



PSS Evaluation

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Purpose

Introduce approaches to evaluate PSS alternatives.

- Answers to Task 4 in project report: 4. **Discussion** of value and cost along the lifecycle for customers and manufacturer



Alternative PSS (examples)

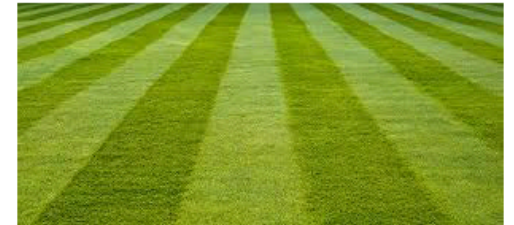


Provide Always
perfect lawn



Provide Always
Sharp Lawn mower

Mowe
Lawn

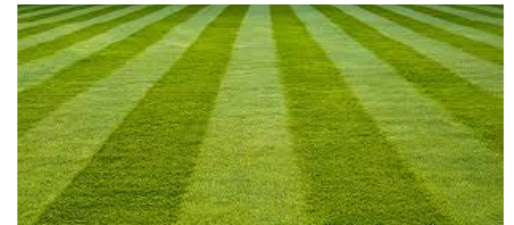


Sell Lawn
Mower

Provide Spare parts
and a sharpner for
separate sales

Sharpen

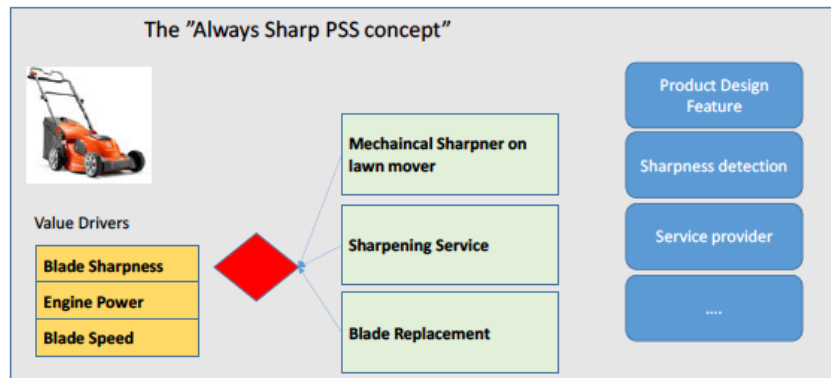
Mowe Lawn



Evaluation of PSS

1. Evaluate satisfaction of stakeholder expectations and needs (qualitative approach)

2. Evaluate quantitatively the Life Cycle Costs and Revenue (Net Present Value) of alternatives (quantitative approach)



- A product solution may be compared to a service alternative solution
- Cost evaluated by Life CycleCost



Provide Always Sharp Lawn mower



Provide Spare parts and a sharpener for separate sales

Sharpen

Are stakeholders needs and expectations satisfied?

Stakeholder expectations are formulated BY STAKEHOLDERS and their satisfaction typically require assessment of stakeholders own experience of the PSS solution...

- Real evaluation require understanding stakeholders' true satisfaction
- Observations, Focus Groups, Feedback forms, Measures of in-use..
- Often difficult to evaluate in advance...



Are stakeholders needs and expectations satisfied?

Stakeholder Needs are one step closer to what can be evaluated objectively

- Stakeholder Needs address a certain characteristic that is easier to evaluate objectively
- The step towards evaluation is via the "value drivers" as the factors impacting Stakeholder Needs.

Stakeholder Need

Stakeholder Needs are high-level statements of problems that need to be solved by a new or re-used system solution. In a given context these needs will be based on captured and validated expectations of external and internal stakeholders.

Needs are the source for the development of Requirements and are satisfied by improvements along one or several value dimensions.

