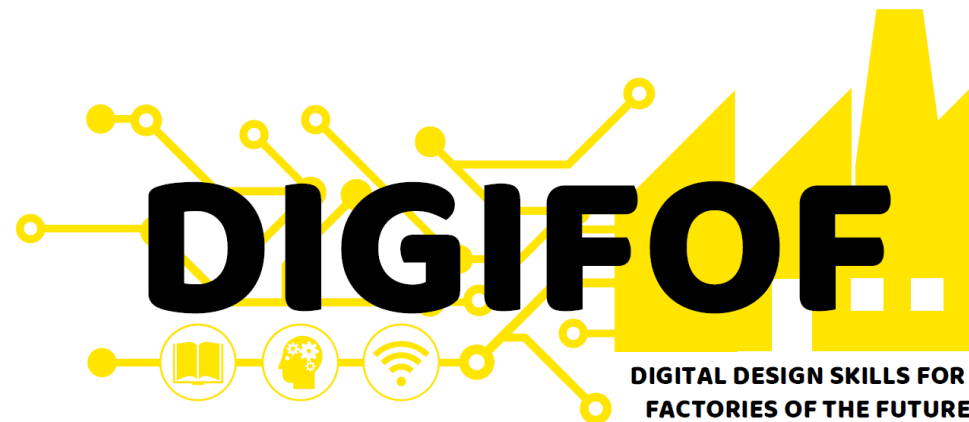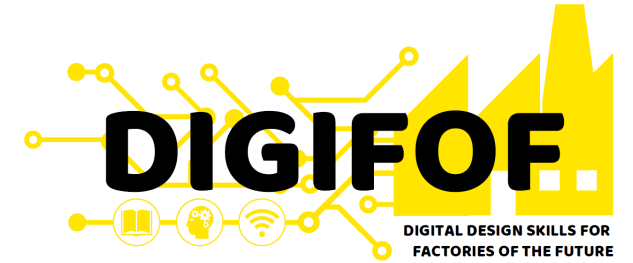# *PSS Modelling Procedure Application,*
based on a real case study and a practical exercise
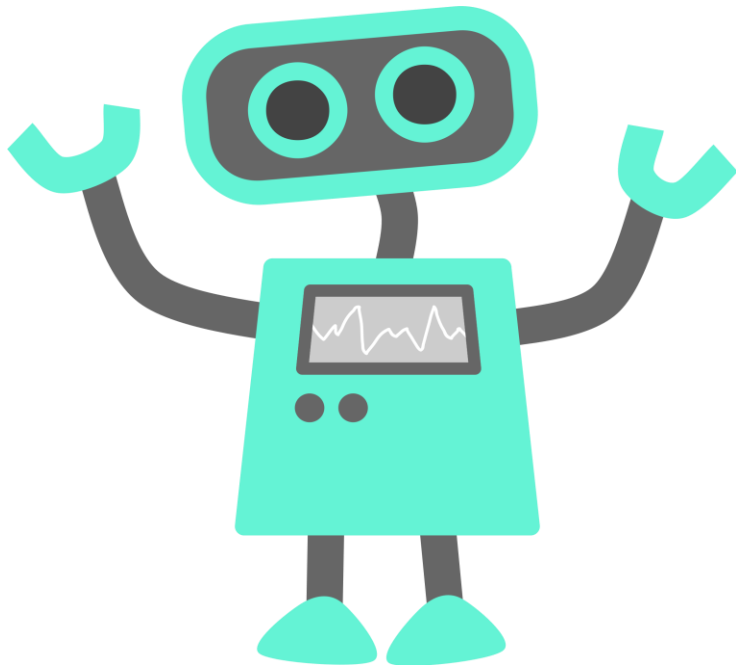
Presentation of the case study
GENERAL INFORMATION

DIGIFOF
DIGITAL DESIGN SKILLS FOR FACTORIES OF THE FUTURE

Automaton agent

- It is a PSS design industrial project.

- It is framed in the economic sector/activity of the meat transformation industry.

- It is mainly composed of an autonomous cleaning robot and services deployed during its PSS lifecycle.

- It focuses on the qualitative design stage of both the robot and the services opportunities, for characterizing the PSS offer specifications.

Presentation of the case study
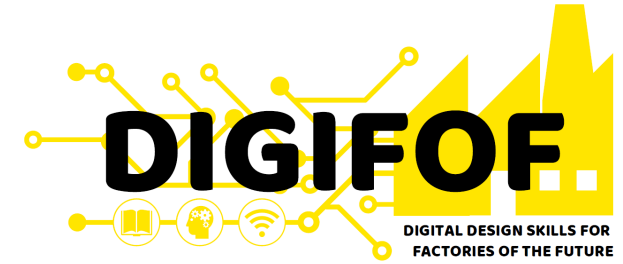
CONTEXT DESCRIPTION

Requirements and needs

LEGAL:
- Hygiene standards are evolving, requiring innovative methods and technologies to keep up with new requisites.
- Overcome with sanitary controls.
- Compliance with safety and occupational health laws.

INDUSTRIAL AND TECHNOLOGICAL:
-- Automation of cleaning processes and hygiene functionalities.
-- Hygiene and quality are two key objectives.
-- Potential of high-added value solutions coupling robotics with service.

SOCIAL AND HUMAN:
- Food safety is one of the main concerns of consumers in this field.
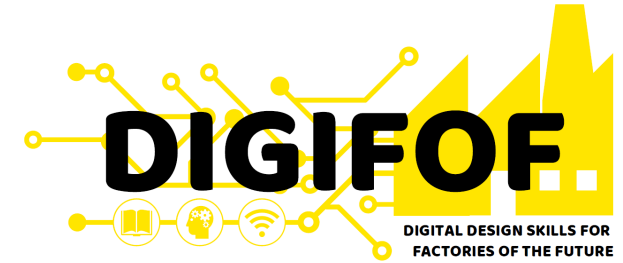- Preserve the quality of life of the work force through the improvement of its work places.

ENVIRONMENTAL:
- Benefits from innovative solutions to increase the efficiency of cleaning process.
- Optimization of resources (water and energy) and responsible use of chemical substances.

Presentation of the case study

KEY ACTORS AND THEIR EXPECTATIONS

"PROVIDER": a small-sized company manufacturing batteries (E1) who has a key role in and impact on the PSS delivery. **Expectations:**
- Access to new markets.
- Benefit from mass/serial production.
- Integrate the principle of modularity.
- Improve the monitoring of its costs system.

"SERVICE INTERMEDIARY": (E3), a facilitator agent or enterprise in charged of cleaning services in the customer places as well as maintenance activities for the equipment ("Automaton Agent"), in some scenarios where the manufacturer does not expect to provide them. **General expectation:**

- Develop business alliances with the producer of the "Automaton Agent".

"MANUFACTURER": a small-sized company manufacturing special machines including robotics and providing customized solutions (E2). E2 plays a major role in the delivery of the envisioned PSS solutions. **Expectations:**
- Suitable services, availability, efficacy of special machines.
- Access to international markets.
- Develop service culture and serial production.

"CUSTOMER/END USER": a medium-sized company from the meat transformation industry (E4). **Expectations:**
- Ensure autonomous cleaning services into cold warehouses without removing the meat carcasses.
- Reduce meat contamination risks.
- Diminish exposure to chemical substances.
- Night cleaning to avoid production disruptions.
- Increase frequency of cleaning processes.

