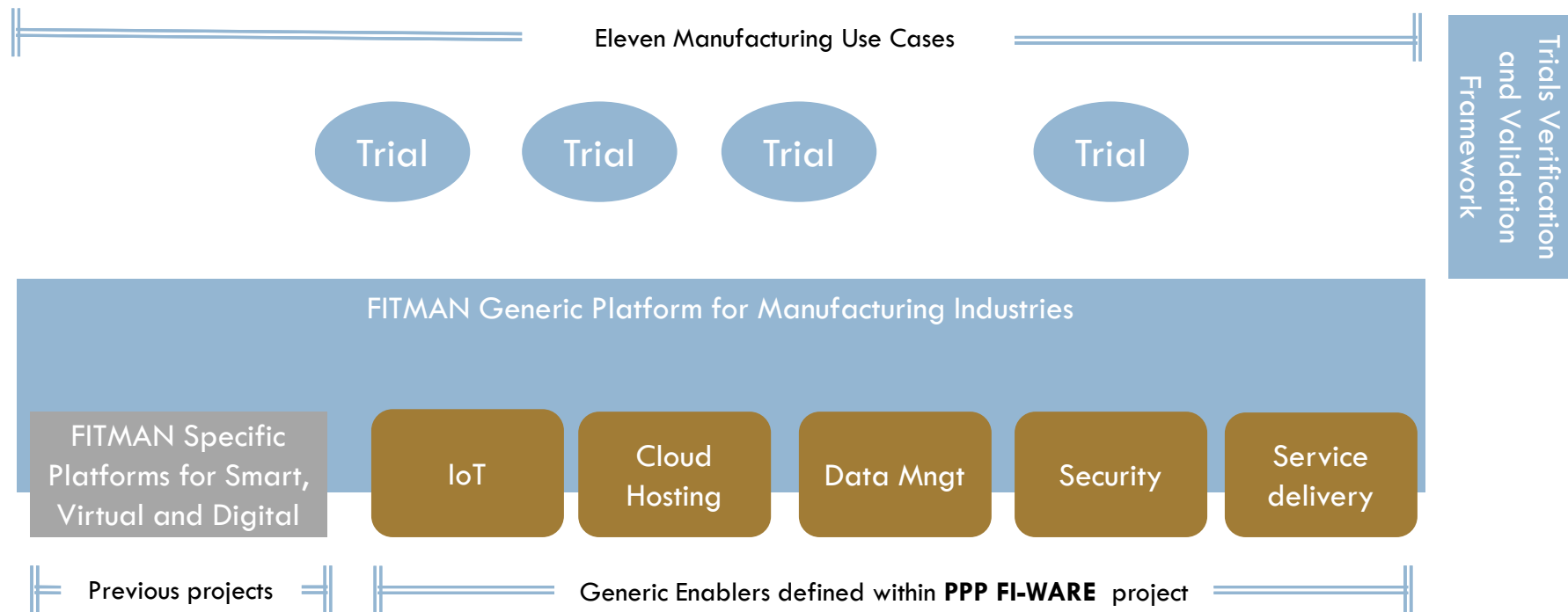**Start date:** April 1st 2013

