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TITLE

Management accounting practices in the emerging functional foods industry: empirical evidence

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1.1. Introduction

In times of climate change, growing world populations, and with clear evidence of the depletion or damage to critical resources, it is imperative to take action to sustain and develop the capacity of agricultural and manufacturing systems to continue to provide food, the most basic of human needs.

In this context, food and beverage industry gives the consumer both a myriad of choices of food from all over the world and constantly fresh fruit and vegetables. In particular, recently, a new kind of food entered in the food markets: the functional foods. They represent one of the most interesting and innovative areas of research in the food industry; because for many consumers, health is a key factor in determining their food choices. As well as simply providing nutrition, it is now being recognized that the consumption of certain foods can promote improved health and well-being.

In view of the key role held by functional foods, the critical areas that concern the production and distribution companies are not few. For instance, the presence of skeptical or reluctant consumers about the effects produced by functional foods (so it is necessary to start awareness activities, which would improve the perception of the product). Or the necessity to improve management accounting systems to analyze the performance of functional products better.

In functional foods management literature, many scholars focused their attention on consumers' behavior. The topic of management control systems has not been explored until now. For these reason it is interesting to reflect on issues related to management control, since the introduction of new products as functional foods might require some adaptations of management control systems, considering differences in business processes and consumers' behavior between functional and non-functional foods.

In the first chapter of this thesis it will be firstly describe the history of functional foods and define what it is meaning by "functional foods". Functional foods will then be analyzed in an International and European perspective, for understanding the market size of the phenomenon, before it is described the product development process and the differences between traditional products and functional foods. This is followed by a scheme describing regulations surrounding functional foods in Europe and Italy.

1.2. Definition and history of functional foods

In the past, nutrition science was worried about preventing deficiencies and supporting body growth, because social conditions did not guaranteed a proper nutrition. Since '60s, the economic growth and the wellness conducted to have all nutrients available, so nutrition science emphasized the use of foods to promote a state of wellbeing and better health and help to reduce risk of diseases. Moreover, the increasing cost of health care and the desire to improve quality life of ancient people, connected to the steady increasing in life expectancy gave a central role to nutrition. For these reasons, nutrition science focuses its attention on the concept of optimal nutrition with the aim to improve the daily diet[1]. In this context, the concept of functional food has emerged.

The Japan was the pioneer for the introduction of these kinds of food in the market since 1980s. Effectively, the term functional food was first used here for food products fortified with special constituents that possess advantageous physiological effects. Functional foods may improve the general conditions of the body, decrease the risk of some diseases, and could be used for curing some illnesses. There are some researches that demonstrate the increase in demand for functional foods and the necessity of extra medical services for the aging population[2].

In the described context, the concept of functional foods was first promoted by Japanese scientists, in 1984, who studied the relationships between nutrition, sensory satisfaction, fortification and modulation of physiological systems. In particular, the Ministry of Education promoted studies on functional foods which was initially led by the Special Study Group on the Systematic Analysis and Development of Food Function. This project was focused on investigating the benefits of functional foods in controlling the physiological function of a living body.

A few years later, the results of these studies conducted the Japanese Ministry of Health and Welfare to introduce a new specific category of food called Food for Special Health Use (FOSHU) and it labelling regulations. For foodstuff to be eligible for FOSHU, then scientific documentation from clinical and nutritional trials proving health efficacy, daily intake, safety, stability of the food or ingredient are required. Thus, Japanese

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[1]M. Doyon, J. Labrecque, "Functional foods: a conceptual definitions", in *British Food Journal*, Vol. 110, n. 11, 2008, pp. 1133-1149.

[2]C. Mark-Herbert, "Innovation of a new product category – functional foods", in *Technovation*, n. 24, 2004, pp. 713 - 719.

functional foods are foods with scientifically documented effects, claimed on the food and approved by the Ministry. It should also satisfy the following conditions:

- it should consist of conventional ingredients or compositions and be consumed in the conventional form or method of food;
- it should be consumed as part of staple diet;
- it should be labelled as having body control function.

It should be emphasized that this role of food incorporates functions which had previously been permitted only for drug, although, as food, it is required to work within the context of a staple diet.

Very important to underline is the attention of Japanese government about the use of word, in fact the term 'function' of functional food might be confused with the term 'function' in medicine so, they decided to use FOSHU to intend this kind of food and officially defined as a sub-group of the category, foods for special dietary uses and where the labelling suggests that people who consume it in the diet may achieve the intended health benefits[3].Furthermore, FOSHU should satisfy other criteria, for example: the food should be expected to contribute to the improvement of one's diet and the maintenance/enhancement of health; the health benefits of foods should have a clear medical and nutritional basis; the daily consumption should be defined for the improvement of wellbeing; the food ingredients should be safe to eat; the food ingredients should be well defined in terms of chemical and nutritional properties; the food should be in a form normally consumed; the product should be in the form of normal food, and not pills or medicine; the food should be not use as a medicine. From these considerations, it is clear the points of view of Japanese Ministry of Health and Welfare, the FOSHU are food and have not confused with drugs.

