Integrated Methodology for Product Design Including Sustainability Criteria and Palm Oil Value Chain Requirements

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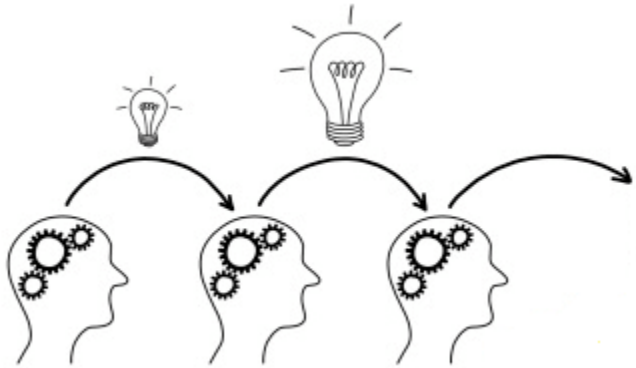
Product Design

Product design a process that involves **creating new products** to be sold by a business to its customers. It involves understanding the **needs of the customers**, creating a concept that can fulfill these needs, and transforming this concept into a physical product

Chemical Product Design: It's the application of chemical engineering principles to the design of new products, often involving the conversion of raw materials into valuable forms



[1]

1. Adapted from: https://ccs.org.co/quimica-sostenible-la-via-para-lograr-el-cumplimiento-de-los-ods/

Product Design Challenges

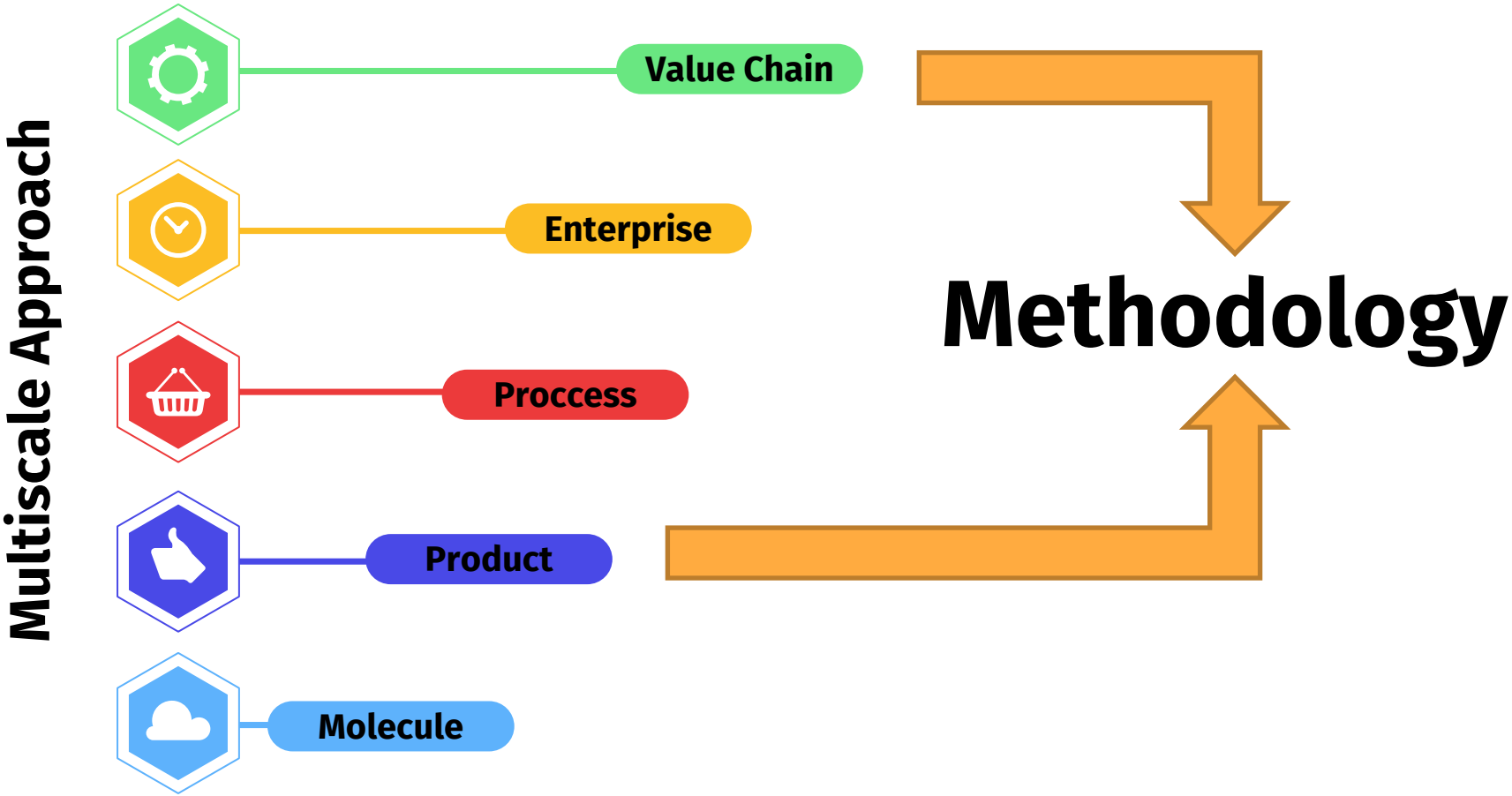
Gani, R (2004) Chemical product design: challenges and opportunities
Martin, M (2019) Challenges and future directions for process and product synthesis and design
Taifouris, M (2020) Challenges in the design of formulated products: multiscale process and product design

