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The development of an analytical tool for integrating ‘the voice of the consumer’ in New Product Development

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Abstract

The development of new products and how the process is organised and managed within the firm is a key area in management research due to the high failure rate of new products and the consequent waste of limited resources. Developing new products and being innovative requires companies to have deep understanding of the consumer, the market and the environment but most importantly to effectively apply this knowledge in the development of new products that meet consumer's expectations. This paper aims at developing an innovative framework to incorporate the ‘voice of consumer’ at early stages of the new product development (NPD) process. To that end, the paper will consider the practical implementation of the Quality Function Deployment (QFD) in the development of new food products. QFD is considered as the most complete and comprehensive methodology for planning the goals of a stream of processes in order to align them with customer's requirements. QFD forces the design team to place customer needs in first place and ensures that this customer focus is kept through the NPD process. In doing so, QFD reduces two types of risks: first, the non-correspondence between product specifications and the wants of a predetermined target consumer group; and second, the risk that final products do not comply with product specifications. To date, QFD has been partially applied in the food area with only a handful of studies venturing in this research area.

Keywords : quality function deployment, new product development, voice of consumer.

1. Introduction

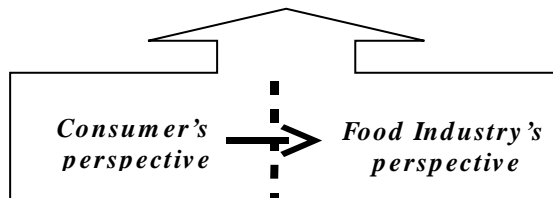
A key factor to remain competitive in an ever-increasingly competitive environment is the development of consumer-oriented marketing strategies. The coordination and structure of the food supply chain is currently conditioned by the increasing demand by customers and consumers for information on food quality and safety. Developing quality products has evolved in the last decades from being a luxury concept in the 1960s to be a key marketing strategy in the current business environment. In the past, quality policies aimed at end-product test with the resulting impact on cost. Today, the aim is to translate consumer's food quality perceptions into objective parameters (product attributes) to assist the development of new food products, leading to profitable business strategies.

This paper emphasises the importance of the interaction between consumer approaches and food industry perspective regarding food quality and safety aspects. Despite empirical evidences indicating the need for an integrated (theoretical) approach to the study of quality perception and safety, studies in this area have mostly focused on the analysis of quality aspects from a single dimensional approach. Therefore, the introduction of both consumer and food industry perspectives into a single approach is paramount in terms of innovation and research and implies an important advance on the current state-of-art. Taking the analysis of consumer attitudes and preferences for

beef meat as point of departure and using the Quality Function Deployment (QFD) as the methodological framework, this paper proposes an innovative, integrative theoretical framework in order to translate the ‘Voice of Consumer’ to the development of new food products ().

Figure 1. A framework proposal for a research from consumer- industry approach

Design of new tools to develop new food products oriented to consumer and market expectations



This paper is structured in five sections. After this introductory part, the paper displays the importance of being ‘market- oriented’ for the food industry. In Section three, it is exposed the necessity of consumer perceptions study and some employed research tools aimed to the new product development process. Section four focuses on the application of a Quality Management tool, the Quality Function Deployment (QFD) and the identification of the main aspects for its implementation in the food sector. Finally, in section five, we present some conclusions.

2. Market Orientation in the Food Industry

Increased consumer awareness concerning food product attributes (i.e., quality, safety, provenance, etc) is posing increasing demands on food companies .The food industry faces the challenge of developing food products that meet consumer needs and wants . Continuous changes in consumer’s buying patterns requires greater emphasis by the food industry in understanding consumers’ wishes and developments in supplier offerings; in order to speed up the new product development (NPD) processes .

NPD may arise from new technologies or new market opportunities . In other words, it is closely linked to, in one view, technological change and research and development (R&D) activities and in the other view, the detection and fulfilment of unfilled needs and wants of potential consumers . Developing new products and being innovative requires not only a better understanding of the market, but also a skilful use of that understanding, that is, being ‘market- oriented’ (Grunert *et al* . Therefore, in order to generate a new product concept, it must be combined not only its primary features and a broad understanding of the technology needed, but also its consumer benefits.