Although the present concept of functional foods originated in Japan it has been evolving internationally and the concepts vary at the national level since they have been influenced by various national factors. These include national differences in culture, the differences in approach to nutrition science, and the different market situation found in countries. The concept of functional foods originated from the traditional concept in Far Eastern countries that a food can function like a drug. While this concept has now

[3]Anon, *Concerning the amendment of ministerial ordinance on nutrition improvement law*. Japan: Ministry of Health and Welfare, 1991.

spread to other countries, including Western countries, it has to be considered within the context of their own national diet and culture. To date a number of national authorities, academic bodies and industry have proposed definitions for functional foods. The lack of an agreed terminology may not seem to be a direct obstacle to the development of a mature market since consumers are more attracted by a health message rather than the use of a particular legal term. In addition, it may appear unnecessary for scientists to spend their time discussing the definition of functional foods[4].

However, in order to achieve adequate regulatory control, an explicit definition of functional foods is crucial. Common terminology must be the basic requirement on discussing the relating issues among academy, industry and government. Without it, it is possible that what one person calls a functional food can be considered by other people only more nutritious[5].

Therefore, after Japanese definition of FOSHU, it is fundamental to consider authoritative definitions of functional foods in Western Countries. In Europe, the first explanation for this category of food came from the UK Ministry of Agriculture and Food (MAFF) work that temporarily defined a functional food as «a food that has had a component incorporated into it to give a specific medical or physiological benefit, other than a purely nutritional effect»[6]. A few years later, taking as inspiration the previous definition and the one provided by the Institute of Medicine in US National Academy, the IFIC promoted the following definition «foods that may provide health benefits beyond basic nutrition»[7]. This means that it is possible to speak about functional foods when foods provide beneficial effects to health, over the usual nutritional count. The definition above appears as immediate as generic, because it doesn't give information about how the food manages health benefits, or refer to such ingredients/substances in food are involved in this process. Indeed, from this definition, it seems that food has healthy effects as a whole, which is incorrect, because only some ingredients have a demonstrated power to prevent illnesses or maintain health status. Also, it does not give a clear difference between functional foods and traditional ones, considering that almost

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[4]G. Pascal, "Functional foods in the European Union". *Nutrition Review*, 54(11), 1996, S29-S32.

[5] D.B. Schmidt., M.M. Morrow, C. White, "Communicating the benefits of functional foods: Insights from consumer and health professional focus groups", *Chemitech*, 27(12), 1998, pp. 10-16.

[6]D.P. Richardson, "Functional foods-shades of gray: An industry perspective", *Nutrition Reviews*, 54(11), 1996, S174-S185.

[7]IFIC Foundation, "Functional Foods: opening the door to better health", in *Food Insight*, November-December, 1999.

all foods can bring benefits to health, for example the vitamins content of fruits and vegetables. Probably, these are the reasons why the IFIC definition has failed in the attempt to harmonize the issue of functional foods internationally.

Nevertheless, the definition results in line with the statement given to Japanese Ministry of Food and Welfare to FOSHU, even if this second explanation appears more complete because it specifies that only certain components of food are able to provide specific physiological functions. At the same time, this statement considers only processed food and not natural one.

So the American Dietetic Association (ADA) suggested inserting in functional foods category all food that have positive impact on health also, for example snacks sugar free. It is clear that the ADA operates in a perspective of greater permissiveness and defines the functional foods as «whole foods and fortified, enriched, or enhanced foods, which have a potentially beneficial effect on health when consumed as part of a varied diet»[8]. If on one hand this definition is more complete then the earlier, on the other one it may be misleading, because for ADA a food is "functional" when is taken in a varied diet. Although it may be right emphasize the benefit made from a balanced diet, it must not forget that the functionality (physiological) of a given food is an intrinsic proper and, therefore, it is independent. In the United States others authoritative definitions underline the connections between foods and diet, for instance the American Council on Science and Health (ACSH) says that «functional foods are whole, fortified, enriched or enhanced foods that provide health benefits beyond the provision of essential nutrients, when they are consumed at efficacious levels as part of a varied diet on a regular basis»[9]. This one is more thorough and complete then the ADA's but they have the same limits, because it speaks about the importance of regular consumption of a given functional food in order to obtain health benefits.

In the US context, another relevant definition for functional foods is given by the International Life Sciences Institute of North America (ILSI). The functional foods are defined as «foods that, by virtue of physiologically active food components, provide health benefits beyond basic nutrition». The explanation's relevance is connected with

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[8]ADA, "Position of the American Dietetic Association: functional foods", *Journal of the American Dietetic Association*,104, 2004, pp. 814-826.

[9]ACSH, Facts about "functional foods". A report by American Council on Science and Health. Technical Paper by Hasler, C. Project coordinator Kava, R. Broadway, 1/4/2002.

the aim of ILSI to spread scientific indications at international level, but it appears general as IFIC's one. However, the ILSI points out that functional food produce benefits on health thanks to biologically active substances contained in it. So the strength of the earlier definition is linked with this aspect. But, at the same time, it cannot be universally valid because it does not specify whether the functional ingredients are naturally present or intentionally added. It could be considered that both conditions are valid, but in a new area of interest it is necessary to be clear and to avoid any uncertainty.

The Health Canada states that «Functional foods are similar in appearance to a conventional food, consumed as a part of the usual diet, with demonstrated physiological benefits, and/or to reduce the risk of chronic disease beyond basic nutritional functions»[10]. It is interesting to underline the need that the functional food and the traditional one must have the same appearance. Like Japanese FOSHU, Canadian functional foods must be recognized as food and no drug, not only in composition but also in appearance. Indeed, the regulatory treatment is completely different between healthy foods and drugs[11]. Nevertheless, the above definition has some limits connected with appearance, for example if on one side the clear difference between foods and drugs is relevant, on the other there are a lot of functional foods quite different since traditional ones. Moreover, food presentation is linked with the place it comes from, as well as the usual diet.