Value chain

The value chain encompasses all the activities that are performed to create and deliver a product, from raw material to final product delivery.

Case of study: Palm oil in Colombia

How to connect these two scales?



Proporsal: Methodology for CPD considering the value chain requirements

Objective:
Limitation identification
Value/supply chain mapping

Objective:
Include the value chain limitations in the product design

Objective: to enable participants to select an appropriate emulsifier within the context of a product design

Design of a vegetal beverage, without milk or added sugars.

Selection of emulsifier

Glyceryl Monoestearate /Sodium Etearoil-2-lactilate

HLB: 10

Polysorbate 80

HLB: 15

Lecithin

HLB: 9

Case of study: Results

Students

Lecithin

01 Price
02 Health
03 Social impact
04 HLB

Students

Lecithin

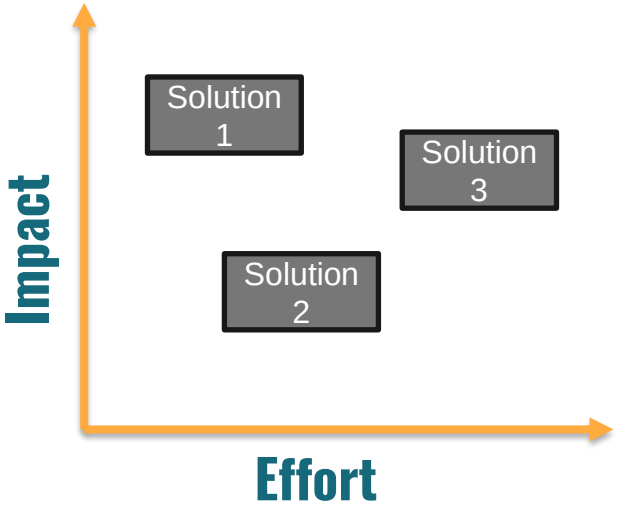
01 Environmental impact
02 Functionality
03 Nutritional contribution
04 HLB

