Research theme 3 - QUALITY DESIGN OF FOODS: PRODUCT, PROCESS, AND CHAIN (REDESIGN)

Introduction
In this research theme, the design of healthy foods is approached in a holistic way from the nutritional, technological, and managerial point of view to find out the more suitable strategies to create value at the different points of each food chain. All aspects that should be considered to achieve quality in developing food products, in developing food process designs, and in developing food chain design will be considered. Quality design is very important for companies in agribusiness and food industry to remain competitive. Similarly, the adoption of quality design approach into the food chains deals with incorporation of critical chain aspects, for instance, trustful customer-buyer relationships determining optimal food quality.

Objectives
The overall objective of research is to find out critical quality points in developing new food products, in developing new food process designs, and in new food chain designs to establish an optimal food quality that helps companies in remaining competitive. Food healthiness is one of the main driver in the creation and marketing of new food products. Different strategies can be pursued to design healthy foods such as the adoption of new ingredients having potential health benefits or the implementation of production processes to optimize the formation of desired compounds and to reduce the formation of those potentially harmful. Also, foods targeted at specific categories can be designed: children, pregnant women, elderly, sportsman, students population. As well as foods intended for the prevention of specific pathological conditions: foods for weight management, osteoporosis, gut health, mental performance and so on.

- To design healthy foods looking at the different point of the production chain from raw materials to consumer satisfaction. Developing formulation and processing strategies for designing foods tailored for different health benefits
- Evaluate the possibility to introduce new ingredients having additional health functionality over those already claimed also using in vitro models for the systematic design of functional food for the benefit of gastrointestinal tract
- To control the development of Maillard reaction minimizing the formation of potentially dangerous products and increasing the formation of desired ones
- To find out critical quality points in developing new food products, in developing new food process designs, and in new food chain designs to establish an optimal food quality that helps companies in remaining competitive.
3.1 Consumer perception of factors determining fresh meat quality

**Supervisor:**
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Meat is one of the sources of food having a high nutritional value. As for each food product a high quality is important for consumers. The major components determining of high meat quality are:

1. **Yield and gross composition**
   - Quantity of saleable product
   - Ratio of fat to lean
   - Muscle size and shape

2. **Appearance and technological characters**
   - Fat texture and colour
   - Amount of marbling in lean (intramuscular fat)
   - Chemical composition of lean
   - Colour and WHC of lean

3. **Palatability**
   - Texture and tenderness
   - Juiciness
   - Flavour

4. **Wholesomeness**
   - Nutritional quality
   - Chemical safety
   - Microbiological safety

5. **Ethical quality**
   - Acceptable husbandry of animals

Several factors determine the quality of fresh meat in meat chains. These factors are for example feed or stress before slaughtering or other factors. Moreover, slaughtering of animals yields different types of meat with different quality. Quality factors of for instance a steak or a slice of bacon are different. Also meat quality of meat from different animals (beef, pork, chicken, lamb, etc.) is different. Two overall types of quality can be distinguished. Functional quality refers to desirable attributes in a product. For example, we might want red meat to be tender and chicken meat to have good flavour. Conformance quality is producing a product that meets the consumers' specification exactly. For example, pork chops must be trimmed or we want “portion sized” chicken breasts. Most people tend to mean functional quality, but quality management often focus on conformance quality. However, both types are important. Your task is to distinguish the importance of factors determining fresh meat quality.
3.2 When is Lean Thinking effective for improving food production processes?

Supervisor
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The concept of ‘Lean Thinking’ as prescribed by Womack and Jones (2003) considers five principles: (1) specify value, (2) identify the value stream and eliminate waste, (3) make the value flow, (4) let the customer pull the (value) process, and (5) pursue perfection. These five principles align with the Deming's generic improvement cycle of plan, do, check, and act (Haque & James-Moore, 2004). The concept of lean thinking has its origin in other industries than food industry. However, the application of lean thinking seems to be promising for the food industry to improve the food production processes and to improve the new product development (NPD) processes. The likelihood of process improvement via the concept of lean thinking addresses the following questions: “To what extent can the application of lean thinking improve the food processes? Can we say something about this improvement of food processes in a scientific way?” Therefore, this research project will explore the following four main research questions:

1. How is the concept of lean thinking being applied in the food industry?
2. How can the concept of lean thinking improve the food production processes?
3. Which technological and managerial requirements need to be taken into account to have a successful application of lean thinking to the food processes?
4. How can the improvement of food processes, induced by the application of lean thinking, be measured and thus proven?