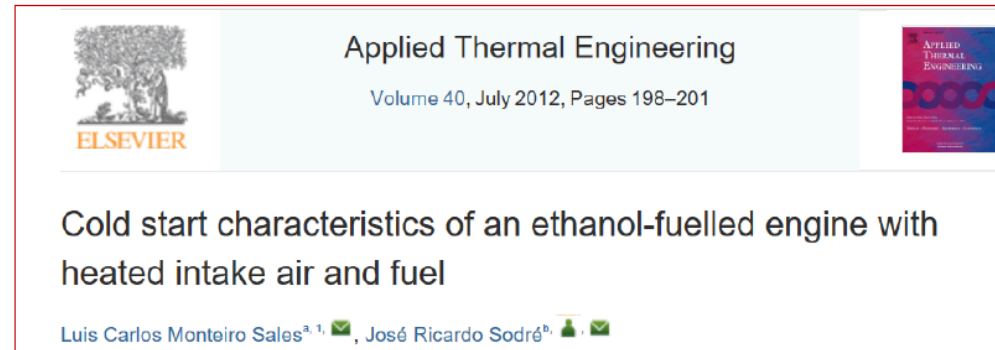
- Example: "A car engine must be possible to start at any temperature"



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- A "Scientific" approach is to look for others who have studied this
- Physical and Virtual Testing are other means
- Evaluation of "key characteristics" (Value Drivers) another

Stakeholder	Expectation	Needs	Dimensions	Alt A	Alt B	Alt C
User	Easy to operate	Reliable start	Engine performance			
		Low effort to control	Manouverability			
	Always ready	Reliable Power Source	Engine Performance			
		Reliable Parts	Durability			
	Good result during all conditions	Always sharp	Cutting Performance			



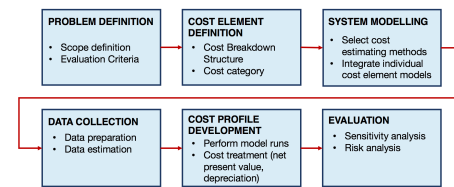
1. Qualitative assessment of needs

You can use tools and methods you have seen in other courses (e.g. Product Planning) – Pugh Matrix, QFD, Kesselring Matrix....



Stakeholder	Expectation	Needs	Dimensions	Alt A	Alt B	Alt C
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		Low effort to control	Manouverability			
	Always ready	Reliable Power Source	Engine Performance			
		Reliable Parts	Durability			
	Good result during all conditions	Always sharp	Cutting Performance			

2. Evaluate quantitatively Life Cycle Costs



The best way is usually to calculate a LCC of a current PSS offering, taken as a **benchmark**, and then to calculate a LCC model of your developed PSS

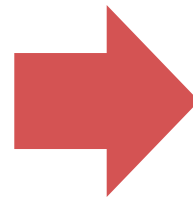
Questions to ask: how do the design parameters we decide in our PSS solution affect with LCC? Which current bike sharing can we benchmark (scenario?)

So, you will developed two LCC, one for the current PSS (with the 'old' weight of the frame, and the new one



