

Case Design Sheet



1. CASE DESCRIPTION

TITLE: Integrated design of a product service system and the associated economic model

PARTNER:	LOCATION:	TIME/DURATION:
SME in case study/Mines saint Etienne	FRANCE	2016-2019

2. DIGITAL TRANSFORMATION CHALLENGE

2.1. BUSINESS TRANSFORMATION

The meat transformation industries are challenged with increasing international competition and changes in customer behaviour. These circumstances compelled professionals in the field to work not only on decreasing production costs, but also and most importantly on improving the quality of their products. Further on, food safety (hygiene) is one of the main concerns of professionals in this field and such a concern is usually turned into a means to take advantage over competitors. In this sense, both hygiene and quality are two key objectives in the meat transformation industry. Additionally the standards in terms of hygiene are increasingly evolving, thus requiring innovative methods and technologies to keep up with the new requirements. For instance, the industrial cleaning should benefit from such innovative solutions to increase the efficacy of the cleaning process.

The case study consist in designing an innovative Product-Service-System (PSS) answering these industrial cleaning needs. The PSS is designed to be implemented within a meat transformation French enterprise (E1) in order to clean cold storage warehouses. The adoption of PSS thinking is motivated by a desire to unleash the potential of high-added value solutions coupling robotics with service. The PSS solution has been developed by a consortium:

- With three industries : a medium-sized company from the meat industry (E1), a small-sized company manufacturing special machines including robotics and providing customised solutions (E2), a small-sized company manufacturing batteries (E3);
- Where E2 is the leader company for the development of the PSS offer and the integration of all the components for further commercialization,
- Which includes two multi-disciplinary research centres: a research centre specialised in the machine vision (L1) and the Fayol Institute (Ecole des mines) research team specialised in PSS engineering.

The need for an autonomous solution is explained by a desire of the professionals in the meat industry to reduce the presence of operators within the meat storage area during the cleaning process for multiple reasons. First, there is a contamination risk of the meat because of the operators' presence (e.g. hairs,

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shoes, etc.). Second, the exposure of the human to the chemical cleaning substances may be harmful. Third, the meat carcasses impede the traditional cleaning process, which requires operators and uses usual cleaning machines. Finally, the autonomy allows running the cleaning process during the night. Thus, it is a money-saving process, as the production is not disrupted by the cleaning task, which usually causes a lot of wasted time in removing the carcasses.

The development of the PSS solution is based on technological innovation for the design of a new robotic solution answering the specific constraints of the project, as well as on service-oriented innovation to manage all the life cycle of the solution and to offer opportunities of new economic models. The technical complexity of the robotic machine and the constraints of the working environment (meat cold warehouses) require suitable services notably to ease the use, ensure the availability, and increase the efficacy of the ‘special machine’. These services can also be encapsulated in a PaaS (Product as a Service) solution, where the economic model could be based on selling the availability (Use-oriented PSS) or even the performance of the solution (Result-oriented PSS).

2.2. CONCEPTUAL TRANSFORMATION

The concrete result of the project is the design, development and industrialization of a PSS solution for industrial cleaning.

However, the conceptual transformation we refer to, in the case study, is the internal transformation of collective competencies of SME (E2), which contributes to the transformation of its Business Model:

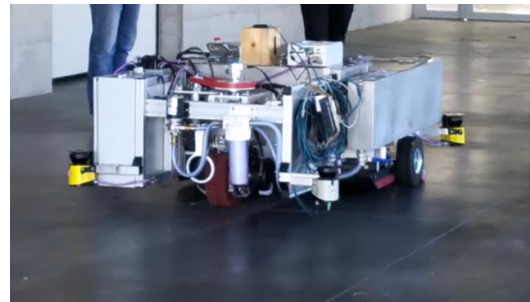
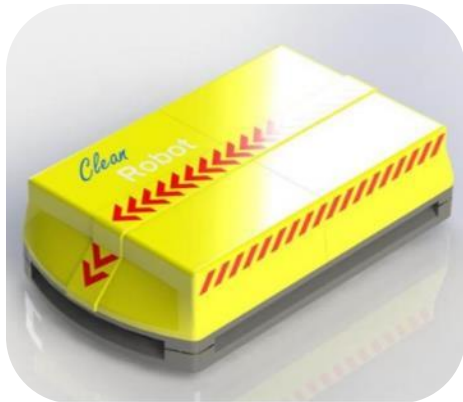
1. **Servitization on an industrial company:** Servitization, PSS concepts and experiments have spread during the last decades in academic and practitioner communities (Hou and al, 2013), with a recent renewed interest through the development of smart PSS and digital servitization (Oluwafemi and Laseinde, 2020; Wang et al., 2018). This paradigm shift requires questioning the business objectives and overall functioning of industrial companies. PSS are not only based on technical aspects; organizational aspects are also strongly involved, which makes the implementation in industrial businesses complex (Cook and al., 2006; Rabetino and al, 2017).
2. **Part of this transformation path consist in a transition of design capabilities:** The design teams have to change their product development practices (and methods) to integrate three aspects in association of the design of the technical system. These aspects are the design of (i) the service offer and packages, (ii) the value chain to deliver the integrated PSS offer, (iii) the associated economic model. Thus, the project had the objective to support the company in its changes of design capabilities.
3. **Transformation of the economic model** for the commercialization of technological solutions. The PSS solutions offer the opportunity of a set of alternative economic model (e.g. basically, selling both product and additional services, selling the usage of the products, or selling a