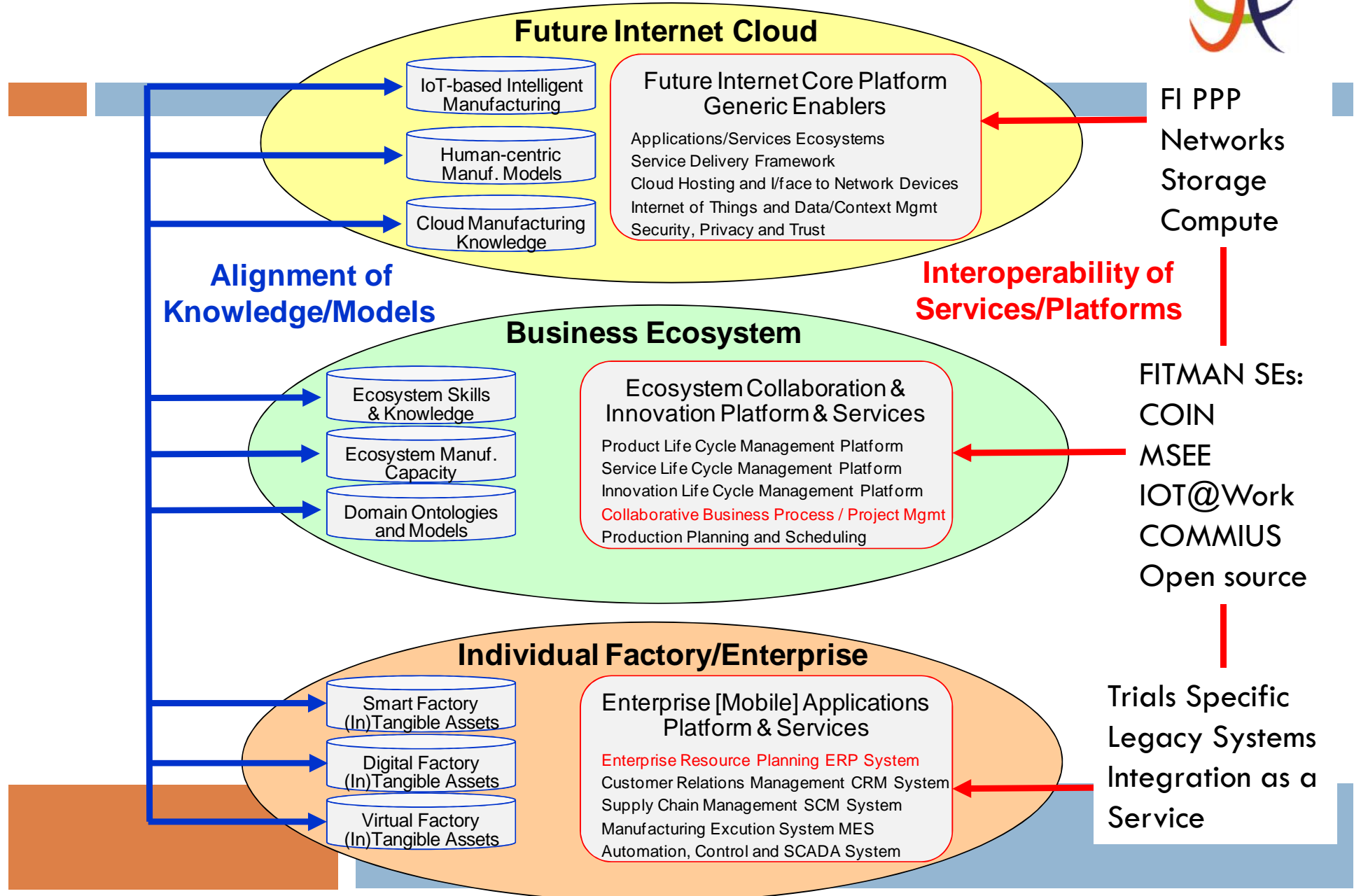**Partnership:** 29 partners, 9 countries