Designers

Lecithin

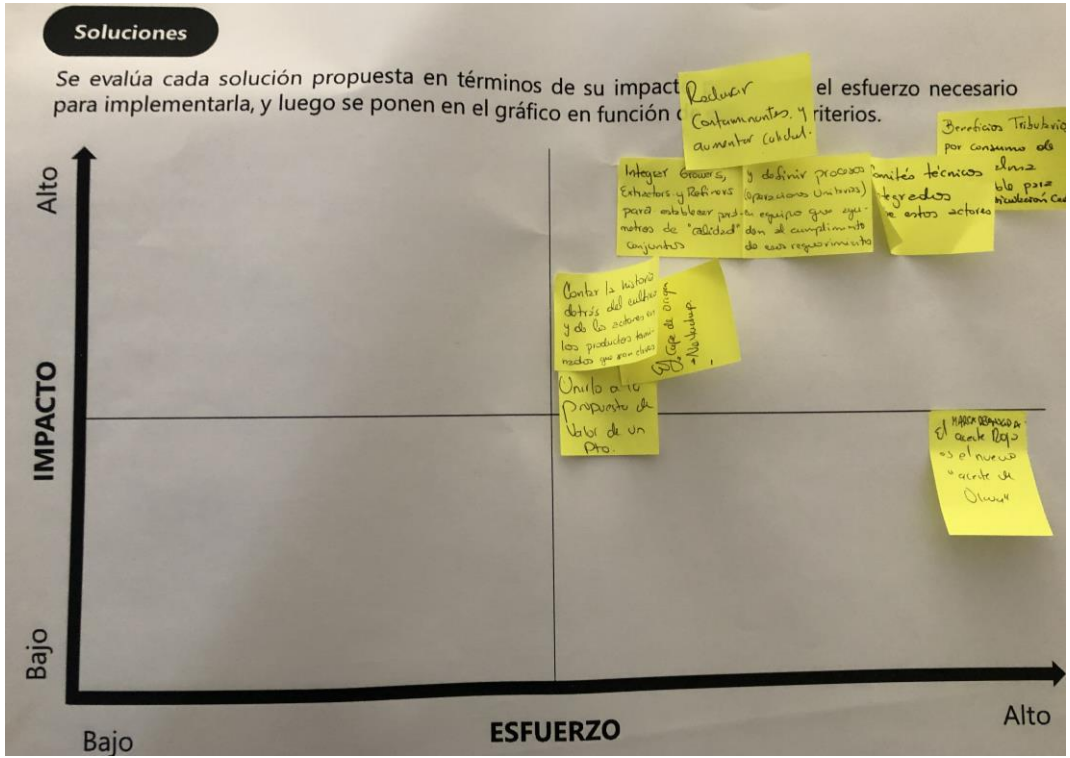
01 Naturalness
02 Functionality
03 Nutritional contribution
04 Cost

Evaluation of limitations



- **Objective**: Engage participants in the exploration of value chain limitations and potential solutions.
- Participants are encouraged to suggest improvements and innovative strategies to overcome specific challenges in the value chain.
- Then organize these ideas based on two key parameters: the effort required to implement the solution, and the potential impact of the solution on improving the value chain