In the context analyzed, functional foods cannot be a single well-defined and well-characterized entity. Indeed, a wide variety of food products are, or will be in the future, characterized as functional foods, with a variety of components affecting a variety of body functions relevant to either a state of wellbeing and health and/or to the reduction of the risk of disease. Thus no simple, universally accepted definition of functional food exists[12].

After having analyzed a wide range of definitions from different Countries, the attention is focused on the European environment. It is in the general context above that the ILSI Europe coordinated European Concerted Action on Functional Food Science in Europe

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[10]Health Canada, Nutraceuticals/Functional foods and health claims on foods. Policy Papers. Therapeutic Products Programme and the Food Directorate from the Health Protection Branch, 1998.

[11]This topic will be addressed in detail in another section.

[12]M.B. Roberfroid, "Global view on functional foods: European perspectives", in *British Journal of Nutrition*, n 88, S133-S138, 2002.

(FUFOSE) which ran between 1995 and 1997 developed a working definition of functional foods and reached a consensus on the scientific evidence needed to demonstrate that such specific foods or food components actually had positive or beneficial effects and physiological functions by enhancing or sustaining systematic biochemical and physiological functions, reducing the risk or delaying the onset of disease, and improving well-being and physiological function, either separately or in any combination of these[13]. As already indicated above, and because functional food is a concept rather than a well-defined group of food products, that consensus document proposes the following definition: «A food can be regarded as functional if it is satisfactorily demonstrated to affect beneficially one or more target functions in the body, beyond adequate nutritional effects, in a way that is relevant to either improved stage of health and well-being and/or reduction of risk of disease. A functional food must remain food and it must demonstrate its effects in amounts that can normally be expected to be consumed in the diet: it is not a pill or a capsule, but part of the normal food pattern»[14]. In summary, the main aspects underline in the definition are four, i.e. the food nature of functional foods (not a pill, a capsule or any form of dietary supplement); the demonstration of effects to satisfaction of the scientific community; the beneficial effects on body functions, beyond adequate nutritional effects, that are relevant to an improved state of health and well-being and/or reduction of risk of disease; and the consumption as part of a normal food pattern. The need to give this further explanation is connected to the aim of the work: understand well what food is considered functional in the European context.

At the end, a whole series of definitions, more or less attentive, have been provided for interpreting the concept of functional foods and the evolution of this kind of product. Generally «functional foods are those foods which are aimed at improving health related conditions or preventing such conditions»[15]. Moreover, these foods have been described as nutraceuticals, nutritional foods, pharma-foods, medical foods, super foods, designer

[13]P.J. Aggett, "The process for the assessment of scientific support for claims on food", in *European Journal of Nutrition*, n 48, S23-S26, 2009.

[14]A.T. Diplock, P.J. Aggett, M. Ashwell, F. Bonet, E.B. Fern, M.B. Roberfroid, "Scientific concepts of functional foods in Europe: consensus document", in *British Journal of Nutrition*, n 81, S1 – S27, 1999.

[15] L. Frewer, J. Scholderer, N. Lambert, "Consumer acceptance of functional foods: issues for the future", in *British Food Journal*, n. 105, Vol. 10, 2003, pp. 714-730.

foods and functional foods[16] providing identified health benefits. Among all definitions given, the most robust and specific definition is provided by International Life Science Institute, because it stresses the importance of scientific substantiation of the effects functional foods have on human physiology beyond adequate nutrition. The major markets such as Japan, USA and Europe have different regulations and legislative frameworks to define these foods. Hence, after more than 30 years of functional food inception, there is no single universally acknowledged definition of these foods[17].

Therefore, in this research are considered as functional food: «a natural food, a food to which a component has been added, a food from which a component has been removed, a food where the nature of one or more components has been modified or any combination of these possibilities»[18].

Table 1 Definition of functional foods

Country	Author/s	Definition
Japan	**Ministry of Health and Welfare**	«FOSHU refers to foods containing ingredient with functions for health and officially approved to claim its physiological effects on the human body. FOSHU is intended to be consumed for the maintenance / promotion of health or special health uses by people who wish to control health conditions, including blood pressure or blood cholesterol. In order to sell a food as FOSHU, the assessment for the safety of the food and effectiveness of the functions for health is required, and the claim must be approved by the MHLW»
USA	**American Council on Science and Health**	«Functional foods are whole, fortified, enriched or enhanced foods that provide health benefits beyond the provision of essential nutrients, when they are consumed at efficacious levels as part of a varied diet on a regular basis»
Canada	**Health Canada (1998)**	«Functional foods are similar in appearance to a conventional food, consumed as a part of the usual diet, with demonstrated physiological benefits, and/or to reduce the risk of chronic disease beyond basic nutritional functions»

[16]M.J. Playne, L.E. Bennett, G.W. Smitherns, "Functional dairy foods and ingredients", in The Australian Journal of Dairy Technology, n. 58, Vol. 3, pp. 242-264.
[17]A. Kristallys, G. Maglaras, M. Mamalis, "Motivations and cognitive structures of the consumers in their purchasing of functional foods", in *Food Quality and Preference*, n. 19, pp. 525-538.
[18]M.B. Roberfroid, "Global view on functional foods: European perspectives", in *British Journal of Nutrition*, n. 88, 2002, S133-S138.