Current PSS

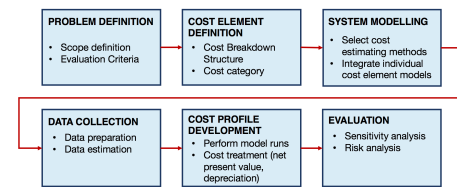
LCC benchmark



Your PSS



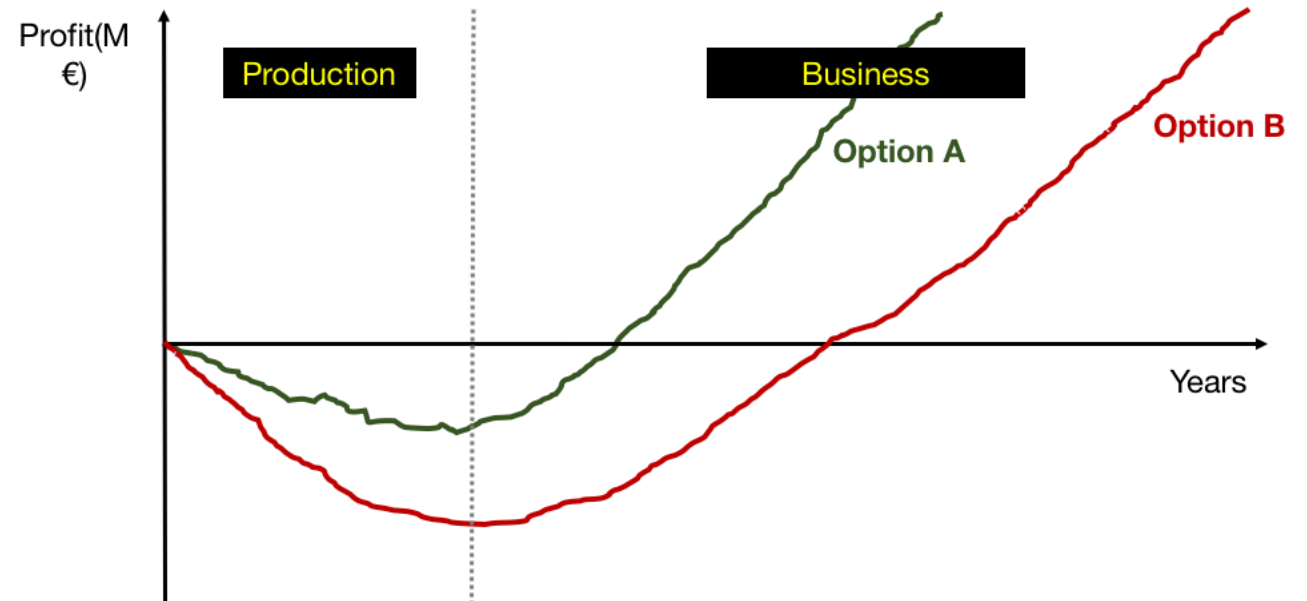
3. Evaluate quantitatively Value and Cost



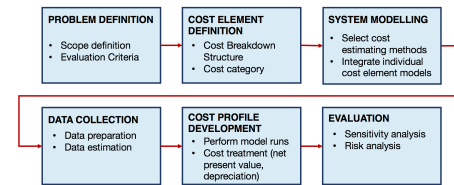
$$\text{Profit} = 35 \left(\frac{\text{SEK}}{\text{hour}} \right) * \text{hours utilization} * \text{number bikes rented} \\ - [(\text{number bikes produced} * \text{production cost}) + \text{usage cost} + \text{maintenance cost}]$$

LCC

Revenue – depends on your ability to satisfy stakeholders expectations and needs!



3. Evaluate quantitatively Value and Cost

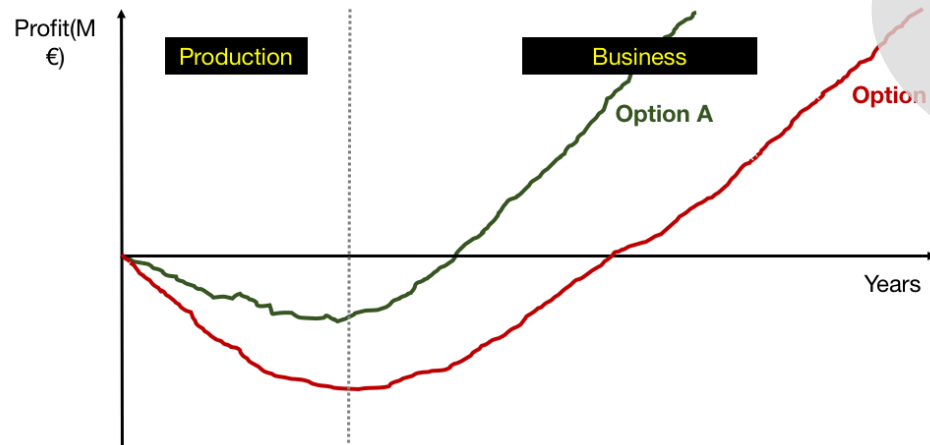


$$\begin{aligned}
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 & + \text{maintenaince cost}]
 \end{aligned}$$

LCC

Revenue – depends on your ability to satisfy stakeholders expectations and needs!

