

#### Decision making methodology for the design of emulsion-type chemical products during early design stages

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# Decision making methodology for the design of emulsion-type chemical products applicable to early design stages



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#### Introduction: Trends in chemical products engineering



#### **Chemical Industry**

- Competitiveness
- Towards high added value products
- Know-how, staff experience



#### **Customers and public opinion**

- Innovative products
- Environmental and safety issues
- New regulations

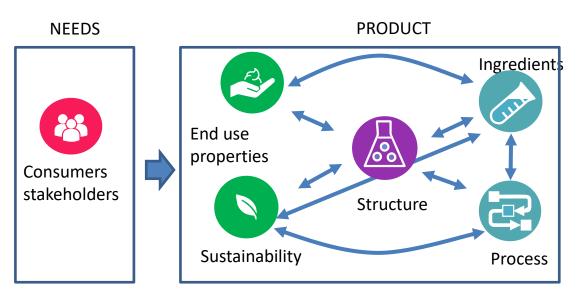


#### **Research in Chemical Engineering and Academia**

- Chemical product design
  - Courses and graduate programs

#### Introduction: Emulsion - micro-structured product

- ✓ Micro-structure
- ✓ End use functions

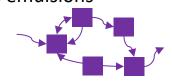


### **Problem statement**

#### Problem statement

Deal with complex systems

 as emulsions

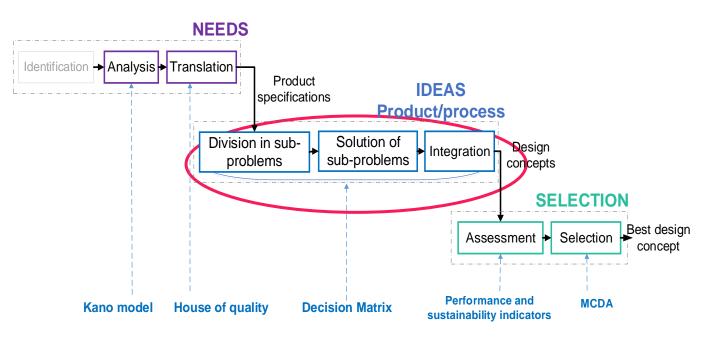


- Early design stages 75% costs. - few information.
- Usability: engineers may understand the methodology and re-use it autonomously

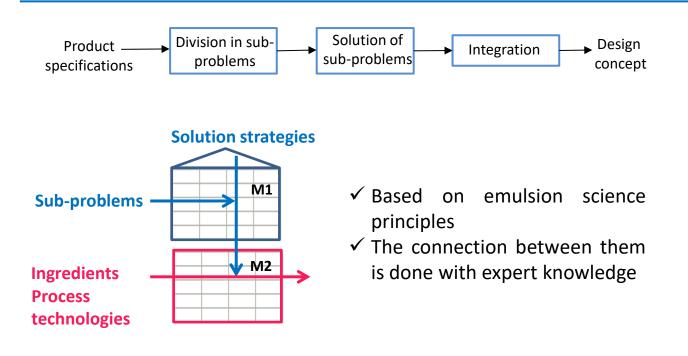
#### Proposal

- Global vision
  - Methods from need analysis to the selection
     - interdisciplinary
- Holistic vision
  - ✓ Identification of interrelation between design variables
- Knowledge base
  - ✓ Emulsion science
  - ✓ Expert knowledge

## Methodology

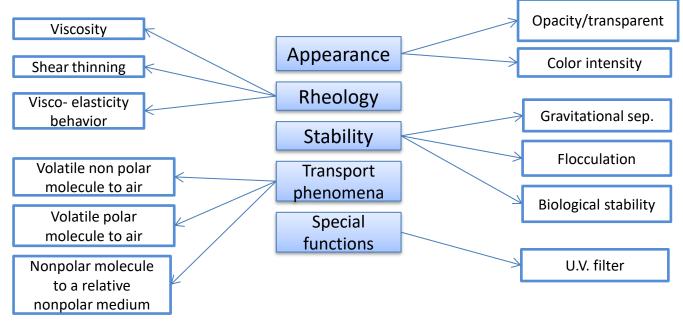


## **Ideas generation: Decision matrix**



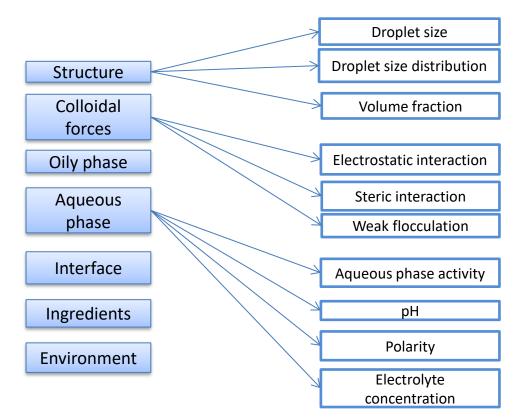
### **Decision matrix: M1 sub-problems**

Identified from emulsion science - 22 + generic sub-problems



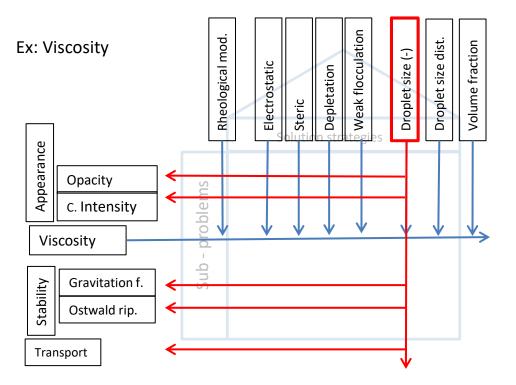
### **Decision matrix: M1 solution strategies**