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commitment on the performance of the product). The objective of the project was to assess and compare quantitatively the alternative economic models available.

2.3. TECHNICAL TRANSFORMATION

From a technical point of view the main innovation areas were directly linked to the technical solution, included in the PSS offer. This solution is a robotic solution able to take in charge industrial cleaning tasks, as part of a PSS offers.



The technological innovation led to design and development of a deeply innovative cleaning robot, answering the following key requirements:

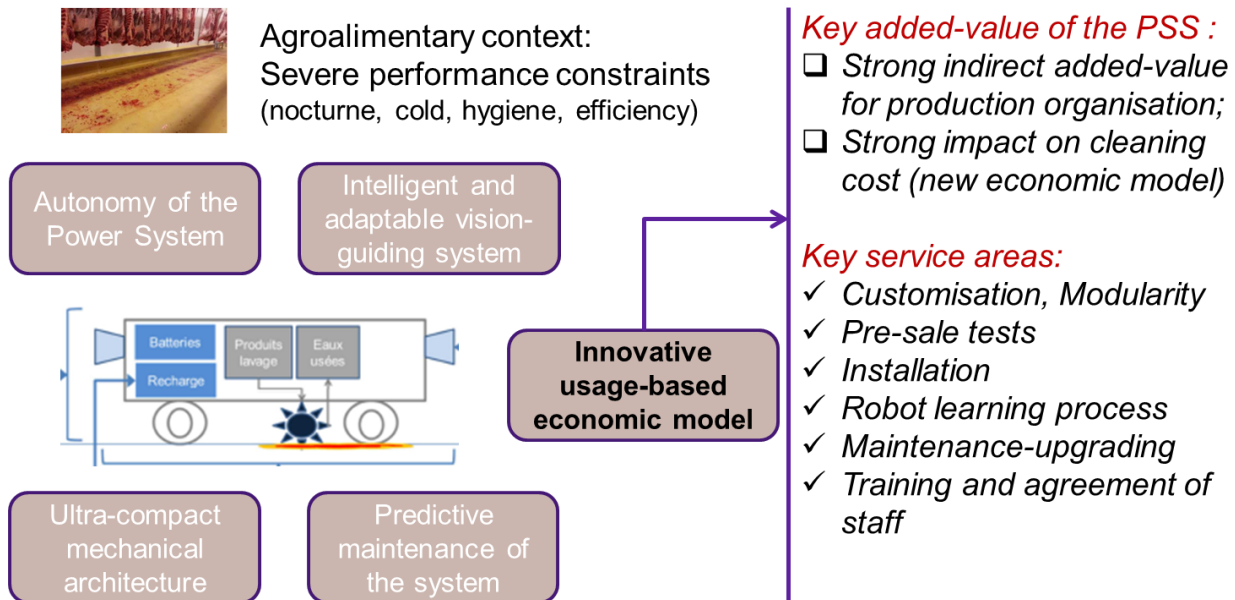
- Constraints of reduced size, due to specific cleaing requirements;
- Vision control to make possible an automous cleaning process;
- Efficiency of the cleaning, for specific constraints of meat industry;
- Environmental constraints, induces by Eu and french norms;
- Energy efficiency, notably linked to the battery energy system, to address a full sustainability of the solution;
- Digitalisation to ensure traceability of usage cycles and for potential remote control

So, one of the key interest of teh project was to integrate several dimension of the innovation : technological innovation of the solution, Business model innovation thourgh servitization, Economic model innovation and Organisational innovation (i) to transform internal competencies and (ii) to develop new forms of partnerships.