Europe	**Diplock et al. (1999)**	«A food can be regarded as functional if it is satisfactorily demonstrated to affect beneficially one or more target functions in the body, beyond adequate nutritional effects, in a way that is relevant to either improved stage of health and well-being and/or reduction of risk of disease. A functional food must remain food and it must demonstrate its effects in amounts that can normally be expected to be consumed in the diet: it is not a pill or a capsule, but part of the normal food pattern»

1.3. Functional foods market

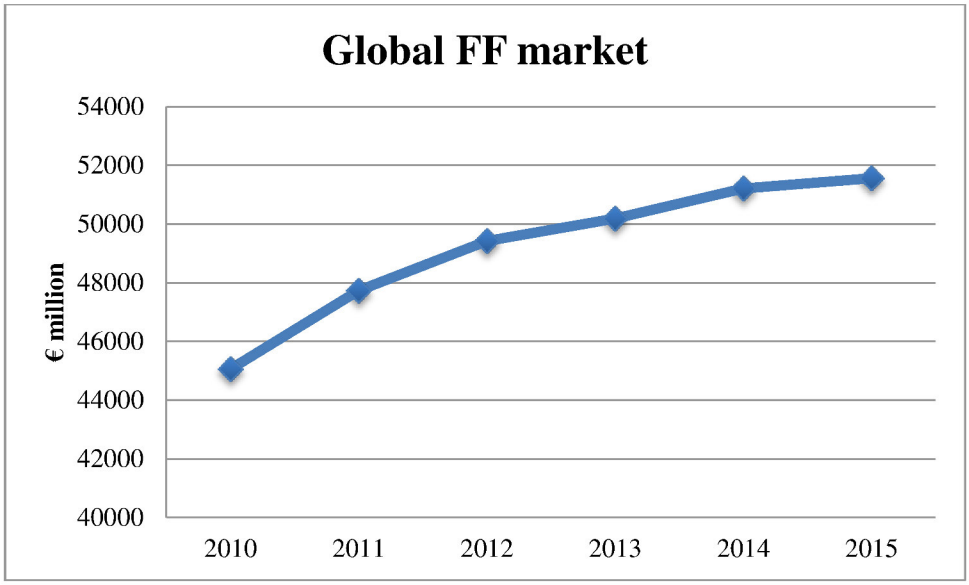
1.3.1 Global Market

The main consumer motive for purchasing functional foods is the growing awareness that foods contribute directly to their health. Today foods are not intended to only satisfy hunger and to provide necessary nutrients for humans but also to prevent nutrition diseases and improve physical and mental well-being of the consumers[19]. Indeed, the consumer will be to use foods either to help prevent chronic illnesses such as cardiovascular disease, Alzheimer's disease and osteoporosis, or to optimize health, for example by increasing energy, boosting the immune system or generation of well-being[20]. This need has led to one of the fastest growing food sectors, with a compound annual growth rate of 5% in the 5 years to 2015[21].

The emergence of a new market segment called 'Health and Wellness' reached a global value of more than €665 billion in 2015and is expected to hit €816 billion by 2020. This segment incorporates fortified/functional foods, but also includes organic foods, "better for you" food and beverages (BFY), "naturally healthy" (NH) foods, products catering to food intolerance, vitamins and dietary supplements, traditional herbal products, slimming products and sports nutrition. Of this market, the functional foods part alone was valued at €235 billion in a global market that is one third of the global market 'Health and Wellness'.

Figure 1 Global retail sale value of functional foods (Euromonitor, 2015)

[19]M.B. Roberfroid, "An European consensus of scientific concepts of functional foods", in *Nutrition*, n. 16, pp. 689-691.
[20]A. Regmi, M.J. Gehlhar, "New direction in global food market (USDA, Trans.)", in A. Regmi, M.J. Gehlhar, *Agricultural Information Bullettin*, Economic Research Services USDA, p. 81.
[21]Euromonitor, Fortified/Functional foods - World, in http://www.portal.euromonitor.com/portal/statistics/tab, 2015.



1.3.2. USA market

The USA over the last five years has experienced slow but steady growth with a pick in 2015. Probably the slow growth is connected to the economic recession which first hit in 2008-09 and then again in 2011. The previous five years' data (2010-2014) indicate that the USA functional food market is maintaining a constant value of around €~39 billion, reaching a value of €50 billion in 2015, with functional foods being 15,4 % of the total sales of packaged food (Euromonitor, 2015).

Figure 2 Functional food market in the USA (Euromonitor, 2015)

