Eco design

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Today’s Presentation

- Introduction
- 1 – The client’s needs
- 2 – Integration of the business goals
- 3 – Conceptual design
- Conclusion

Who are we?

Founded 10 years ago

Product development, VE, FA, FPS

Over 50 clients

2 partners: practitioners with experience

Members of CSVA and SAVE Int.

Economic Context

- The Canadian dollar takes more force
- Emerging countries growing very fast (China, India, Mexico) $\Rightarrow$ rapid increase in energy and raw material demand

Environmental Context

- The consumer is more and more concerned by the environment (Green parties in all developed countries)
- Europe is in advance to protect the environment
- Price of raw material is increasing rapidly

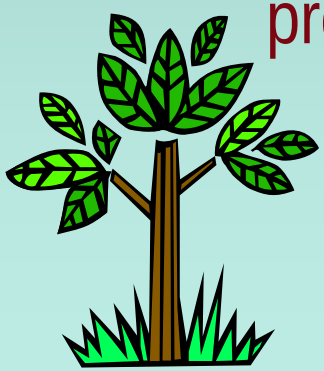
Eco design

Its goals:

- Protect the environment
- Be proactive (no legislation yet but coming!)
- Protect one’s market share
- Find new sources for procurement (recycling of old products)

Eco design and the product development process

- Eco design should be an integral part of product development
- The product user's and the producer's ecological preoccupationd should be present in all the steps of product design



Back to basics…

Product

- What is supplied to a user to fulfill a need: a solution

Afnor NF X 50-150

Part 1

Identification of the client’s needs

Client needs

- KANO quality model
  - Basic quality:
    - Quality a client is automatically expecting
    - Often non spoken
    - Client is very frustrated if he doesn't get it
    - No expression of satisfaction

Client needs

- Performance Quality
  - Expectations expressed by the client
  - Level of satisfaction increases with the performance of the product
- Excitement Quality
  - Brings unexpected surprises for the client
  - Very high level of satisfaction caused by effect of surprise

Client vs designer language

- Client expresses his needs according to usage or performance of product he desires.
- Designer translates usage and performance of product in terms of measurable engineering criteria.

How to define client needs

Function analysis

- Systematic approach
- Expresses the need
- In terms of usage not solutions
- Focuses on final use of the product