Presentation of PS3M Modelling Approach

APPLICATION OF THE MODELLING PROCEDURE
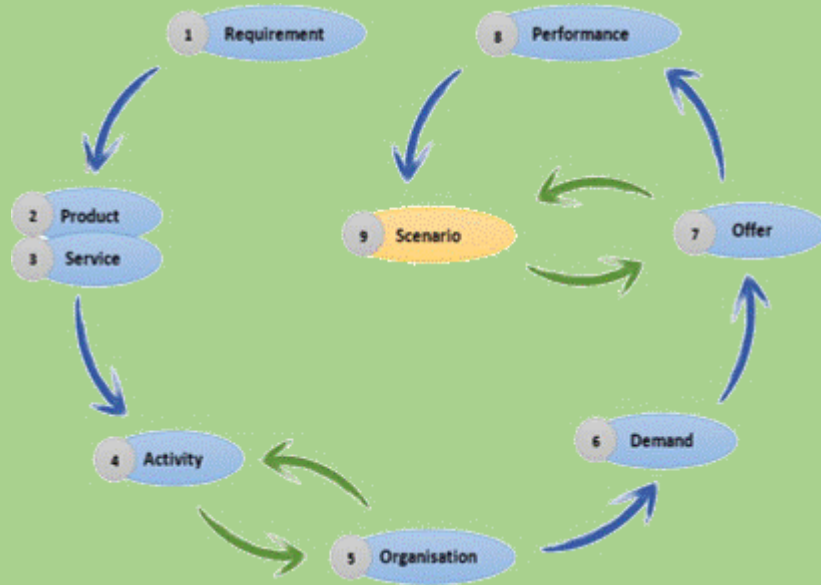
Requirement model

Product model

Service model

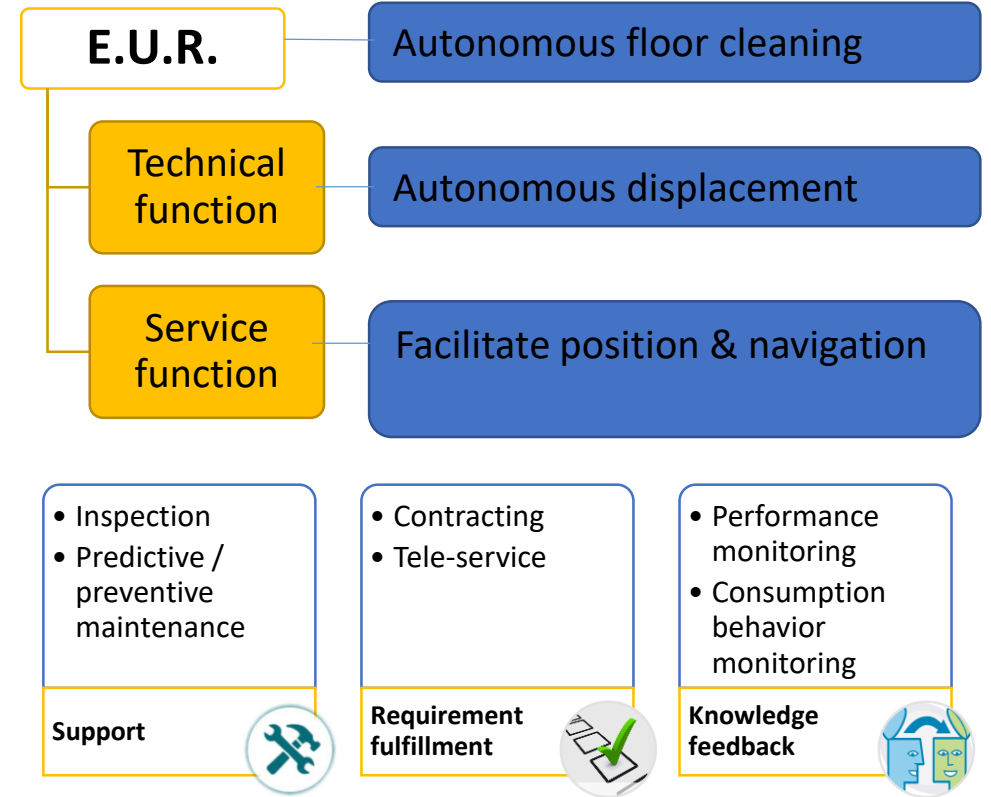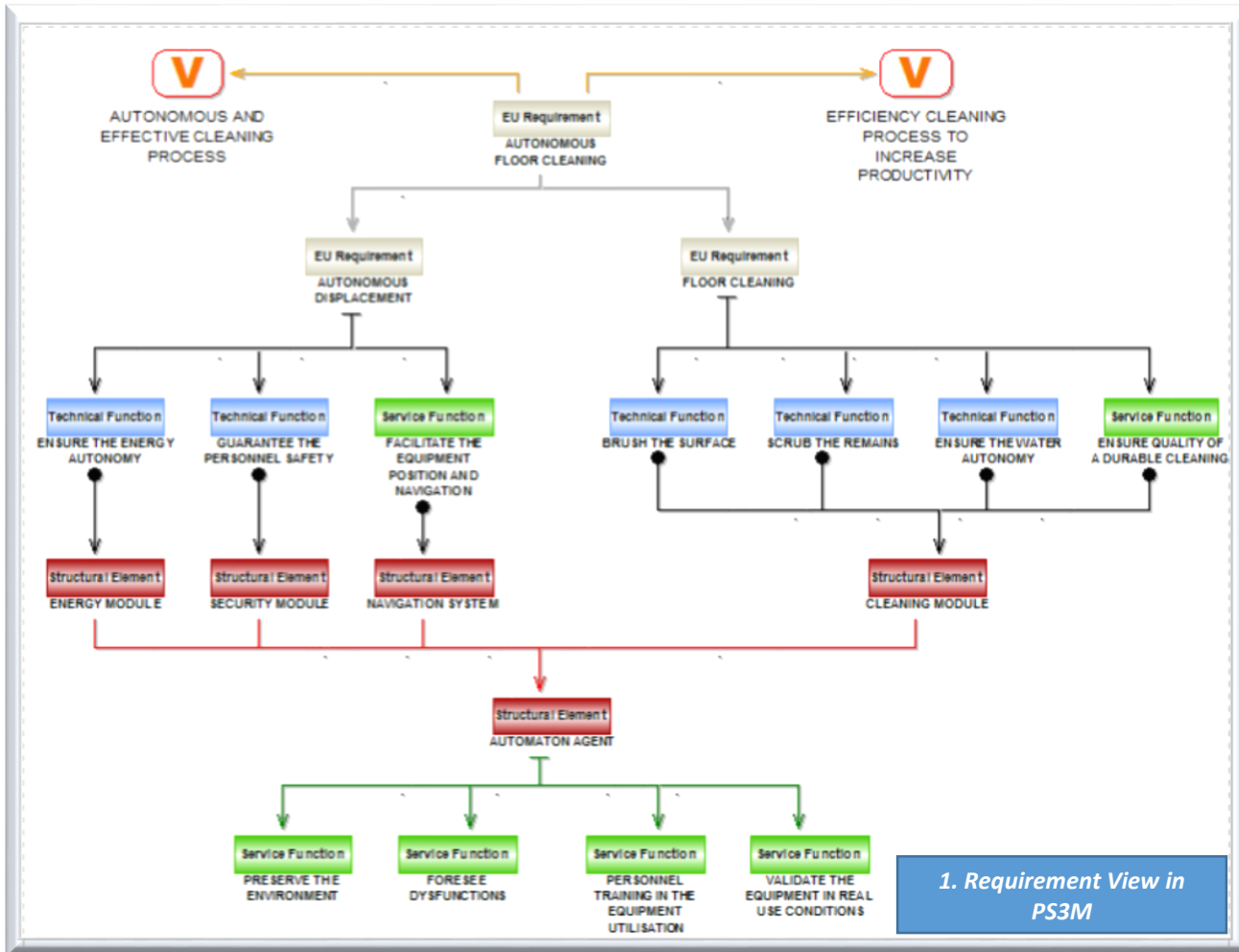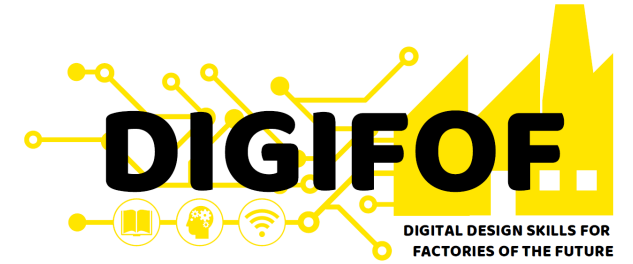Activity model