- The PSS concepts is likely to differer in how cost is distributed over time.
- E.g. Does the PSS solution include a fixed maintenance interval? A predictive maintenance? Automatic upgrade or pay per upgrade?



This is optional – of course will be judged positively

Excercise

You will play the roles of a product designer and a production designer.

“Box”



Pump/compressor



Product Design Brief

The current product (sold on the market) is designed with these characteristics:

- Capacity = 0.8 m^3
- MTBF = 265.500 hours = (130.000 hours for the pump + 401.000 hours for the box) / 2
- Weight = 3.3 kg = 3 kg for the pump + 0.3 for the box
- Energy Consumption = 1.5 kWh (only one pump)

Design the new fridge as a PSS (for 30 years) keeping in mind that:

At year 15, new customers are attracted to use the fridge, but they will desire new capacities:

- One new segment wants a fridge with 0.6 m^3
- One new segment wants a fridge with 1 m^3
- One new segment wants a fridge with 0.4 m^3

Requirements for MTBF and weight must be kept the same.

At year 25, costs for electricity dramatically increases, which drives the customers to have a fridge with a fuel consumption less than 1.3 kWh.

NOTE: you can design a fridge with multiple boxes, keeping in mind that each box requires **one pump**. Not fulfilling the request for capacity means not attracting that specific customer segment

Production Design Brief:

The current production line (sold on the market) is designed with these characteristics:

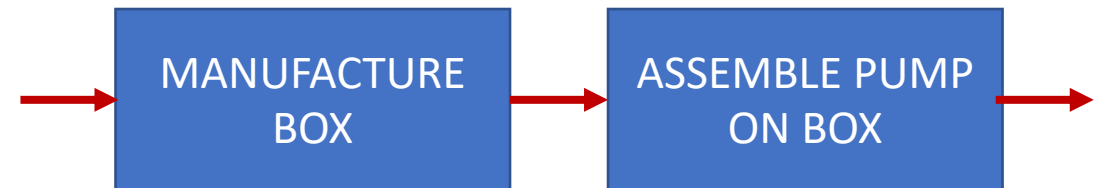
- Throughput time = 6 hours
- MTBF = 230.000 hours
- MTTR = 50 hours
- Current Investment for improvement = 98.000 Euro

Design the new fridge as a PSS (for 30 years) keeping in mind that:

At year 15, costs for repair dramatically increases, which drives the customers to have a fridge with a MTTR less than 30 hours.

Also, the new requirements for the PSS are:

- Throughput time = 6 hours
- MTBF = 300.000 hours



Summary

- 1. Qualitatively impact on stakeholder expectations and needs**
 - **Based on Stakeholders perception**
- 1. Life CycleCost of alternative PSS and the Current Product solution**
 - **Include maintenace, upgrade, repair, value loss etc of the "current" product solution as well "your" PSS**
- 2. Quantitatively estimate Value and Cost**
 - **Requires to estimate how your satisfaction of needs impacts revenues and utilization**
 - **Optional in the project**

Remaining project tasks

6. Do a SWOT analysis of the **original product** to enhance the function analysis with a broader view.
7. Suggest the introduction of possible technologies to the “base” product that would **reduce the risk of maintaining ownership for the manufacturer**, and assess the cost and value of such technology
8. Develop a **roadmap** for the transition from product to PSS for the company and justify the suggestions made.

e.g. Use of TRL levels (https://en.wikipedia.org/wiki/Technology_readiness_level)

Technology Roadmap (<https://www.productplan.com/three-example-technology-roadmaps/>)

9. Develop an action plan for the company to become more circular-economy oriented.

Workshop this Thursday



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