The concept of ‘Innovation’ refers to any good, service or idea that is perceived by someone as new, independently that it may have a long history . A change in the physical product is not essentially a condition when we refer to product innovation. By the way, all changes in marketing parameters may induce a product to be perceived as new by some actors (i.e. consumers, distributors and producers). For instance a lasting price reduction or a major change in advertising message may be innovation in the eyes of consumers, since it changes the perception of the product (i.e. the value- for- money perceived in the product, etc.). Inventions are usually considered as something originated from R&D activities and, as soon as an invention is commercially introduced, it is referred to as an innovation. In summary, it is not required an invention when referring to an innovation, because not all product innovations have to be based on R&D.

Investments into new products and processes are not always a success tool, since new products have also to be adequate for the market. In other words, the new product or process development tends to meet with both technological and market skills. Although

there is no empirical evidence that it influences directly to improve business performance market orientation is becoming a major parameter in competition on food markets. Certainly, the final market acceptance will have in some way an impact on business performance.

The European Food Industry has gone through important changes in the last decade being the most active sector in terms of productivity, accounting for 13.6% of the total EU-15 manufacturing sector in 2002 being larger than automobile, chemical, machinery and equipment sectors.

The Spanish Food Industry is ranked fourth in the European Union (15 members-Europe) in terms of production, after France, Germany and United Kingdom, and fifth in terms of turnover . According to the report of the Spanish Agricultural, Fishery and Food Ministry -Hechos y Cifras del Sector Agroalimentario Español, - the Spanish Food Industry occupies a relevant position in comparison to other industries, since it represents 17.2% of the global turnover of the industry activities and 20.4% of the global expenses in raw materials. In 2001 was the most important sector in terms of productivity, in front of the chemical, automotive, electrical industries. Summarizing, food industry has become a strategic sector of the national economy.

Even though it is outstanding the increasing effort made by the Food Industry in order to supply of innovative food products; new products continue failing at an alarming way and few of the new launched products are successful in terms of acceptance in the market. Genetically modified food, employment of additives or irradiation of products are some examples of technological innovations and new food products, which have not had the expected success. This fact demonstrates that supply and demand do not go so tied, although the food market is considered by the governments, distribution and food industries, as one of the most oriented markets toward consumer .

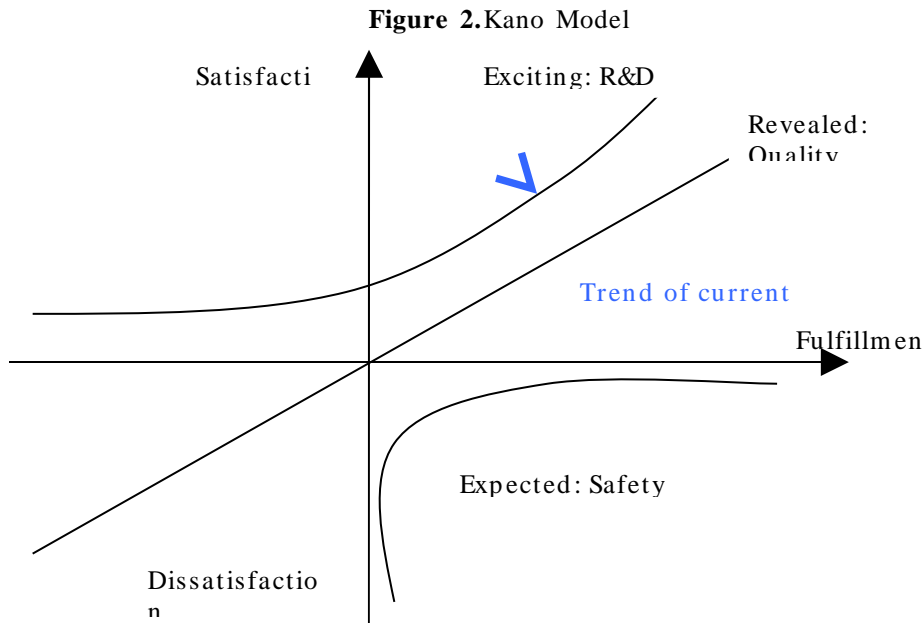
3. Importance of consumer research techniques in NPD process