Organization model

Demand model

Offer model

Performance model

Scenario model

Presentation of PS3M Modelling Approach
Step 1. Requirement Model

1. Requirement View in PS3M

E.U.R. — Autonomous floor cleaning

Technical function — Autonomous displacement

Service function — Facilitate position & navigation

- Inspection
- Predictive / preventive maintenance

Support

- Contracting
- Tele-service

Requirement fulfillment

- Performance monitoring
- Consumption behavior monitoring

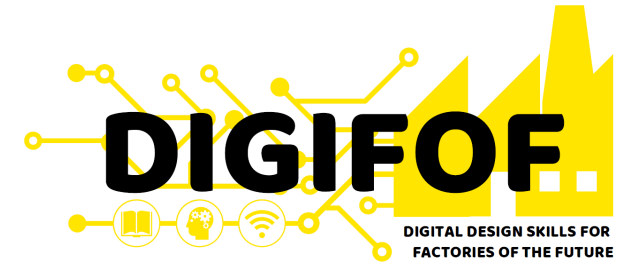**Knowledge feedback**

EMSE, FAYOL Institute - PSS Research Team

Presentation of PS3M Modelling Approach
Step 2. Product Model

Product families → Another autonomous cleaning solution

Composite products → Energy module

Components → Batteries system

Peripheric products → Operation manual, cleaning kit...

AUTOMATON AGENT

is composed of → SECURITY MODULE

uses as support → CLEANING TOOLKIT FOR THE EQUIPMENT

is composed of → ENERGY MODULE

uses as support → INSTRUCTIONS MANUAL

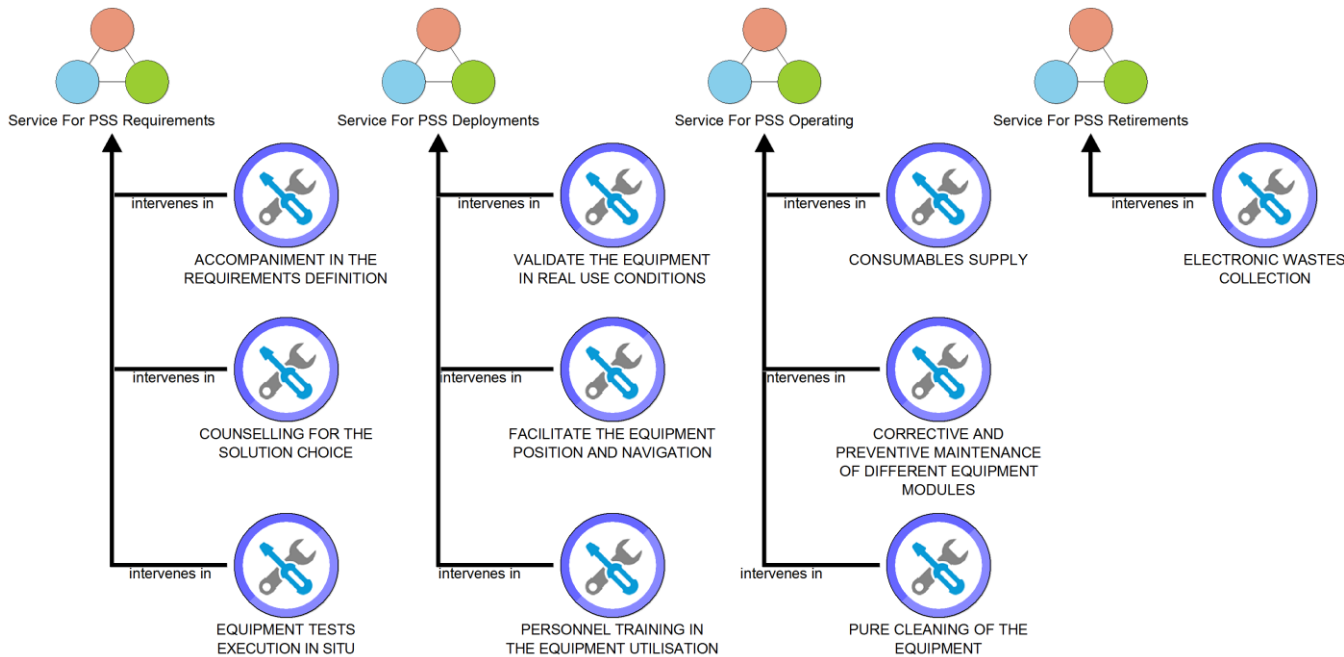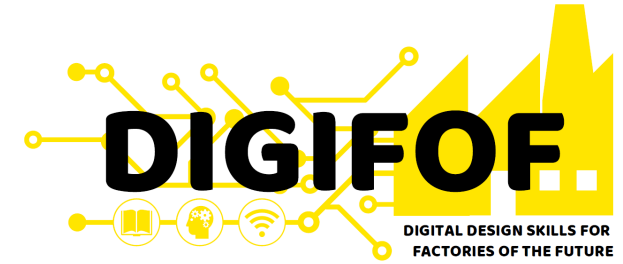is composed of → CLEANING MODULE
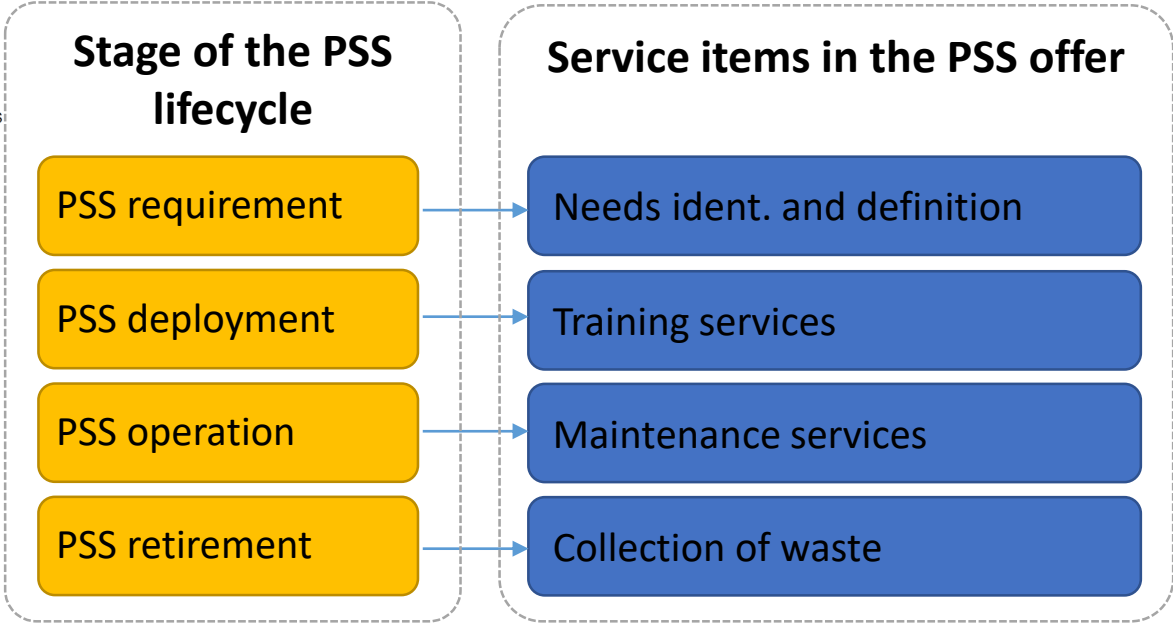
is composed of → DISPLACEMENT MODULE