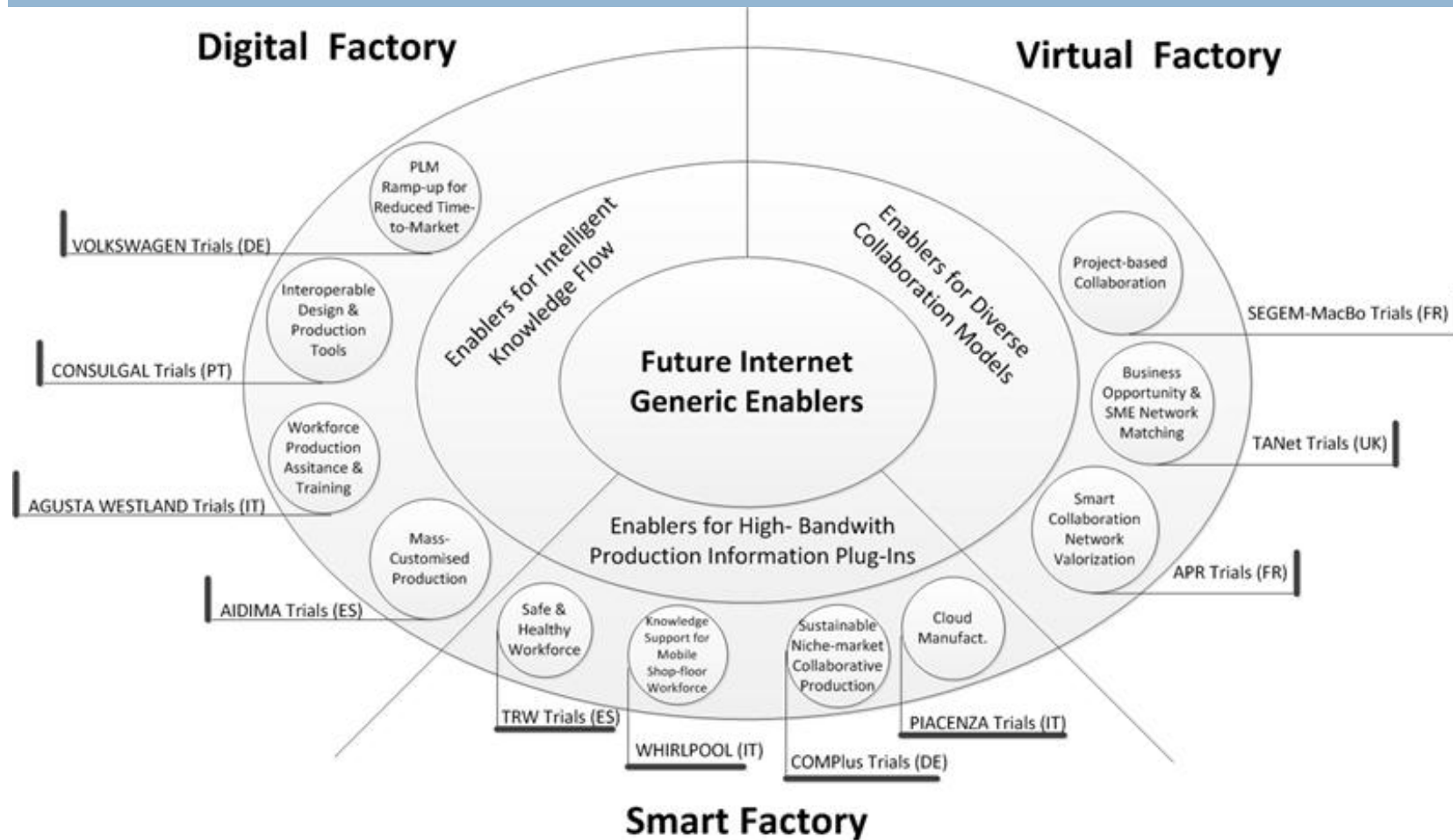
Mission and Objectives