The development of food products that meet consumer needs and wants is the challenge facing the modern food industry. Information on attitudes and changes in attitudes of consumers is a crucial aspect to the product development and improvement process . Food products are complex and the study of consumer's food quality perception is certainly a difficult area of research. Consumer analyses are thus widely recommended in the early stages of the product development process in order to allow product developers to go further and deeper in understanding consumer needs . However, many approaches found on the current literature, adopt a partial, one-sided perspective focused on consumer study. On the other hand, companies want to develop more complex products and to reach a high degree of responsiveness. Therefore successful relations to their direct customers have to be built. For us, the present challenge of the food sector comes from an integrative framework which encloses both consumer and industry perspective ().

Consumer-oriented food product development methods provide a tool to producers to understand consumer voice. Actually, consumer feels more concerned due to the recent food crises causing changes in their consumption attitudes: for instance some changes were observed after the last food crises, BSE in some EU countries, like Germany, United Kingdom and Spain among others. Actually, avian influenza or 'bird flu' is becoming the major concern for European consumer, although, up to date, Europe is considered as free from avian influenza of high pathogenesis. Additionally, the intense existing debate on aspects related to ethical considerations relative to the new agricultural production techniques, animal welfare concerns, employment of hormones, antibiotics, GMOs, cholesterol, etc. has aroused a higher demand of more transparency in the food-chain and more information on the diverse qualitative characteristics of foods (e.g. nutritious value, origin, way of production, etc.).

Generally, customer expects that his/her requirements were fulfilled, even though they were not well defined. Some of these expectations surpass even technical aspects of the

product. shows how different consumer expectancies meet different level of satisfaction. This diagram is known as Kano Model.



Source:

Whereas Quality represents a required characteristic, typically revealed when we ask consumers as its higher presence implies higher satisfaction by them; Safety is an expected requirement, often unmentioned by consumers until we fail to deliver them. It is thus a basic expectation which absence is very dissatisfying but its presence often goes unnoticed by most consumers. Actually Safety is regulated by law and must be always assessed. Excitement is shown in case of new product characteristics, like innovation, but not dissatisfying their absence. Quality perception has become, somehow, a question of trust and in order to have a considerable advantage, food companies hereby have to assess that kind of trust. The use of quality labels, brands, origin certifications are some examples of commercial strategies that are widely used to inference quality and safety. Even more, the implementation of traceability systems, mandatory along the whole food chain since January 2005, is a sort of recognition by governments and agents to act more market oriented. All these tools consist of an increasingly important route for delivering messages about food quality and safety to consumers. Products with differentiated qualities need to communicate these qualities to consumers and consumers need to make inferences to determine that quality differentiation. Consequently, the great efforts made by companies trying to differentiate their products offering higher quality and safety as Exciting requirements.

Application of consumer behaviour researches is crucial from the food product development perspective. The knowledge of the relationship between the objective quality and consumer perceptions, the perception differences among consumer segments are issues that a new developed product must be able to exploit. Therefore, the importance of consumer research techniques to better reflect the specificity of consumers' food choice processes. In the reviewed literature, we have found some

papers which propose methods and techniques to use in the new product development area.

Concerning their purpose, current research methods in the new product development process may be distinguished between: marketing vs. R&D and their suitability: pursued to repositioning strategies or to launch a new product in a new market. In relation to the appropriateness of these methods, Van Kleef *et al.* have reviewed the most common methods in product development ().

Table 1.Recommended consumer research methods

	Incremental new products	New products
For Marketing	Focus groups Free elicitation Kelly repertory grid Laddering	Empathic design Zaltman metaphor elicitation technique
For technical product development	Category appraisal Conjoint analysis	Information acceleration Lead user technique

Source

All the methods situated at the left hand side of the are appropriated for repositioning or updating versions of existing products. The aim of these methods is to capture consumers' needs and desires and optimise existing products accordingly. The right hand side of the table frames all the methods more appropriate for radically new products development.