2. Product View in PS3M

Presentation of PS3M Modelling Approach
Step 3. Service Model

3. Service View in PS3M

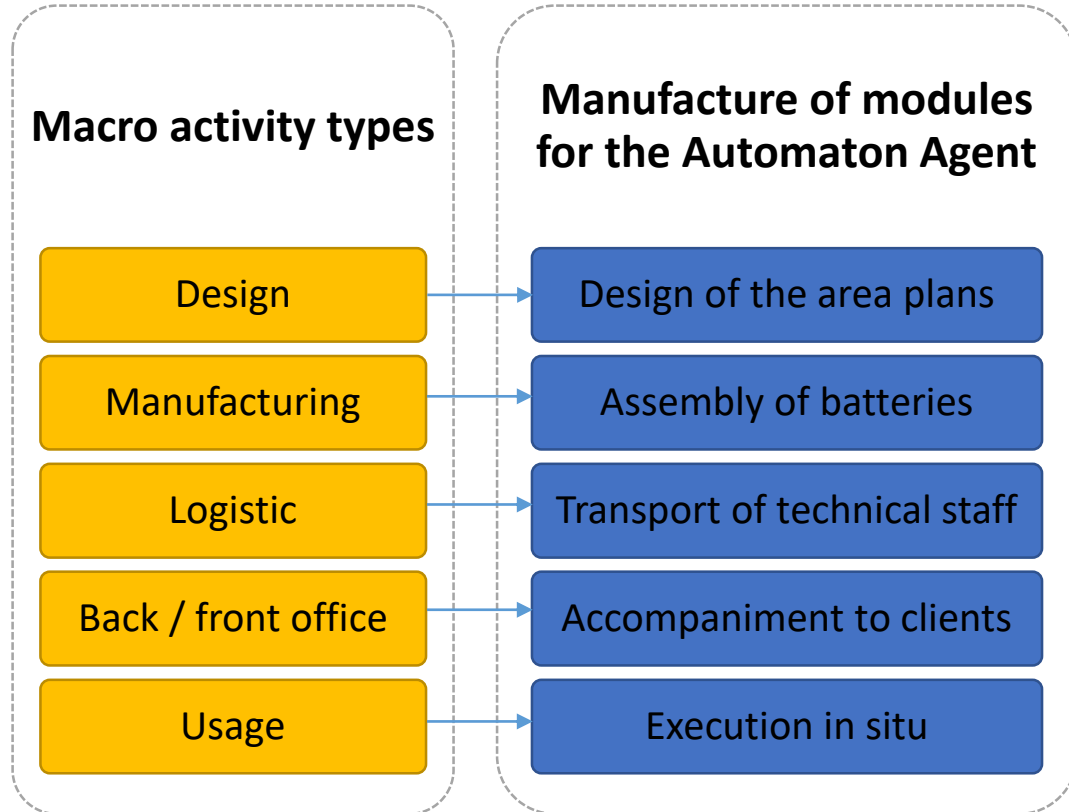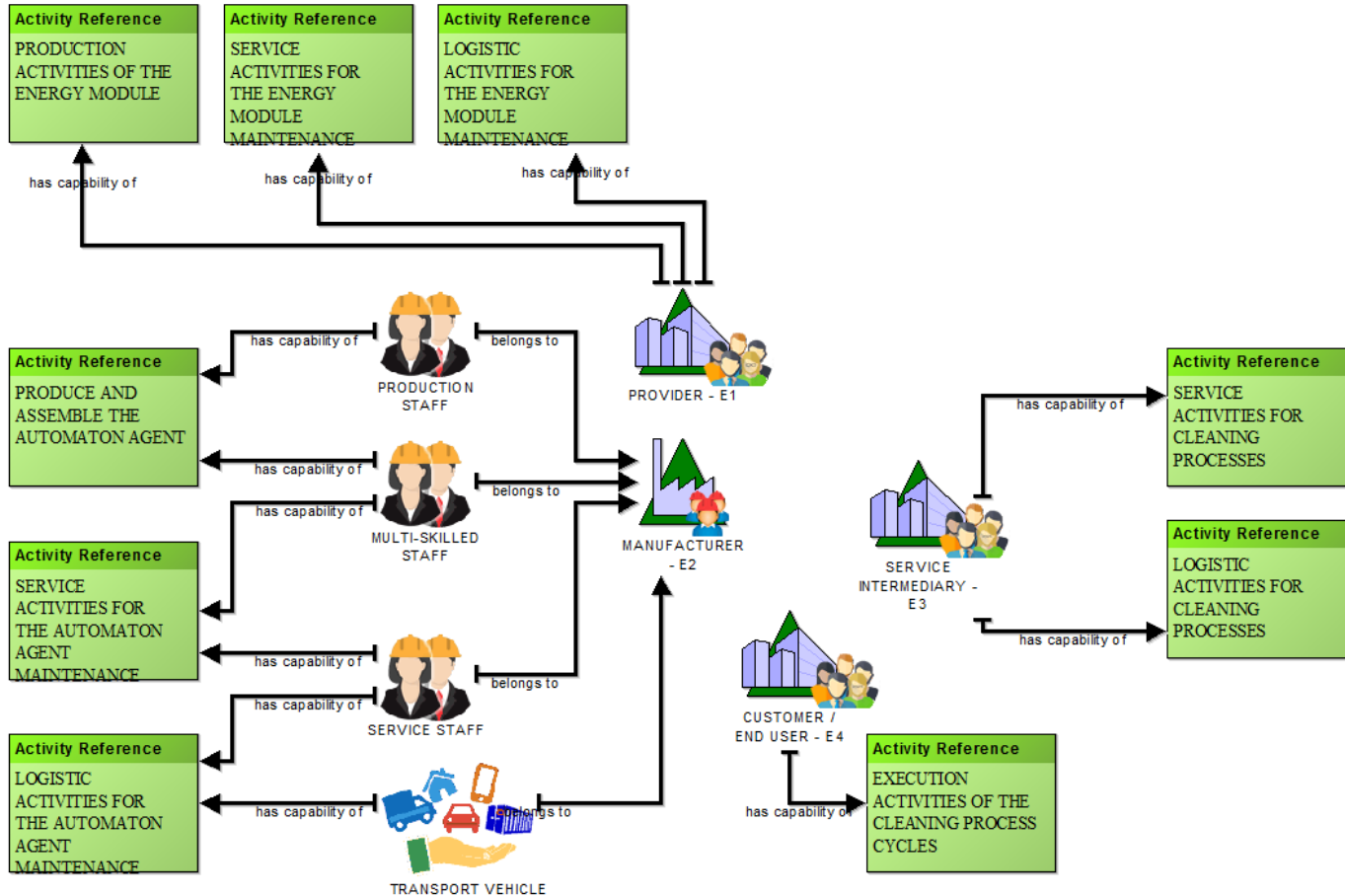| Stage of the PSS lifecycle	Service items in the PSS offer
PSS requirement	Needs ident. and definition
PSS deployment	Training services
PSS operation	Maintenance services
PSS retirement	Collection of waste