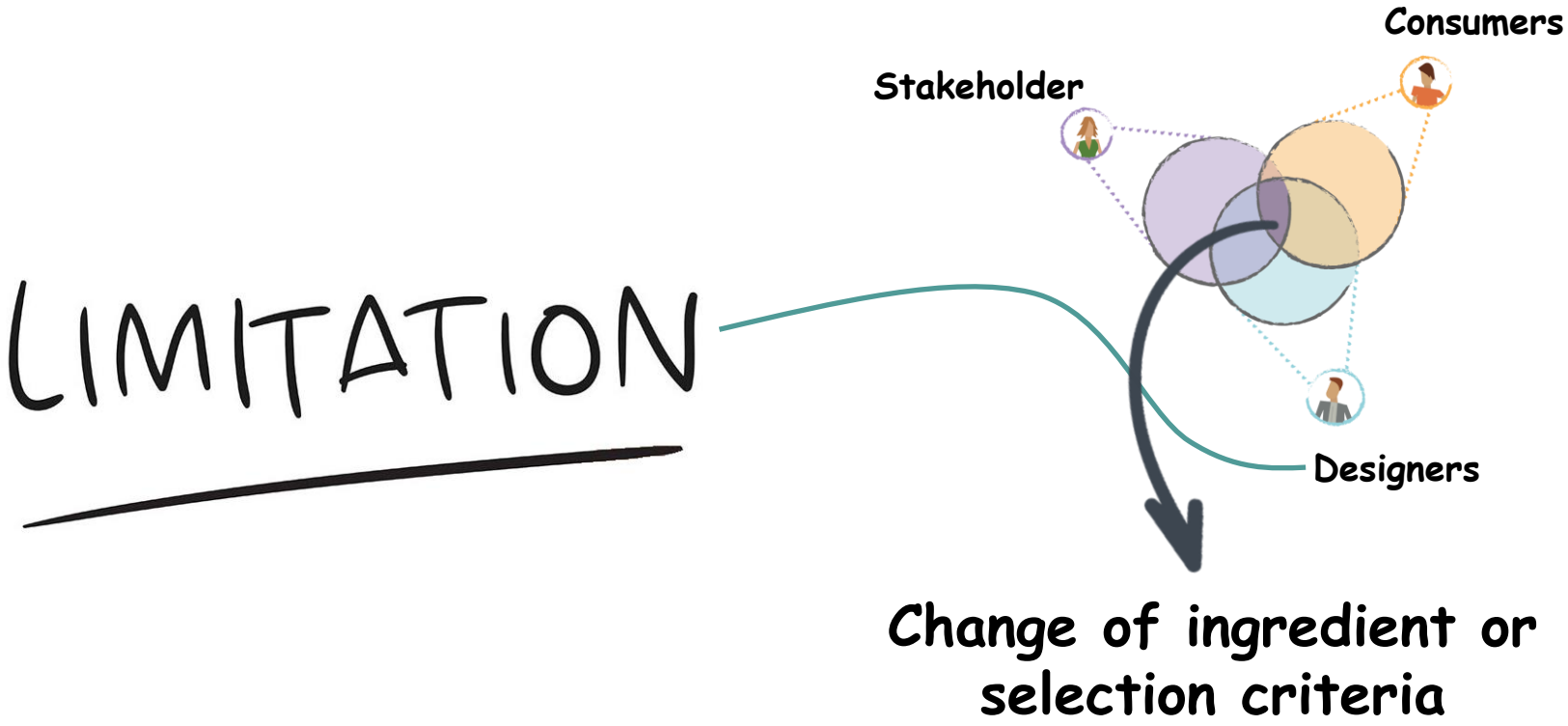
Case of study: Results



Solutions:

- Reduce pollutants and increase quality
- Integrate actors throughout the chain to establish quality parameters.
- To tell the story behind the crop and the stakeholders
- That well-known brands promote the advantages of raw materials

Objective: Include the value chain limitations in the product design



Case of study: Results

Previous: Lecithin

New Choice: Polysorbate 80

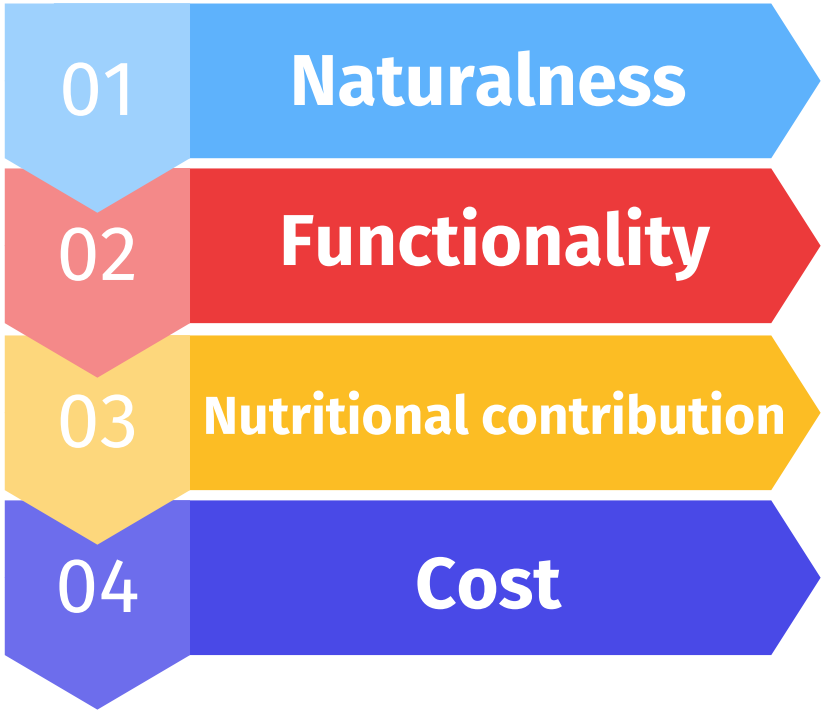
Previous: Lecithin

New Choice: Glyceryl monostearate

Case of study: Results

Designers

Lecithin



No change due to the low amount of emulsifier, but they indicated that with a product that is not so natural, and that the ingredient has a greater impact, the choice and selection criteria could have changed

Conclusions

- The methodology showed its potential to integrate the two scales
- The product design workshop allows us to identify that the participants involved, after knowing the context of the value chain and its limitations, in some cases change their ingredient and sometimes change their priorities in the selection criteria, the designers did not change their selection due to the low amount of emulsifier in the scenario selected.
- A product with another interests and in which the ingredient has a greater impact in terms of quantity, the choice and selection criteria could have changed.

Thanks

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