Charteris recommended the use of multivariate statistical methods to analyse the gathered information ().

Table 2.Multivariate statistical methods for NPD

<i>Qualitative</i>	Multidimensional scaling; Correspondence analysis; Long-linear analysis; Discriminant analysis; Logistic regression; Logit and probit analysis
<i>Quantitative</i>	Factor analysis; Cluster analysis; Variance analysis; Regression analysis; Canonical analysis

Source

Basically, the aim of all these methods is to allow product developers to go deeper in understanding consumers' needs in order to facilitate the design of consumer relevant new products. As indicated above, this is crucial at early stages in the NPD process, since it consists in a key success factor. Hence the importance of taking them into account in order to select the most appropriate ones.

4. QFD: The way to translate consumer needs to the Food Industry

The implementation of research methods in NPD helps industries to optimize their resources, driving them to product success. These techniques enable firms to develop higher-quality products that satisfy customers' needs, providing them the information required to make good product development decisions. However, it is commonly the employ by managers of these techniques in an unfocused way, even though they were solely designed to solve specific NPD problems .

Techniques developed to improve NPD processes may be classified into five categories:

- Design techniques
- Organizational techniques
- Manufacturing techniques

- Information technologies
- Supplier involvement

As design approach is understood an approach that comes up from customer requirements and incorporates them in the quality plan in order to be displayed systematically until the end of the production process. Quality Function Deployment is considered as one of these approaches and means 'deployment of quality through the deployment of quality functions'. It offers specific methods to assess quality along different product production stages. In other words, it consists of a method to develop a design quality aimed to satisfy consumer's requirement and to translate them into design goals and main points of quality assessment.

4.1. QFD philosophy

Originally, QFD quality and quality control philosophy, in line with Japanese approach to quality and quality control, includes human, social and economics concepts but mainly emphasizes the importance of the 'Voice of consumer'. Subsequently, the QFD concept has evolved in line with the 'Western' approach to Total Quality Management (TQM), a philosophy based upon the idea that entrepreneurial success can only be achieved through a) continuous improvements in all company activities, b) customer satisfaction, c) decision-making based on research and facts; and d) employees' empowerment. As novelty, QFD provides the strategic means (at product development level) to put TQM objectives into practice.

This QFD is a formal method to assess that 'Customer's voice' will be considered during the product or service development process. It also identifies the ways to assess that customer requirements will be followed by all the areas of a company. Therefore, its implementation requires from an extensive communication exchange between consumers, marketers, R&D and operators throughout the new product development (NPD) process. The practical implementation of QFD comprises the following three steps:

- 1) Obtain top management commitment and organisational support to the project. High level decisions will be made regarding project's objectives (i.e., quality improvement, NPD, increase customer satisfaction, etc.), time-span and schedule.
- 2) Define the objective of the QFD project (i.e., to launch a new product in the market, to improve characteristics of an existing product, etc.).
- 3) Establish a cross-functional team including members from all functional areas involved in NPD and market introduction and product testing (i.e., marketing, product and process design, engineering and production, quality management, sales and distribution).

QFD helps companies to design more competitive products and services, in the less time, with lower costs and higher quality. Hence it is convenient that QFD will be conceived as part of the 'Total Quality' programme and thus to be adapted to the necessities and characteristics of each company.

Basically, an adequate deployment of quality functions consists in translating those customers' needs that satisfy them (Quality) into a design and assessing that all organizational units (Functions) work together with common objectives: to develop production process, to get a better communication among functional areas and to plan product costs, among others.