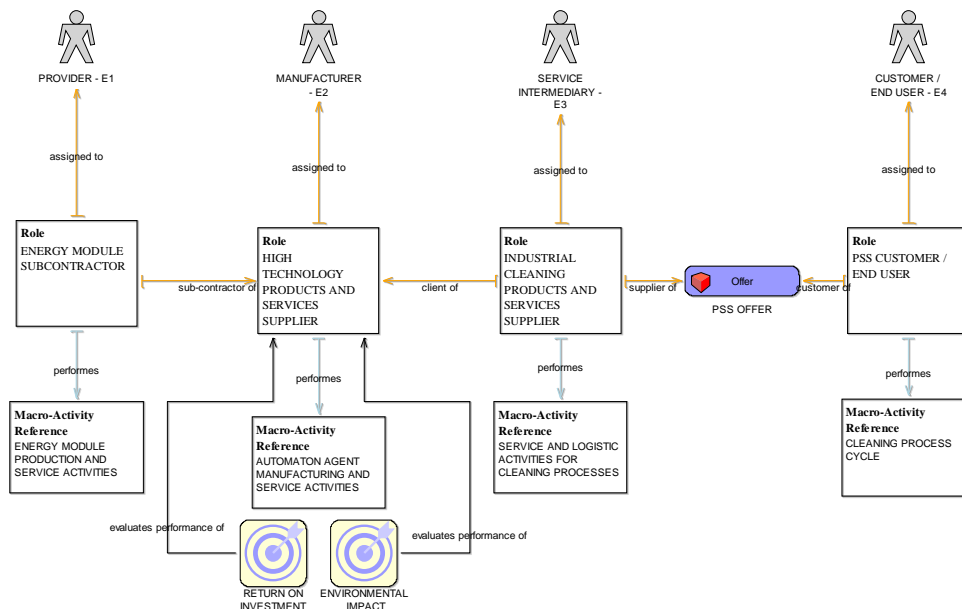
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3. SOLUTION

- A technological solution integrated with a PSS Offer



- A study of several alternative value chains to deliver the solution on the market

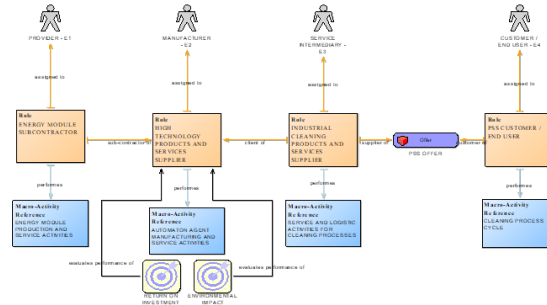


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- A comparative analysis of alternative economic models

Example 'Automaton'

5 value network scenarios depending on (i) Robot owner, (ii) Cleaning activity execution, (iii) PSS type



Example of Key outputs

- Several value-chains studied: **key advantage for the partners to create a dedicated structure** (new company) for the commercialisation of the offer;
- Several PSS offers studied : **key advantage of a commercial offer based on renting contracts** with added-value services (with regards to traditional selling contracts)
- In this case study **the key influencing economic factors** are rather simple:
 - Contract duration and demand level ;
 - Product design : life span, cleaning capacities and speed, cleaning adaptability;
 - Customer behaviours : customer loyalty, customer resistance to PSS
- The quantitative **conclusions should be adapted to market resistances** : offers of distinct types could remain on the market, notably for specific client sectors – Commercial regulations to catalyze PSS deployment should be implemented.

4. KEY SKILLS AND COMPETENCES

Transformation of internal skills of the PSS-oriented company

- Change of design skills (see previous section)
- Transformation of partnership capabilities to deliver both product and services
- Internal change of culture, to switch from an industrial-oriented company culture, towards a service-oriented mindset

5. RESULTS

- The implementation of the project leads to a full new Business Model.

6. CONCLUSIONS AND RECOMMENDATIONS

Is the servitization feasible & pertinent for SMEs ?

It is always a progressive path !

- ✓ Nearly all industrial companies are already in the path towards service offers
- ✓ Different level of maturity on services in the same company, depending on the business

The industrial transition has to be very customized ...

- ✓ But this customization process is well managed today
- ✓ It requires the involvement of the key decision-makers in the company

For SMEs it requires collaboration and some strategic guidance.

- ✓ But methods are mature and supporting expertise is available

This transition appears...necessary.

7. REFERENCES

The case study

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