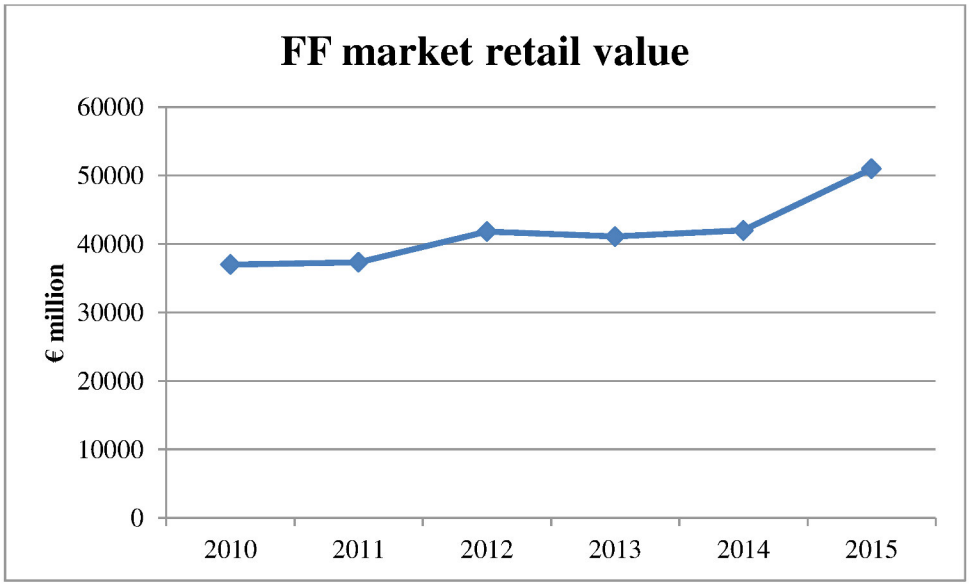
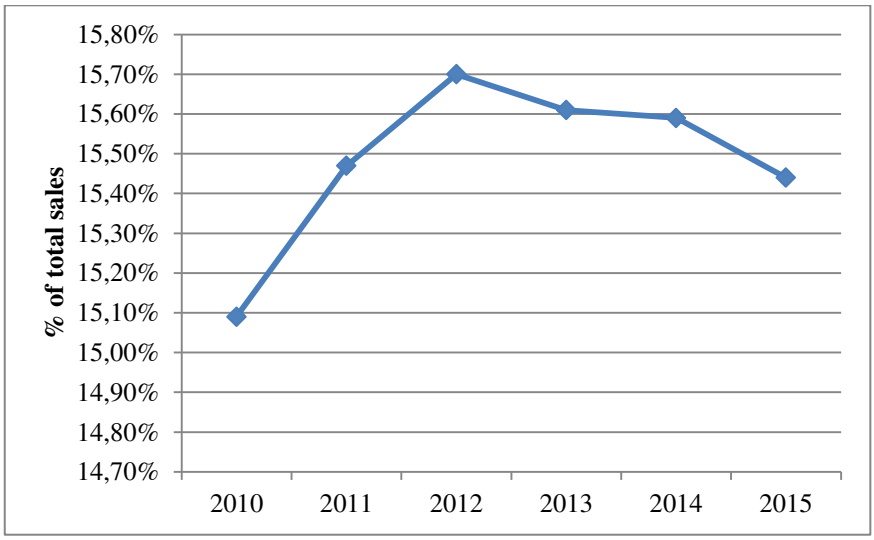


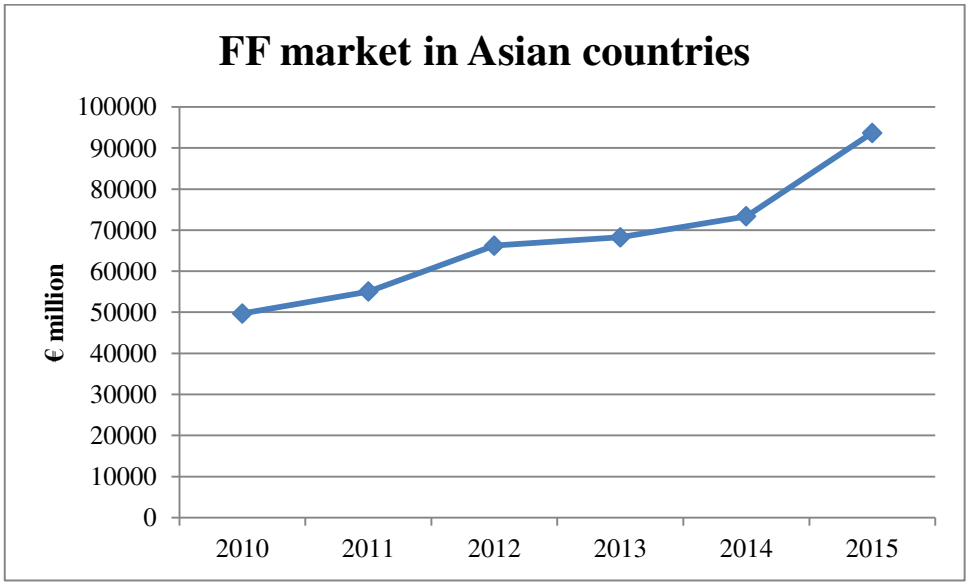
Figure 3 Functional foods as % of total market in USA (Euromonitor, 2015)



1.3.3. Asian Market

The Asian market[22] was the first one to open the door at fortified and functional foods and registered a steady growth in the last five years.