In order to answer these four research questions a broad variety of research methods will be used. The research methods are: literature review, food professional journals review, internet search, company contact, expert interviews and so on. During the research, it is decided whether a systematic review method (in-depth literature study) or company consultations (in-depth consultation of practice) or a combination of research methods would be most suitable in order to answer the research questions in a scientific manner. One student can explore the likelihood of process improvement with respect to NPD processes and one student can explore the likelihood of process improvement with respect to the food production processes. The two students have to work individually, however, they need to collaborate as a ‘learning community’ to jointly improve the research work and to, for instance, jointly visit experts or companies.

References
3.3 Influence of social, economic and cultural factors on acceptance of new products

Supervisors
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High failure rates of new products have been an ongoing topic in the scientific and industry domains. The insights retrieved from scientific literature showed high and stable rates of new product failure in the period from 1965 to 2010 (Castellion and Markham, 2013) and it seems as if neither of the two interest sides have been able to find the proper solutions or have been giving the right answers to resolve the challenge of the high new product failure. One of the highest failure rates of new products has been recorded in the food industry (Earle et al., 2001). The challenge is worth resolving because new product development is recognized as one of the most important means of the companies’ growth and survival (Barczak and Kahn, 2012) and companies should work on its improvement in order to achieve better results. A lot still has to be done to resolve the challenge.

Success of a new product is influenced by many factors, e.g. process characteristics (how the product has been developed), product characteristics (with elements including price, innovativeness and meeting of the consumer’s needs), marketplace characteristics (market potential, description of the target market, competitive activity and its intensity), strategy characteristics (market entry timing, resources for the new product development, marketing and technological synergies) (Henard and Szymanski, 2001). Although these are important factors that should not be overlooked when new product is being developed, some other factors also deserve to be researched, like social, economic and cultural factors. Social factors include individual’s personality, attitudes, lifestyle etc. Economic factors are connected with individual’s income and other financial resources. Cultural factors take into consideration national culture.

The aim of this study is to identify social, economic and cultural factors that influence the acceptance of a new product among consumers, together with the identification of possible cause and effect relationships between new product acceptance and three of the mentioned factors: social, economic and cultural. The research will include a literature analysis, development of a draft causal map (which factors and how they may affect new product acceptance), and a case study for a specific new product.

References:
### 3.4 Difference in new food product perception before and after the first consumption

**Supervisors**

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Recommended courses: Product and Process design (AMC)

Building on research of MFQ students: no

Possibility to combine with internship: no

When thinking about food choice, it is easy to imagine a big table full of tasty food that one can first take a small piece of to try and then decide if they want to eat it or not. When we do our weekly groceries shopping, the situations is usually completely different (Rozin, 2007). When we are walking down the supermarket aisles full of various unknown products, there is usually no way to try the product that has caught our attention and that is safely stored inside and attractive packaging. The only way one can make a choice in such situation is to use their perception. Perception is the way a person notices or understands something using one of the senses. In the case of a weekly shopping, if a person is going for a new and unknown product, one sense is usually excluded - the sense of taste. The situation gets quite different when a person buys the product. Then they can finally employ their sense of taste and build up on the perception of the product. This only confirms how important it is to get all the elements of a new product right and to get them right from the first try. If a product does not catch a person's attention, they will not buy it. If they eventually buy it, it does not mean a food company that produced it has won the battle. If, for example, the taste is not right, they will not buy the product again.

All of this makes new product development challenging, but exciting. New food products are driving food companies towards success. However, that doesn't mean that each ride will result with arriving to the desired destination - high acceptance of a new product among consumers. Consumers' wishes and their food choices are hard to predict and there is no fool proof formula that would give an answer to the question of which product is going to be noticed and accepted and remain on supermarket shelves for long periods of time. However, there is a way of identifying the drivers of product perception that lead to product acceptance. Therefore, the aim of this thesis will be to identify drivers of product perception before and after the first consumption, note the differences and their importance for the overall product acceptance. All of this will be done through literature review which will help with the identification of various factors that influence consumers’ perception and by performing a cases study on the topic.

**References:**