With the aim to provide a comprehensive context for product development in a customer driven context, QFD employs the following components: deployment tables, matrices and conceptual model. A quality deployment table is a chart that represents levels of deployment of a given subject. Information is grouped by affinity and ordered in levels from the left-hand side of the table towards the right-hand side. A matrix is the combination of two deployment tables and, as commented, one of the most commonly employed matrices is called the House of Quality (HOQ). QFD employs a set

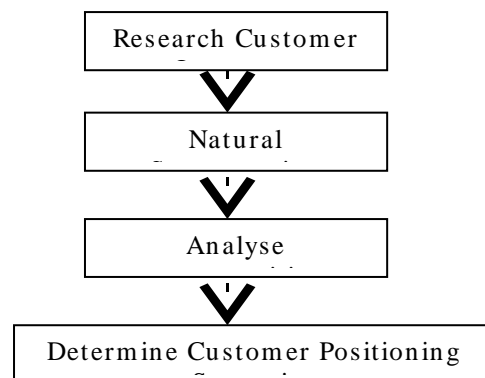
of matrices to establish quality and deploy it through the product development process. Therefore, other matrices are also used in a cause-effect relationship in order to correlate the variables associated with one designed phase to other variables related to the subsequent design phases. This set of matrices are called QFD conceptual model that represents the whole development. A comprehensive quality function deployment system must reflect a number of deployments, such as quality, technology, reliability and cost considerations .

Generally, companies that have used QFD, consider it as a flexible method that permits a clearer assessment of their main competitors and also an opportunity to adjust the concept of the product according to market requirements . The size of the matrices, the commitment of group members and lack of experienced and knowledge about this method are other difficulties that might come up.

4.2. Design a Customer Strategy

As we have mentioned previously, NPD is a key factor to be market-oriented and thus, to develop competences for market responsiveness. Generally, to get information about end users is a hard work which companies do not usually pay much attention to but continual customer research is required to track changes in the industry, especially concerning food product which move quickly through a lifecycle and customer priorities change over time. Hence the development of a 'customer strategy' is a vital step in an approach process and requires a methodological process as it is outlined in .

Figure 3.Translating customer outcomes into customer strategy



Many models have been developed with the aim to explain consumer satisfaction and purchase intention. One of the most notable approaches was proposed by Grunert *et al.* , the Total Food Quality Model (TFQM). This model is considered as the most adequate context for the analysis of perceived food quality, its influence at the point of purchase and the design of products by the food industry with the aim to satisfy consumer demands and satisfactions . In the framework of a theoretical and empirical methodology, as we mentioned above, it is mostly recommended to combine qualitative and quantitative approaches; for instance, focus groups, quantitative research

interviews, conjoint analysis, etc. in order to get a comprehensive understanding of market requirements.

4.3. Some tools for QFD

QFD is a planning process for the design of new products considered as the most complete and convincing system for translating customer requirements into appropriate company requirements'. In order to translate properly customer requirements, it is essential an adequate previous customer analysis. Hence QFD application depends on the progress and result of basic research in a number of food science areas, such as food choice behaviour. Information on attitudes and changes in attitudes of consumers is a key factor to the product development and improvement process. Therefore, consumer research techniques are needed to better reflect the specificity of consumers' food choice processes.

Among the currently existing consumer research methods (see), Focus Group technique and Conjoint Analysis, qualitative and quantitative tools respectively, are usually employed as tools to ascertain consumer purchase behaviour and perceptions. For instance, both tools are addressed by Van Kleef et al. as appropriate for repositioning or updated versions of existing products. These are product-driven methods that provide insights to consumers' judgements about products currently existing in the market in order to optimise them. According to these authors, whereas Conjoint Analysis is highly actionably for product developers to understand the ways consumer needs are interrelated and translate them into physical product characteristics; Focus Group technique is more appropriate for marketing purposes, as it reveals more abstract consumer needs and values.

In relation to Conjoint Analysis; this technique allows researches to implicitly estimate the relative importance of individual product attributes as well as reflects the role that different product attributes play in the purchase evaluation process. Additionally, it allows analysing the most preferred product profiles in different market segments and based on the different attribute levels, to target market segments in order to work in a more market oriented way. The identification of customer segments basically consists in grouping customers into segments where they share the same outcome priority and satisfaction perceptions; which is also useful to predict market shares. Cluster analysis is a statistical technique used for revealing these natural segments. These techniques enables researcher to get a deeper understanding of consumer perceptions and to identify customer segments in order to better design market strategies; therefore all they are summarized in the above commented development of a 'customer strategy'.