Presentation of PS3M Modelling Approach
Step 4. Activity Model

Macro activity types

- Design
- Manufacturing
- Logistic
- Back / front office
- Usage

Manufacture of modules for the Automaton Agent

- Design of the area plans
- Assembly of batteries
- Transport of technical staff
- Accompaniment to clients
- Execution in situ

4.1 Activity View – Manufacturing in PS3M
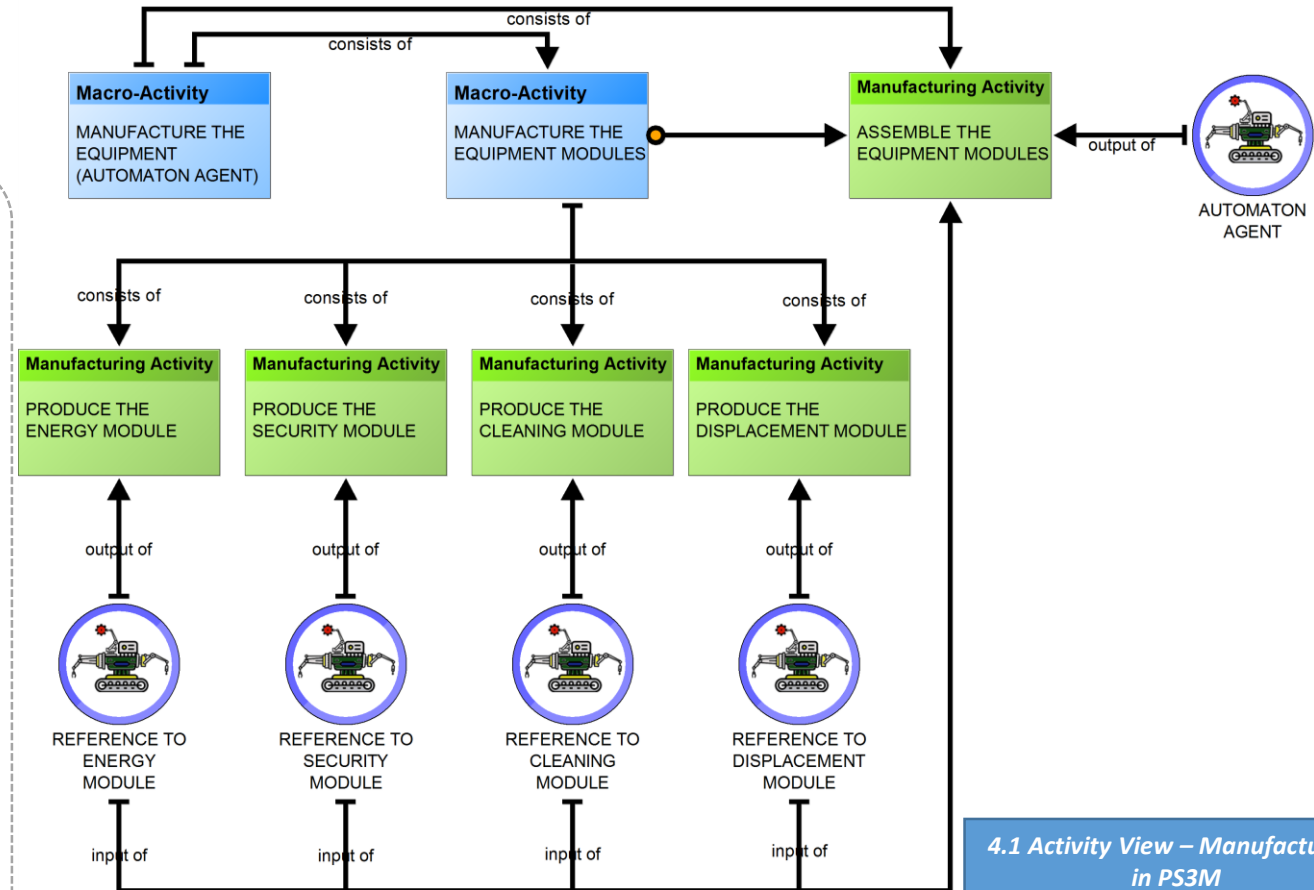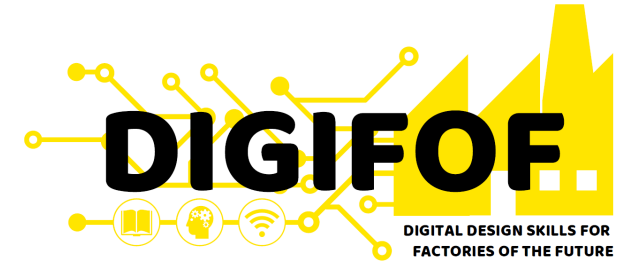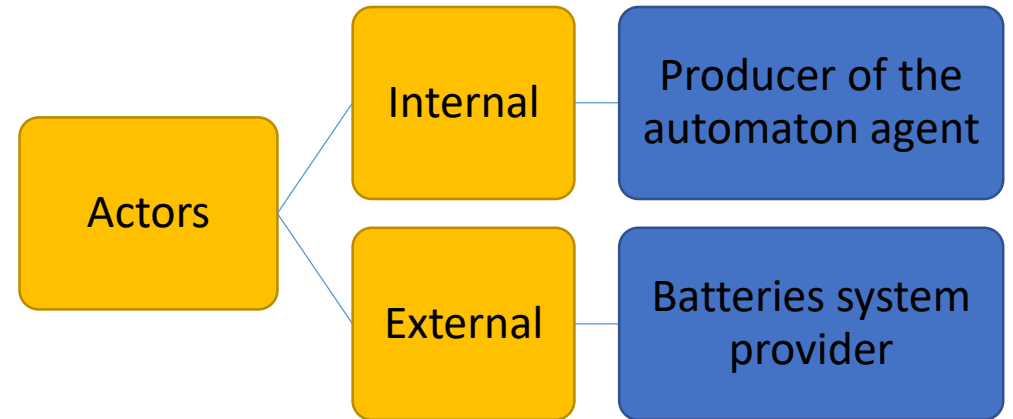
Presentation of PS3M Modelling Approach
Step 5. Organization Model
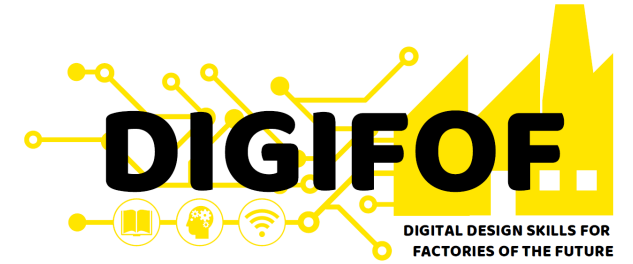
5.1 Organisation View – Configuration 1 in PS3M