*The mission of the FITMAN (Future Internet Technologies for MANufacturing industries) project is to **provide the FI PPP with a set of industry-led use case trials** in the Smart, Digital and Virtual Factories of the Future domains, in order to **test and assess the suitability, openness and flexibility of FI-WARE Generic Enablers**, this way **contributing to the social-technological-economical-environmental-political sustainability** of EU Manufacturing Industries.*

Eleven Manufacturing Use Cases

Trials Verification and Validation Framework

Trial   Trial   Trial   Trial

FITMAN Generic Platform for Manufacturing Industries

FITMAN Specific Platforms for Smart, Virtual and Digital

IoT

Cloud Hosting

Data Mngt

Security

Service delivery

Previous projects

Generic Enablers defined within **PPP FI-WARE** project

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Draft Reference Architecture for Trials

Future Internet Cloud

IoT-based Intelligent Manufacturing

Human-centric Manuf. Models

Cloud Manufacturing Knowledge

Future Internet Core Platform Generic Enablers

Applications/Services Ecosystems
Service Delivery Framework
Cloud Hosting and I/face to Network Devices
Internet of Things and Data/Context Mgmt
Security, Privacy and Trust

Alignment of Knowledge/Models

Interoperability of Services/Platforms

Business Ecosystem

Ecosystem Skills & Knowledge

Ecosystem Manuf. Capacity

Domain Ontologies and Models

Ecosystem Collaboration & Innovation Platform & Services

Product Life Cycle Management Platform
Service Life Cycle Management Platform
Innovation Life Cycle Management Platform
Collaborative Business Process / Project Mgmt
Production Planning and Scheduling

Individual Factory/Enterprise

Smart Factory (In)Tangible Assets

Digital Factory (In)Tangible Assets

Virtual Factory (In)Tangible Assets

Enterprise [Mobile] Applications Platform & Services

Enterprise Resource Planning ERP System
Customer Relations Management CRM System
Supply Chain Management SCM System
Manufacturing Excution System MES
Automation, Control and SCADA System

FI PPP
Networks
Storage
Compute

FITMAN SEs:
COIN
MSEE
IOT@Work
COMMIUS
Open source

Trials Specific Legacy Systems Integration as a Service

FITMAN Trials Galaxy

FITMAN Trial's Requirements (examples)

IoT

- ☐ Requires a secure, reliable and fast communication among the intelligent objects in a shop-floor (in all the production phases).
- ☐ Configure machines and robots to adapt to changes in decisions, based on collected data
- ☐ Automatically managed, in strict real time constraints, huge amounts of data

Cloud

- ☐ Services should be available with high performance and high reliability
- ☐ Huge amounts of data to be securely stored and accessed through services
- ☐ The portability of data and services through different cloud infrastructures, i.e. cloud interoperability, is a requirement for Virtual Factories

Data Mngt

- ☐ An efficient and effective means to filter, process and analyze events generated in the real world shopfloor to feed the proper enterprise systems
- ☐ Location and Mobility are also important in Smart factories, mostly to optimize inbound logistics but mostly to prevent accidents and make industrial workplaces more safe and secure.
- ☐ Social Network data analysis is assuming more and more importance, mostly for the consumer goods industries. Consumers' opinion are carefully analyzed to discover trends and to take decisions about new products and services.

Smart Factory: **Whirlpool** trial

- Highly fragmented market and offers of products range
    - Production of thousands of pieces a day
    - High number of variations of components and parts used to achieve the final variation for customer

- High degree of automation
    - Fabrication process
    - Assembly
    - Material handling

- Mechatronic integration in products
    - High integration of mechanical and electronic components

Whirlpool trial – Scenario

- ☐ Goals
  - ◻ Improve the effectiveness of the production system and exploit at a higher level the unexpressed skills and competences of all the people
  - ◻ Guarantee that workers in the shop floor react in a fast and effective way to real time events
- ☐ Improvements:
  - ◻ Enable fast and accurate data mining that creates correlations between physical events and relevant information
  - ◻ Address the relevant information to the group of people that can dynamically take decision on that piece of information

Managerial Level – Reaction time within **hours**
The dataset is automatically highlighted in a cockpit to ensure that the right people becomes aware

Supervisor Level – Reaction time within **minutes**
A deviation in Process Control chart causes a pre-alarm sent to the head of the Quality Laboratory who decide to set-up for a potential mass measuring campaign on specific products potentially impacted.

Operator Level (Shop Floor) – Reaction time within **task** time (usually 30s to 60s)
Identify a potential anomaly of behavior of a batch of components through correlating two measures provided in different stages of the assembly line. A message is sent to the mobile device of the Incoming Inspection Supervisor, to the Worker and a pre-alarm to the Subject Matter Expert.

Whirlpool Trial – TOBE with FITMAN

- ☐ Close to real time data mining to help on decisions
  - ☐ Each shop floor component is sending results each (20s)
  - ☐ Approx. 600MB/day
- ☐ Close to real time set-up/change right parameters to be used when specific product will be processed
- ☐ Track all the products along each step of the process (i.e. RFID).