As it is patent the importance of gathering customer data in the early stages of QFD implementation and as aim of our research, as commented at the beginning, the present research has carried out a detailed analysis of consumers' food quality and safety perception of beef products. Firstly, a qualitative study based on Focus Groups' methodology was undertaken in order to identify concepts relating to consumption, purchasing behaviour, quality cues and safety perception of beef; to determine strategies, which could increase consumer confidence on beef (e.g. brands and quality labels) and consumer willingness to pay. Five Focus Groups were organised between May and June, 2004 and conducted in five Spanish cities. The following stage involved a quantitative research based on the results of the Focus Groups and the initial literature review. A sample of 519 randomly selected consumers was interviewed, face to face, between January- March, 2005 in different Spanish cities, in order to get a representative sample. The followed methodology and collected data has been fulfilled according to the Conjoint Analysis with the aim to estimate the relative importance of individual pre-specific attributes and the degree of preference for each level of each attribute. Moreover factor and cluster analysis and a study of market share preferences were undertaken. The findings of these researches have allowed us to assimilate properly this 'voice of consumer' into the product and development process. It is important to point out the crucial importance of these information-gathering and -processing phases, followed by a dissemination phase, in the 'four-phase stage' implementation process and moreover,

to realise them during the product development process for each scenario: product, manufacturing and production process.

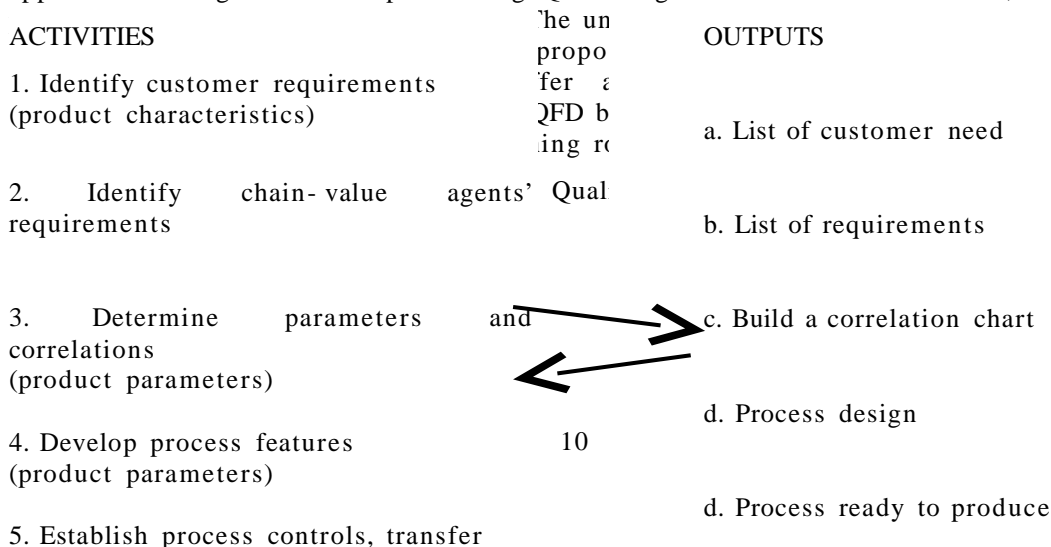
4.4. Implementation of QFD in the Food Industry

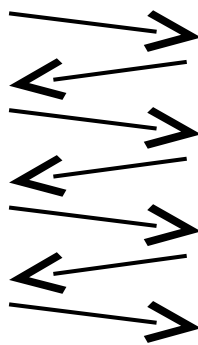
Although it is a concept introduced in 1966 in Japan in the shipbuilding industry and that has been adopted by Japanese, American and European firms mainly within car and electronic industries; the practical implementation of QFD in the food industry to date, has been quite limited due to the lack of interest and involvement by food companies, the limited adaptation of the QFD model to account for the special features of the food industry, and the lack of awareness by food technologists of QFD's key principles. In the reviewed literature we find authors that claim the suitability of QFD method for food product development as those who attribute some failures to its implementation in case of not accomplishing some modifications .