Presentation of PS3M Modelling Approach
Step 6. Demand Model

- •50 m² to be cleaned daily — Demand
- •Intensive cleaning process — User profile
- •Meat transformation firms — Customer class

CUSTOMER / END USER (E4) PROFILE ← characterised by ← CUSTOMER / END USER CLASS ← from ← CUSTOMER / END USER DEMAND

6. Demand View in PS3M
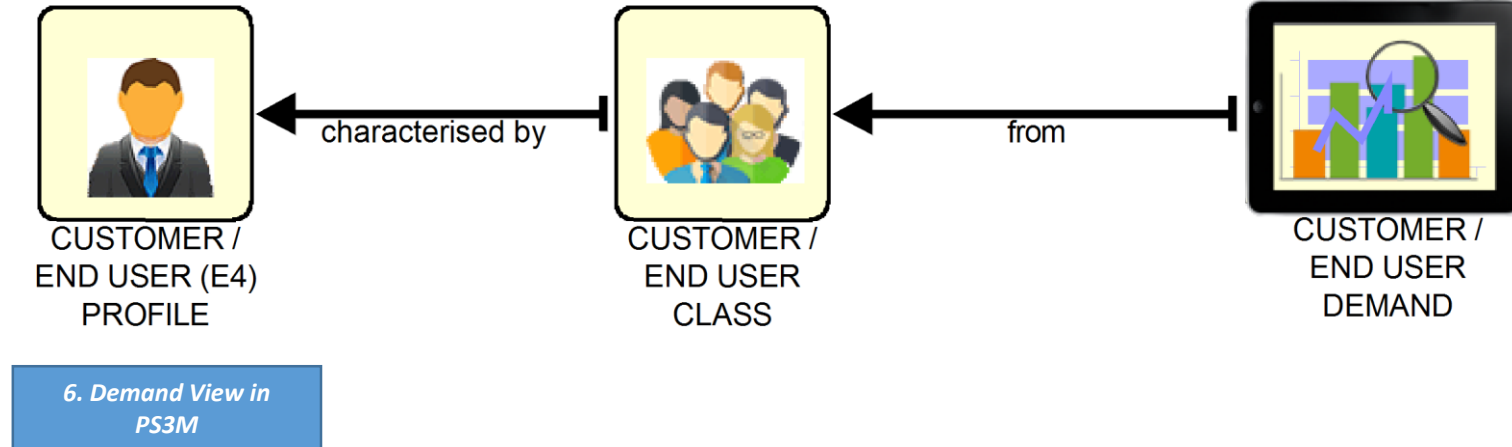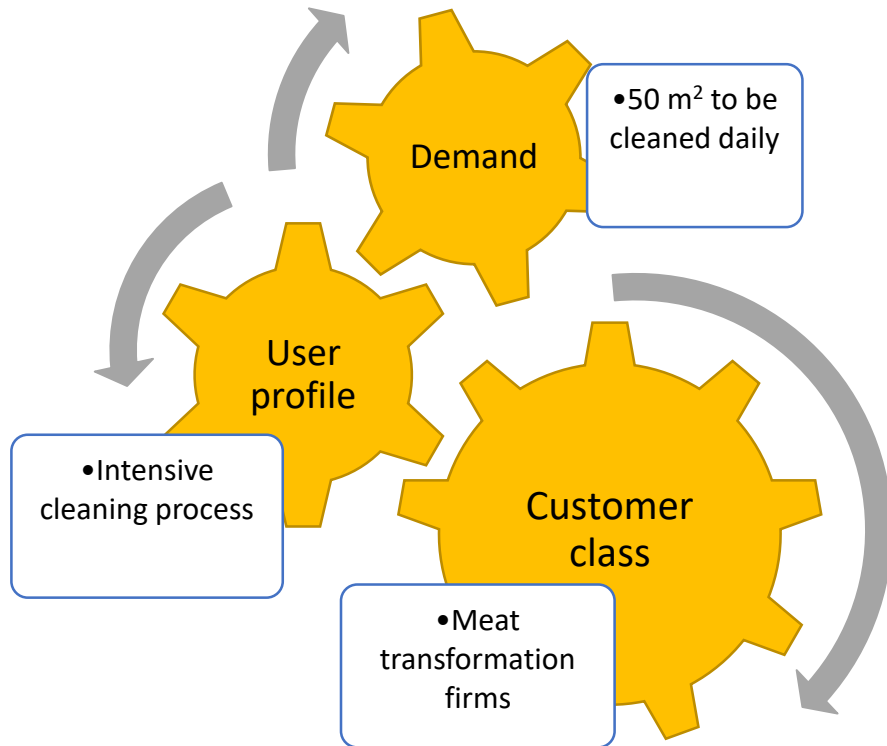
Presentation of PS3M Modelling Approach
Step 7. Offer Model
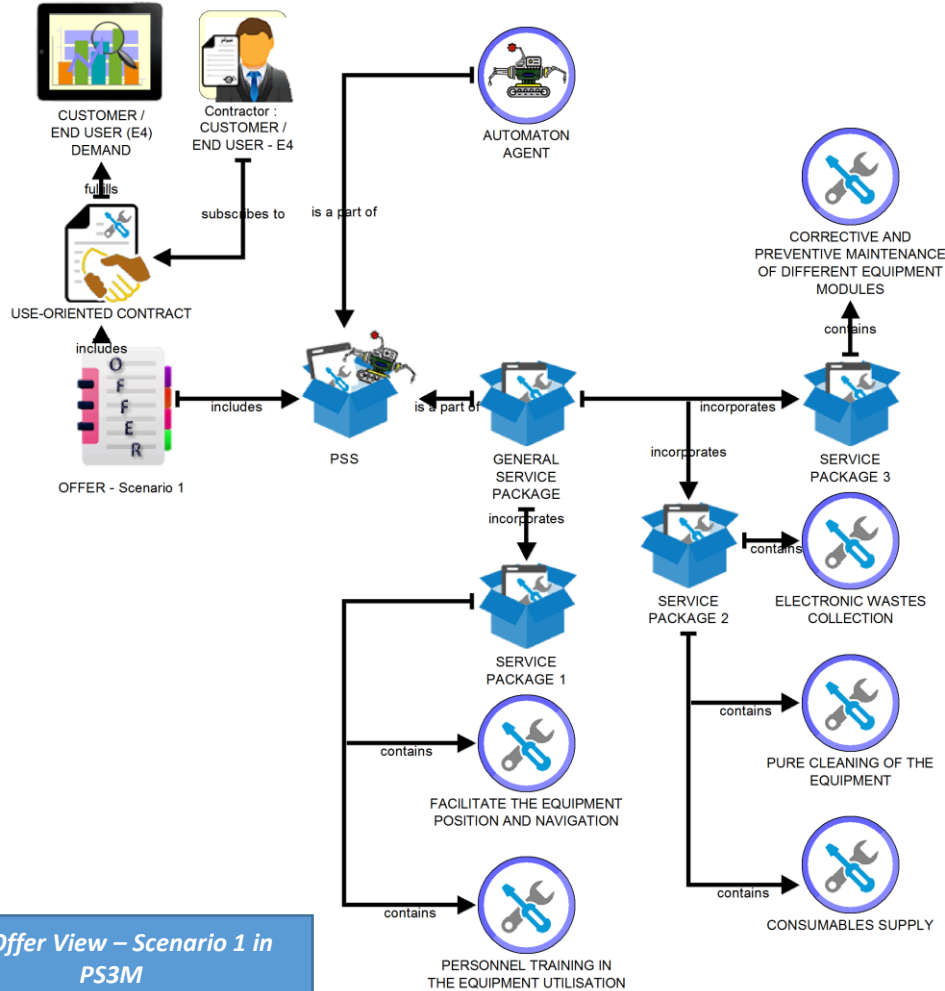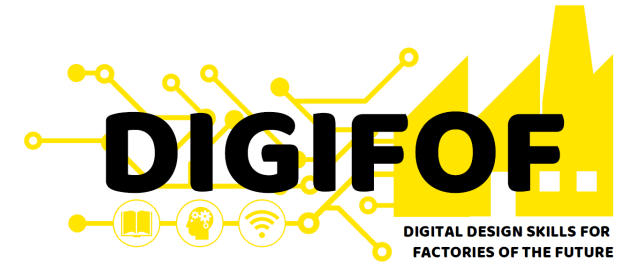
7.1 Offer View – Scenario 1 in PS3M