Identified from emulsion science 36 general solution strategies



### **Decision matrix: M1 interrelation**

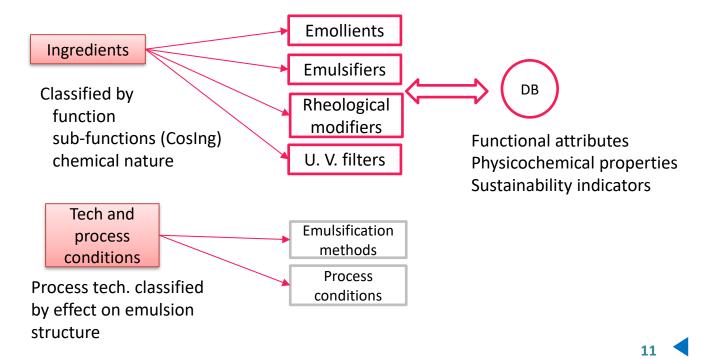
Interrelation of sub-problems and solutions strategies – experts knowledge (O/W emulsion, low concentration of the oily phase (<20%))



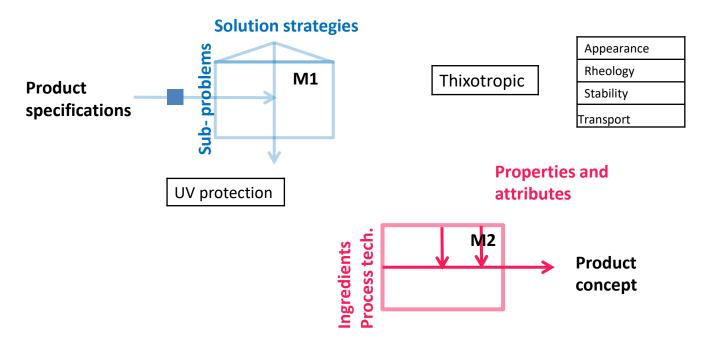


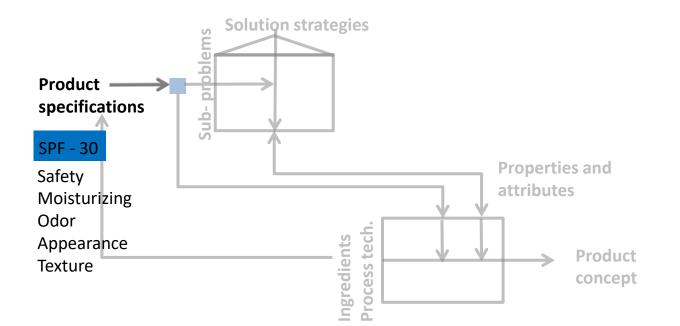
## **Decision matrix: M2 ingredients and technologies**

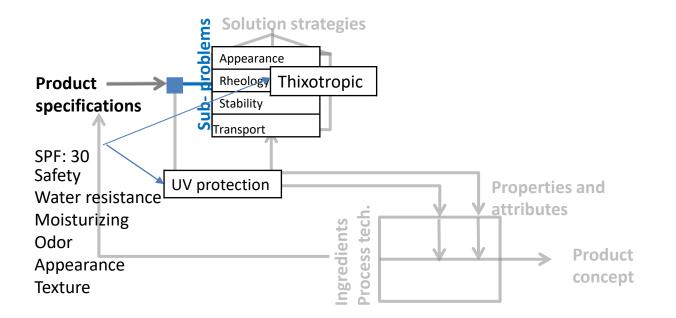
Structure of second matrix of the decision : Cosmetic emulsion – skin care

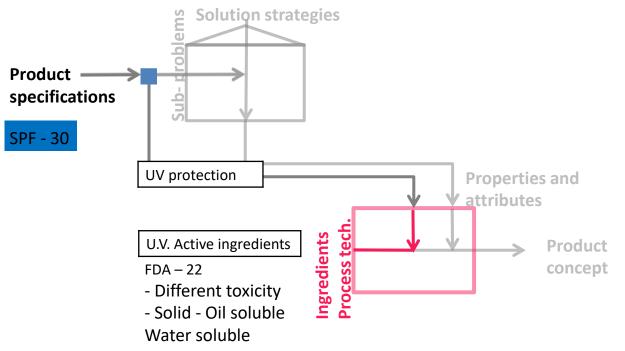


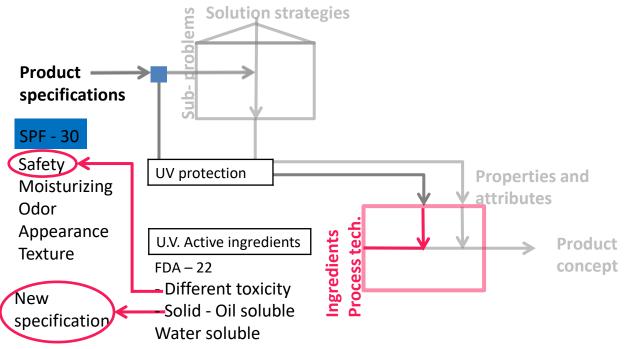
### **Decision matrix: Information structure**













- The base of our methodology for decision making during early stages of chemical product design is presented.
- ✓ A method for ideas generation based on emulsion science principles and expert knowledge is proposed.
- ✓ The information structure of the decision methodology is exemplified with a case study of the cosmetic sector: a sunscreen
- This methodology will be taught to last year chemical students in order to evaluate its usability.













# Thank you



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