Research in the food area has mostly focused on the implementation of the first quality matrix, known as House of Quality . House of Quality, is the basic design tool of QFD that consists in a conceptual map that provides the means for inter- functional planning and communication . The foundation of the House of Quality is the belief that products should be designed to reflect customer's desires and tastes and hence can be perceived as a graphical tool to translate customer criteria into producer criteria and to adapt producer criteria to input factors in order to reduce the inherent risk of NPD .

Some modifications of this first quality matrix are found in the published literature. For instance, a new structure of the HOQ in which relationships between sensory, technical attributes and consumer requirements are highly detailed was proposed by Bech *et al* . The main room of HOQ was divided in two rooms, one referring to the technical relations and the other specifying relations between results of sensory analysis and customer requirements. This modified HOQ was used to optimise the translation of consumer requirements into sensory attributes measurable by descriptive sensory analysis. Viaene & Januszewska also employed a trained panel to find out which sensory attributes drive consumer preferences with the aim to integrate instrumental and sensory results in the House of Quality with application to chocolate couverture. A second modification for the implementation of House of Quality is described by Holmen and Kristensen who divided consumer demands into intermediate users requirements and end- users requirements. They added an incompatibility matrix to the right side of the relationship matrix in order to show incompatibilities between these demands and to provide developers a suggestion about the way the product has to follow as well as reveals incompatibilities which are considered as an input for the product development process. These modifications of the first matrix are expected to better reflect the specificity of food product development (namely of food sensory properties) in QFD projects . In our opinion, QFD must not be restricted to the application of the first quality matrix but additional phases/matrices should be required for further development of the research in order to translate successfully product requirements. A proper deployment should cover all the deployments, i.e. costs, quality and performance deployments, including risk analysis.

The present survey represents a willingness to consider previous intentions of QFD application and go further implementing QFD along the fresh beef meat chain, involving





The demanded qualities must be converted into measurable design and engineering elements. Whereas planning and development activities are related to users' satisfactions and safety, design is related to process control items (e.g. critical process analysis parameters, identification of potential engineering bottlenecks, cost requirements, etc.)

Certainly, QFD implementation must not be rather methodical neither complex. Once, that the determinant phase of consumer information gathering has been carried out, next challenge is to study how QFD could better fit into the stages of the product development process.

5. Conclusions

Nowadays, competitiveness in the food sector is increasing as well as the interest of producers in obtaining more value added products. Market orientation is thus a key element in the innovation process; trying to satisfy consumers' needs, either real or potential. A critical success factor for NPD is to incorporate the 'voice of consumer' in the early stages of the new product development process. Food consumption behaviour is difficult to understand and predict; consequently, it is essential and not arbitrary the choice of an adequate method or technique to gather information data. The first challenge to the research scientists is to find what to measure in the end product and the way to measure it .

An emerging quality management tool in this sector might be Quality Function Deployment (QFD), considered as an adequate strategy to integrate customer needs into final product characteristics and process parameters. The implementation of QFD means to traduce the Total Quality Management approach in a company or value chain. Important successful results are attached to the implementation of this methodology; nevertheless, its application in the food industry has been quite limited and has been perceived by food researchers with scepticism.

In this paper we have outlined different aspects to consider when developing an adequate conceptual methodology for practical implementation of QFD in the beef meat sector. As initial phase, we have carried out an exhaustive and comprehensive consumer choice analysis in the framework of the Total Food Quality Model (TFQM) proposed by Grunert *et al.*. By means of Focus Groups technique and Conjoint Analysis developed with face-to-face interviews along different Spanish cities, we have reached an explicit understanding of consumers' beef choice process which must be included in the QFD process to be traduced into final product characteristics.

This paper is an attempt to implement QFD method as product development structure that enables a development team to specify consumers' requirements and evaluates the proposed product systematically in order to determine its impact on realising these needs.

6. Acknowledgements

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7. References