Contract		
Product oriented	Cleaning equipment
Use oriented	500 hours of cleaning per month
Result oriented	1000 m^2 cleaned per month

PSS elements		
Product	Autonomous cleaning device
Service packages	Waste collection
	Supply of consumables
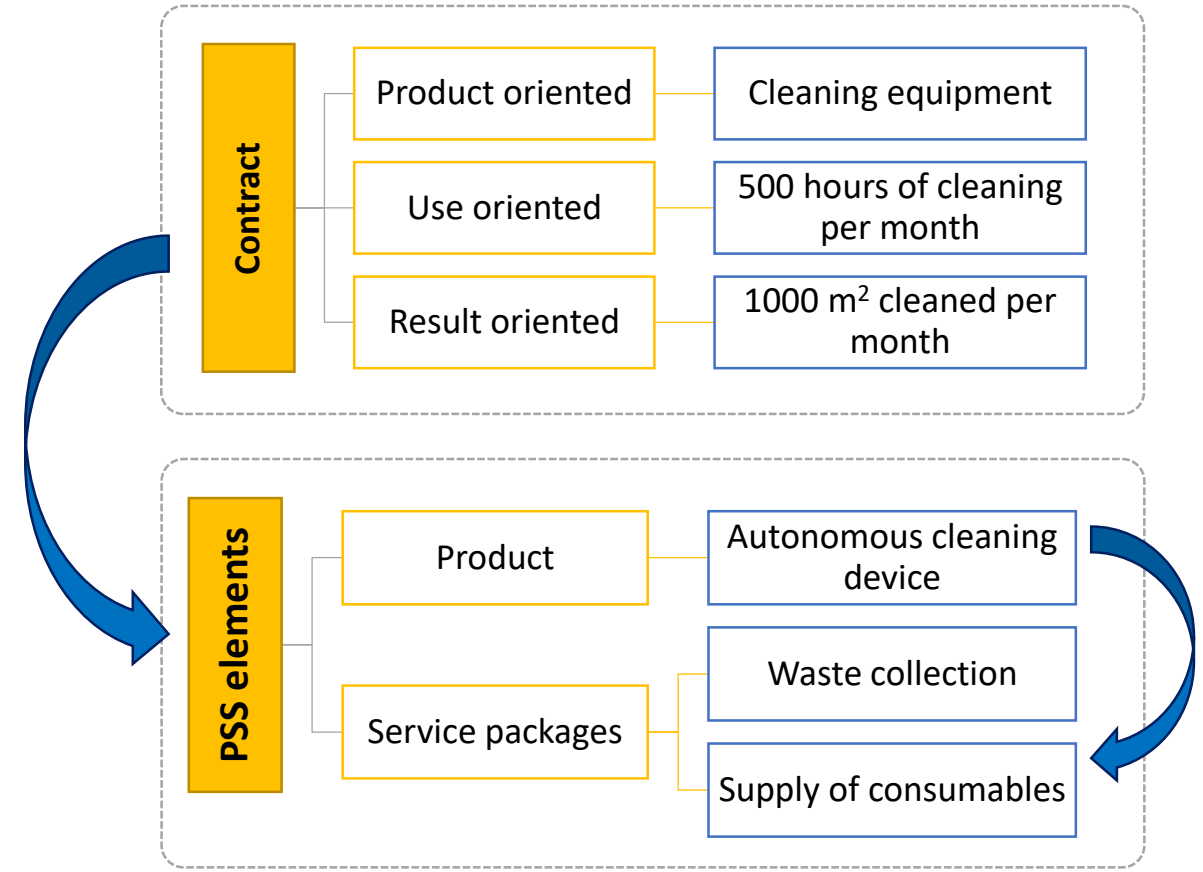
Presentation of PS3M Modelling Approach
Step 8. Performance Model