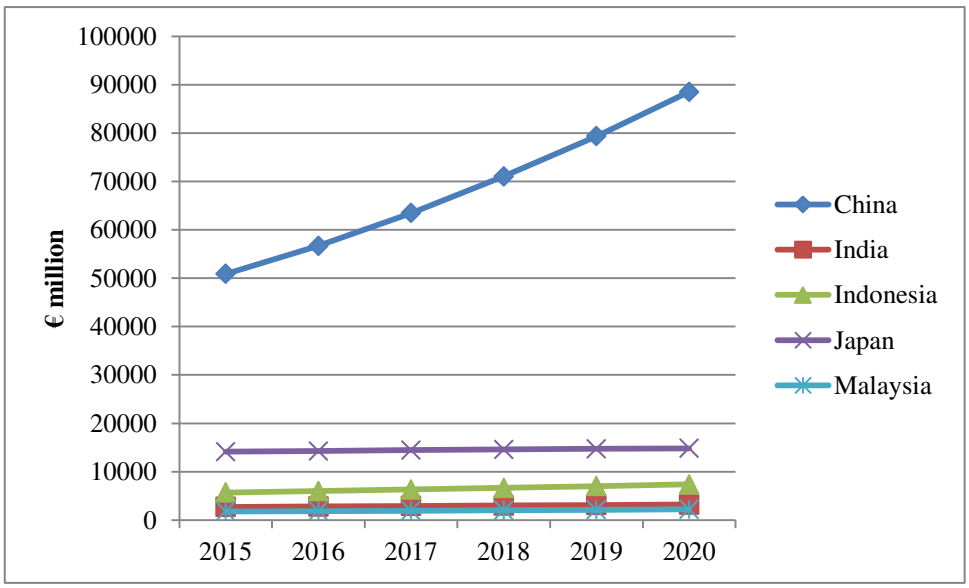
Figure 4 Market size of Asian countries over the last five years (Euromonitor, 2015)



[22] Composed of 46 countries: Afghanistan, American Samoa, Armenia, Azerbaijan, Bangladesh, Bhutan, Brunei, Cambodia, China, Fiji, French Polynesia, Guam, Hong Kong, China, India, Indonesia, Japan, Kazakhstan, Kiribati, Kyrgyzstan, Laos, Macau, Malaysia, Maldives, Mongolia, Myanmar, Nauru, Nepal, New Caledonia, North Korea, Pakistan, Papua New Guinea, Philippines, Samoa, Singapore, Solomon Islands, South Korea, Sri Lanka, Taiwan, Tajikistan, Thailand, Tonga, Turkmenistan, Tuvalu, Uzbekistan, Vanuatu, Vietnam (from Eurostat 2015.

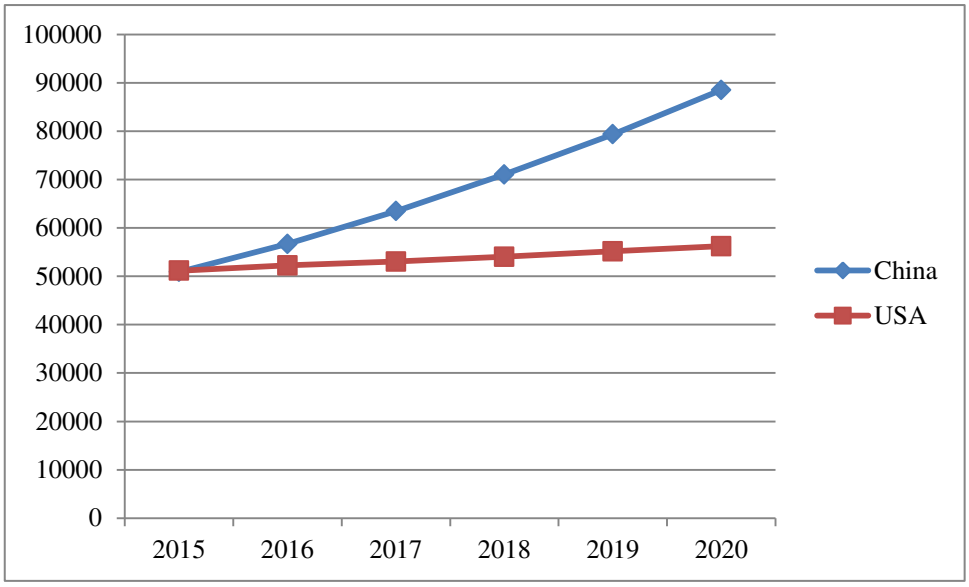
Data for year-on-year growth shows that China, India and Indonesia are constantly growing in this segment of the functional food market. The future forecast shows that by 2020, the functional food market in China will reach more than €88 billion from the current value of €50 billion i.e., a 57% increase in the next five years (Figure 5). Other big market in Asia is Japan.

Figure 5 Forecast growth of functional food market in Asia (Euromonitor, 2015)



Comparative data on projected forecasts of the functional food market growth suggest that China will overtake the USA by 2016 (Figure 6). This is based upon current prices and fixed exchange rates (Euromonitor, 2015).

Figure 6 Comparative projected forecast of the value of the functional food market in China and USA (Euromonitor, 2015)



At the end of 2020, China will have a lead of approximately €32.298,3 million over the USA market.