Integrating ecological needs of the CLIENT

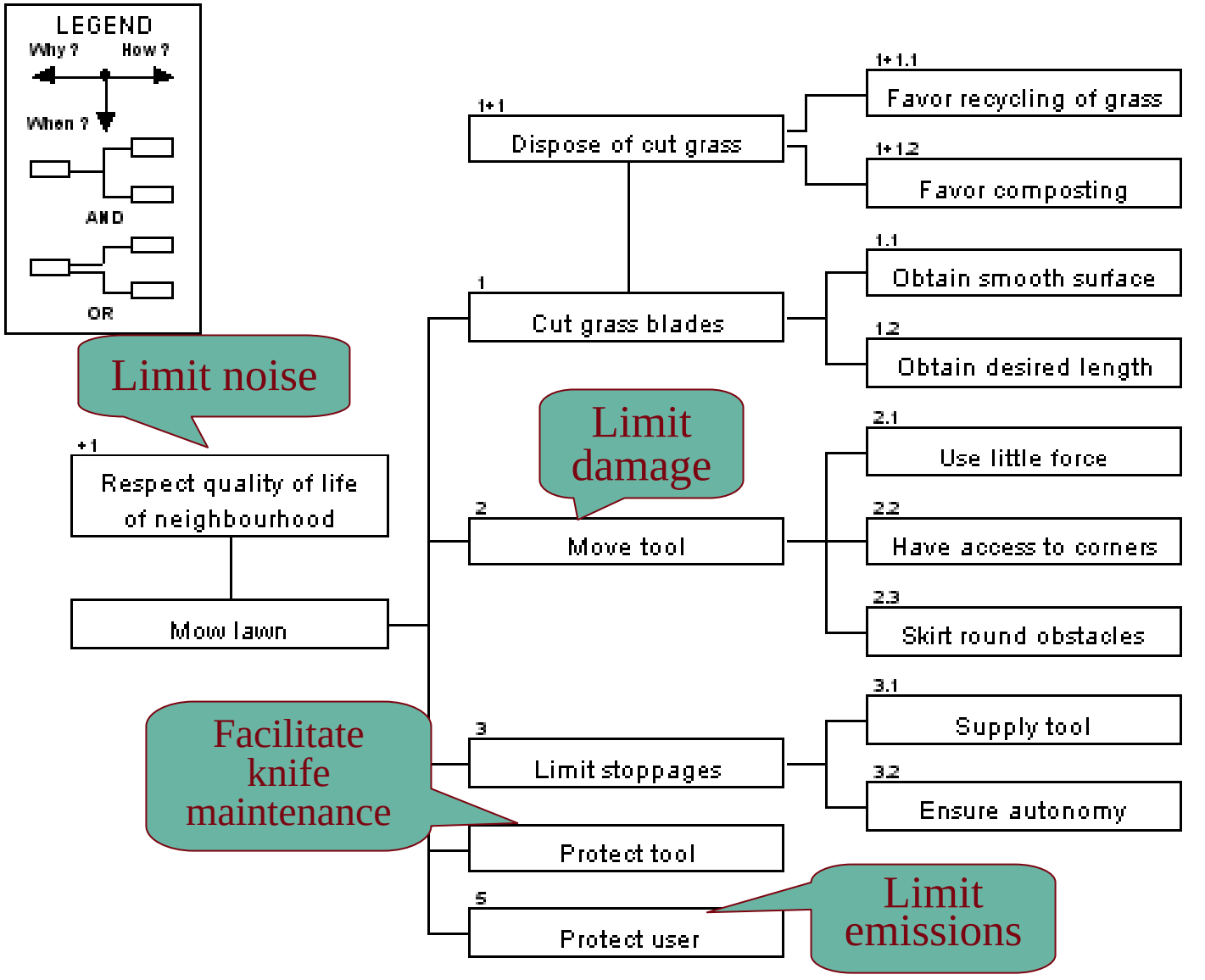
Functional diagram

- Define ecological usage of each function and place them in the « when » relation
- This exercise helps understand the ecological needs when using the product

EXAMPLE

Lawn mower functional diagram

Functional diagram: Lawn mower



Characterisation of needs

- The Criteria-level-flexibility must be applied to all ecological functions

Definition of engineering specifications

- Engineering specs:
  - must be acheived by the product
  - must be precise, measurable
  - must allow the measurement of the performance of the product.
- Product performance is its capacity to satisfy the client's needs

Engineering specifications

- Engineering specs:
  - must be expressed with Criteria, Level and Flexibility.
  - must be understood and accepted by all, including marketing

Functional performance specification

	Function	Criteria	Level	Flex	Engineering criteria	Level	Flex
1	**Cut grass blades**	Length of grass	3 to 10 cm	F0	Adjustment of knife	3 to 10 cm from ground	F0
		smoothness of lawn	equal even on bumps	F0	Width of cutting	less than 20 cm	F0
		Surface of cut	maximum even in corners	F1	Turning radius		AD
					Distance from knife to edge	minimum	F1
2	**Move tool**	Effort	Minimum	F1	Pushing force	50kgf	F0
					Force to lift tool	25 kgf	F0
3	**Limit stoppage**						
3.1	**Supply power**	Power source	conventional	F0	power source	Electricity or gas	F0
		Availability of source	Easy	F0	Availability	Easy	F0
		Pollution	Minimum	F1	GGE emission	minimum	F1
					Power usage	max 1 litre per hour	F0
						1kw H	F0
3.2	**Ensure autonomy**	Length of time	2 hours minimum	F0	Capacity of power storage	2 litres	F1
4	**Protect tool**	Duration	5 years	F0	Rust	No trace for 5 years	F1
5	**Protect user**	Injuries	0	F0	access to dangerous parts	none	F0
	Respect neighbourhood	Noise	minimum	F1	Noise	80db measured at 2m away	F0

Pause!

- Common understanding of client needs including the ecological ones
- Sharing of engineering criteria by all on the design team
- Over or under designs are avoided

Part 2

Integration of business goals

Integration of business goals

- Each entreprise has goals, values, policies:
  - environnement
  - ROI
  - Cost policies….
- They are basic factors for project selection

Business goals in ecodesign

- The company has the mandate to:
  - Develop a product that protects the environment when being used(or at least not damage it)
  - Produce the product with processes that are the least polluting
  - Manage the product life end:
    - Give it a second life, or to some of its components
    - Use materials that are not harmful to the environment when degrading
  - Integrate ecological constraints during the design of the new product

Concept selection criteria

- The business goals are transated in selection criteria (the voice of the company)
- The selection criteria must:
  - Be stated, prioritized and validated by management
  - Give the rules for selecting the best alternatives
  - Be accepted unanimously by management and design team

Part 3

Conceptual design

Conceptual design

- The conceptual design gives the technical orientation for the product
- Creativity tools for the design team are required
- Creativity subjects are identified by the functional performance specification

Idea selection

- Ideas generated during the creativity phase are selected according to:
  - Their response to engineering specs
  - Then, their response to business criteria
- Rejected ideas are kept in list, to be used later

Using the FPS in eco-design

- Failure mode analysis is an analytical technique used by designers to methodically analyse causes and effects of a failure, BEFORE THE DESIGN IS FINISHED

FMEA in eco-design

- With the FMEA methodology, identify components that are the most susceptibles of changing during the life of the product (wear,fatigue, aging…)
- Design for De-Assembly will be applied to these components

Choice of raw material

- Choose only material that are recyclable or have little impact on the environment

Reconditioning defective components

- A reconditioning plan based on identification of defective parts of the component
- During design, these parts will be isolated to make them independent and easily replaceable

Development of ecodesign plan

- Replacement plan of components: who, where, how.
- Recuperation plan for the components
- Reconditioning plan
- Disposal / destruction plan

Conclusion

- It is possible to consider environmental issues during early design phases
- The business must make choices early

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