ENVIRONMENTAL

Energy consumption

Waste reduction

SOCIAL AND HUMAN

Training return on investment

ECONOMIC

Revenue growth rate

TECHNOLOGICAL

Overall Equipment Effectiveness (OEE)
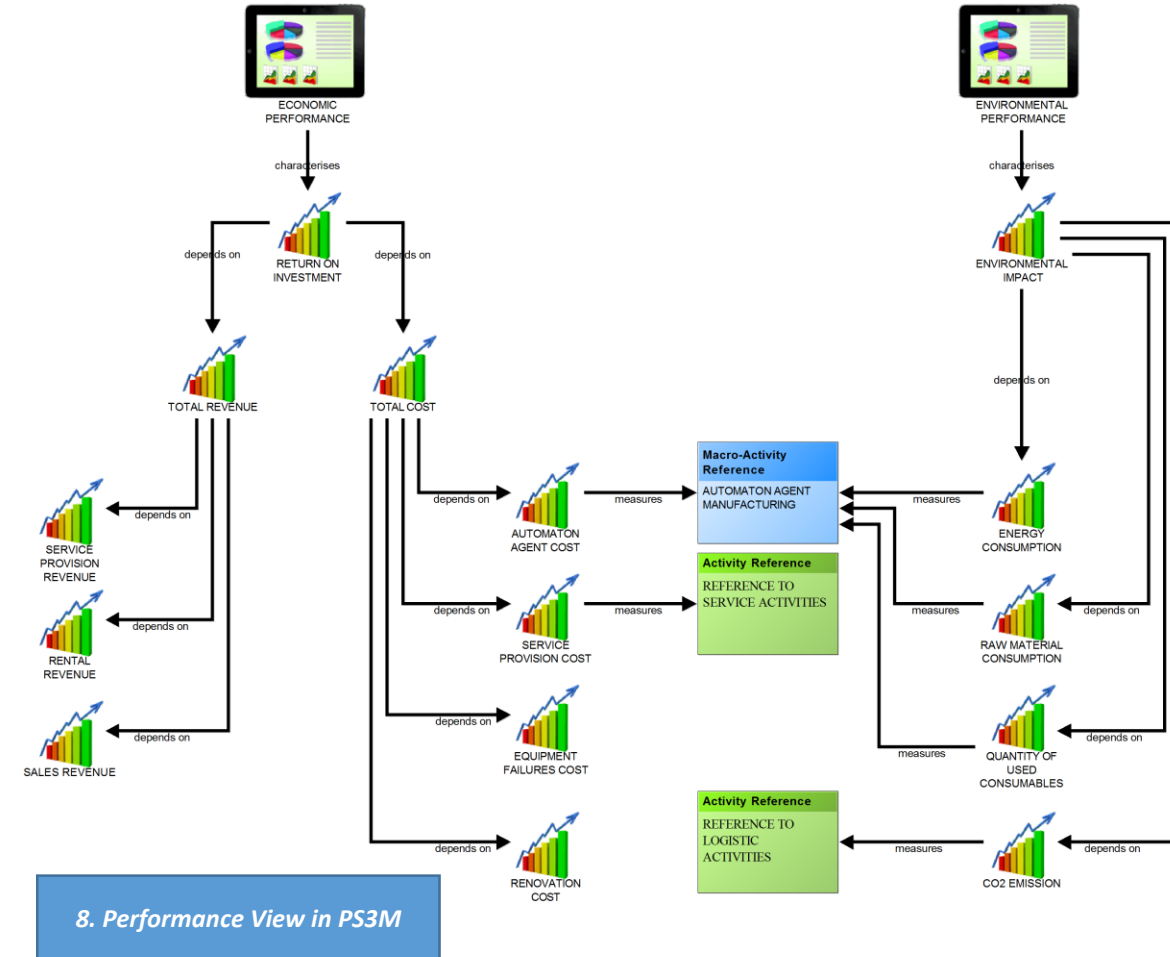
ACTIVITY REFERENCE
- Assembly of battery system

MACRO ACTIVITY REFERENCE
- **Fabrication of robot**

ACTIVITY REFERENCE
- Transport of robot

8. Performance View in PS3M

Presentation of PS3M Modelling Approach
Step 9. Scenario Model
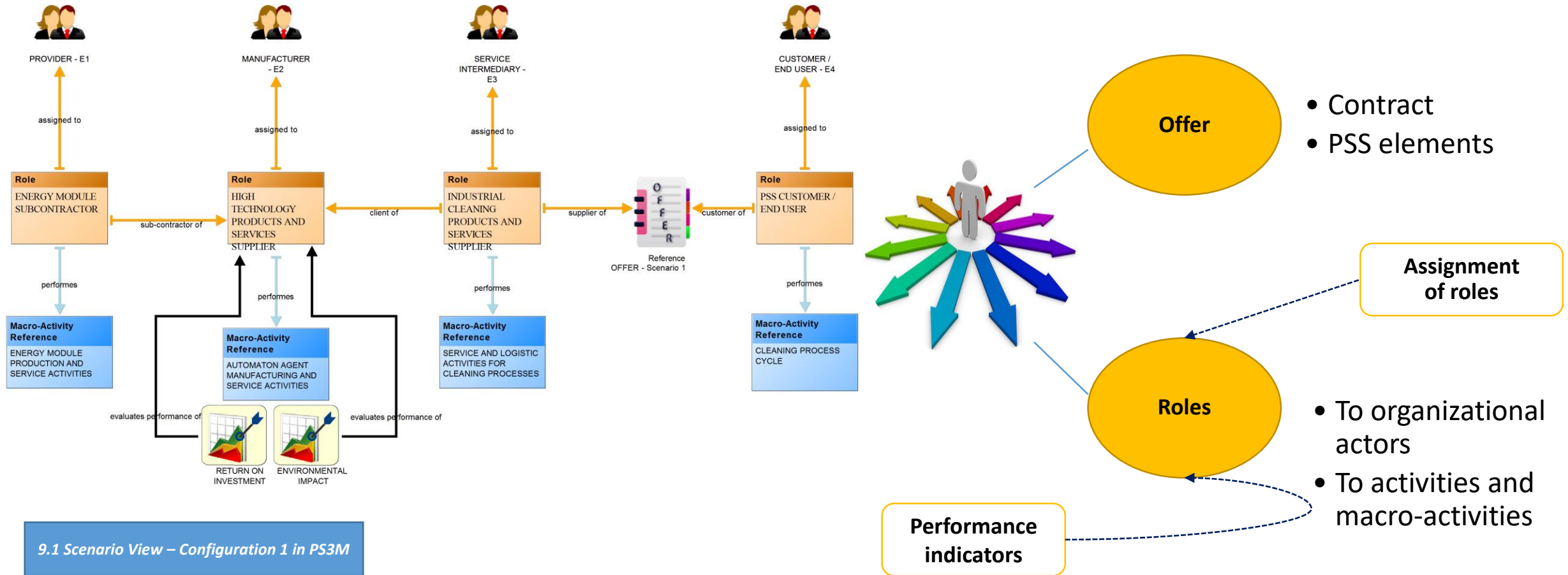
9.1 Scenario View – Configuration 1 in PS3M

Offer
- Contract
- PSS elements

Assignment of roles

Roles
- To organizational actors
- To activities and macro-activities

Performance indicators

Exercice : Part 1
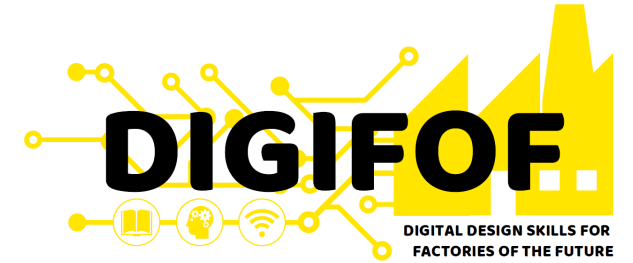
Before starting: *constitute design team with 3 persons representing the following roles : Key users / Electrical system provider / Robot manufacturer.*

Question 1 - Creativity:

Based on a collaborative work between the design team members identify between 2 to 4 alternative ways to deliver PSS offer to the customer (think of the three types of PSS and contracts) and provide a qualitative description:

- **Text explaining the content of the PSS offer and the way to deliver it**

- **Table specifying the various roles necessary and responsibilities of each role (You can create intermediary roles, or other roles if necessary**

- **Table showing the points of view of the 3 key roles of the team (expressed as expected added-value) which includes all the cost and revenue factors for each of the roles, covering all the lifecycle of the PSS (from design, to deliver and use)**

Exercice : Part 2 & 3

Phase 2 : Modelling

Question 2 – Build Offer Views

Create the offer view for each of the PSS alternatives you have configured in question 1

- *Create 1 offer view for each alternative : the offer view associates the product with (i) a type of contract, (ii) the specification of service packages and (iii) the demand.*

Question 3 – Build Scenario Views

- *Create 1 scenario view for each of the offer views of question 2 : the scenario view specifies the roles, assign the actors and assign macro-activities and performance indicators to the roles.*

Exercice : Part 4

Question 4 – Feed-back

- *Based on the scenarios views and on Question 1 report on the most suitable scenario for each of the PSS actors and decide on which scenario can be acceptable for all of the actors.*

REPORT

- *Provide a set of slides arguing your answer to each of the 4 questions.*

- *Export the adl file and join it to the report (both files in a zip).*