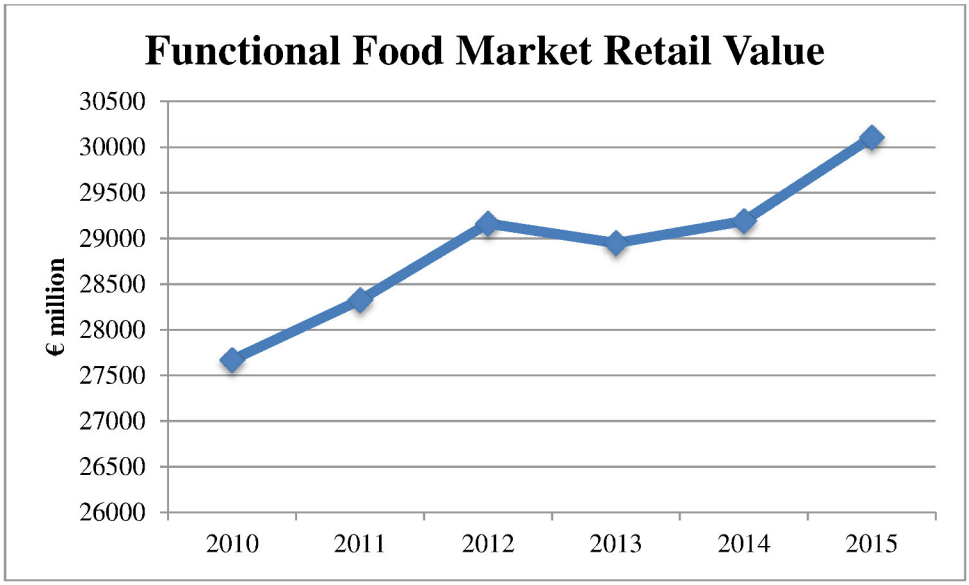
1.3.4. European Market

1.3.4.1. Western European market

Functional foods market in the Western European countries[23] reached a value of €30 billion in 2015, registering a steady growth over the last five years, with the exception of 2013, when sales were lower than the previous year.

[23] Composed of 25 countries: Andorra, Austria, Belgium, Cyprus, Denmark, Finland, France, Germany, Gibraltar, Greece, Iceland, Ireland, Italy, Liechtenstein, Luxembourg, Malta, Monaco, Netherlands, Norway, Portugal, Spain, Sweden, Switzerland, Turkey, United Kingdom (from Eurostat, 2015).

Figure 7 Market size of Western European countries over the last five years (Euromonitor, 2015)



Data for year-on-year growth shows that UK, Austria, Germany and Italy are constantly growing in this segment of the functional food market (Figure 8). The future forecast shows that by 2020, the functional food market in UK will reach more than €8 billion from the current value of €7 billion i.e., a 12,5% increase in the next five years (Figure 9). Other big markets in Western Europe are Germany, France and Italy.

Figure 8 Comparative market size of Western European countries the last five years (Euromonitor, 2015)

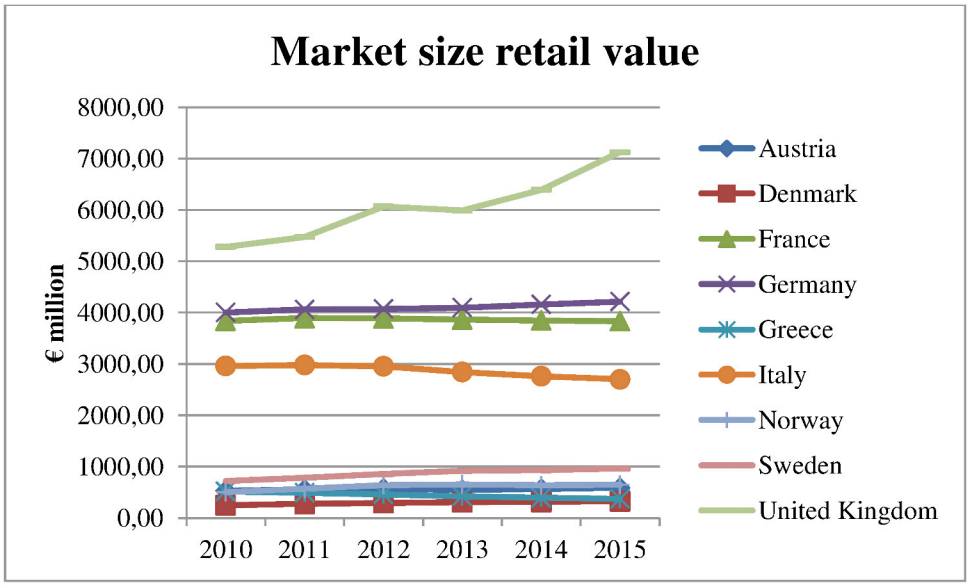
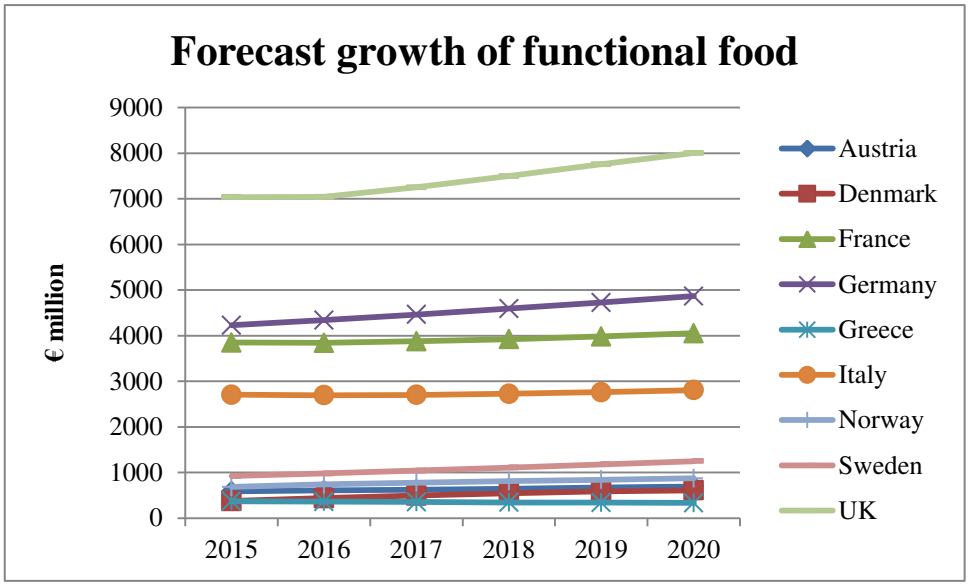