- ☐ Use various FI-WARE GEs,
  - ☐ (IoT) GEs
  - ☐ (Data Mngt) CEP, Pub/Sub
  - ☐ (I2ND) Connected Device Interfacing (CDI)

Digital Factory: **Consulgal trial**

□ **Baixo Sabor Dam**
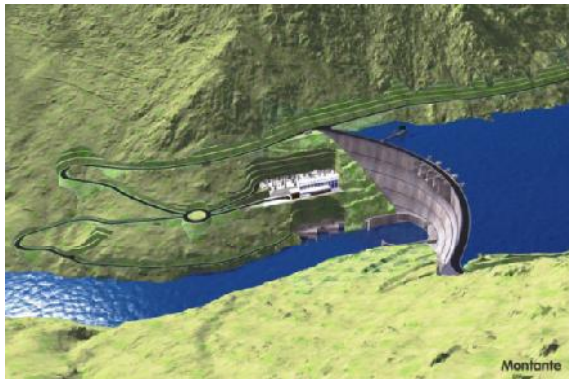
□ Construction of an upstream and a downstream dam

  □ Upstream dam:
- □ Wall height – 123 m;
- □ Volume - 700,000 m³
- □ Diversion gallery
- □ Spillway

  □ Downstream dam:
- □ Wall height – 45 m;
- □ Volume - 170,000 m³
- □ Spillway

□ Access roads, stilling basins, high pressure galleries
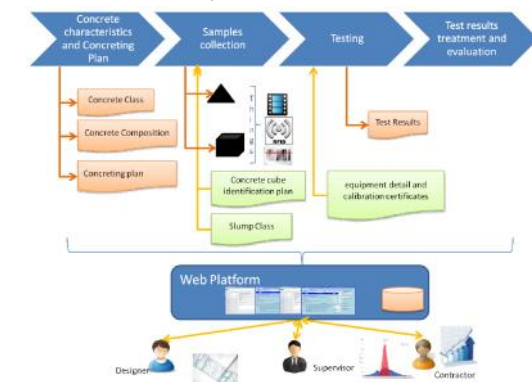
Consulgal trial – Scenario

- ☐ Ensure projects are built according to design and specification.
- ☐ Multidisciplinary expert teams and multiple stakeholders
- ☐ Pressure to take informed, well fundamented decisions
  - ☐ Efficient information management system
- ☐ Example: Concrete handling and testing
  - ☐ Essential part of any construction project;
  - ☐ Testing intends at ensuring that the design characteristics are met by each load arriving at the work site;
  - ☐ Concrete is tested:
    - ■ upon arrival (slump test); after being matured in 7 and 28 days: for resistance to compression
    - ■ In complex works, the number of test results generated can be in the order of thousands.
  - ☐ Test Results are important in making further decisions
- ☐ Improvements:
  - ☐ Better information integration;
  - ☐ Quicker communication;
  - ☐ Speedier decision/approval/rejection processes;

Consulgal Trial – TOBE with FITMAN

- Collaboration platform for stakeholders to reengineer and improve information dissemination and problem solving process, leading to further increase in productivity.
- Connect physical objects to the information system thus feeding Augmented Reality technologies and analyze their impact on project and help quicker decision making.
- Integrate Designer, Contractor and Supervisor in the process of design, work and decision making through virtual workspace.
- Visualise the concreting zones and obtain visual and textual information on:
  - Concreting operations schedule; distribution of concrete classes; distribution of concrete stress values and corresponding sample history; concreting zone status in terms of execution status, concrete characteristic stress results availability, compliance with design
  - Provide easier way to identify and track concretes on site and quicker way to record/retrieve concrete test results
- Use various FI-WARE GEs,
  - (Cloud) ObjectStorage
  - (Application Mashup) Wirecloud
  - (SECURITY) Identity Management
  - (I2ND) Connected Device Interfacing (CDI)
- (IoT) GEs/ QR Code SE
- Trial Specific Components for Statistical and Deviation analysis.

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