Figure 9 Forecast growth of functional food market in Western Europe (Euromonitor, 2015)

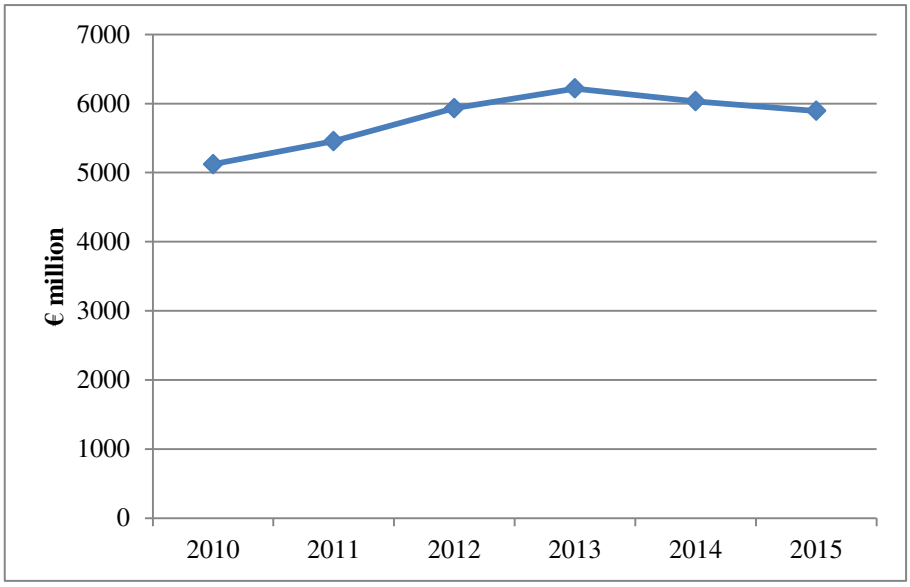


1.3.4.2. Eastern European Market

In 2015, fortified/functional foods and beverages, the second most dynamic health and wellness category over the review period, accounted for 21% of health and wellness sales in the Eastern European region[24].

[24] Composed of 22 countries: Albania, Belarus, Bosnia-Herzegovina, Bulgaria, Croatia, Czech Republic, Estonia, Georgia, Hungary, Kosovo, Latvia, Lithuania, Macedonia, Moldova, Montenegro, Poland, Romania, Russia, Serbia, Slovakia, Slovenia, Ukraine(from Eurostat, 2015).

Figure 10 Market size of Eastern European countries over the last five years (Euromonitor, 2015)



Data for year-on-year growth shows that Hungary, Poland, Romania and Slovakia are constantly growing in this segment of the functional food market (Figure 11). The future forecast shows that by 2020, the functional food market in Poland will reach more than €1,5 billion from the current value of €1 billion i.e., a 50% increase in the next five years (Figure 12). Other big market in Eastern Europe is Russia.

Figure 11 Comparative market size of Eastern European countries the last five years (Euromonitor, 2015)

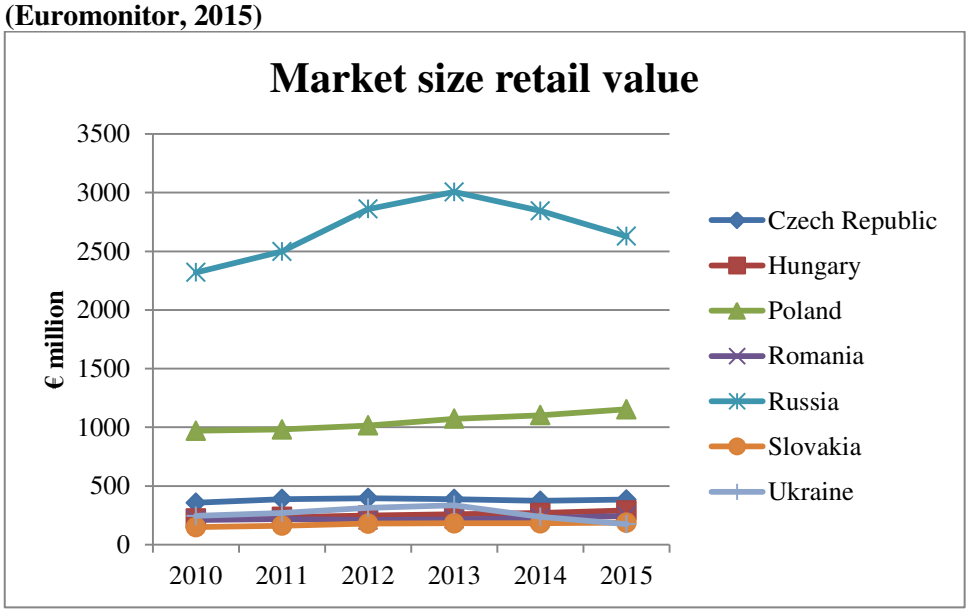
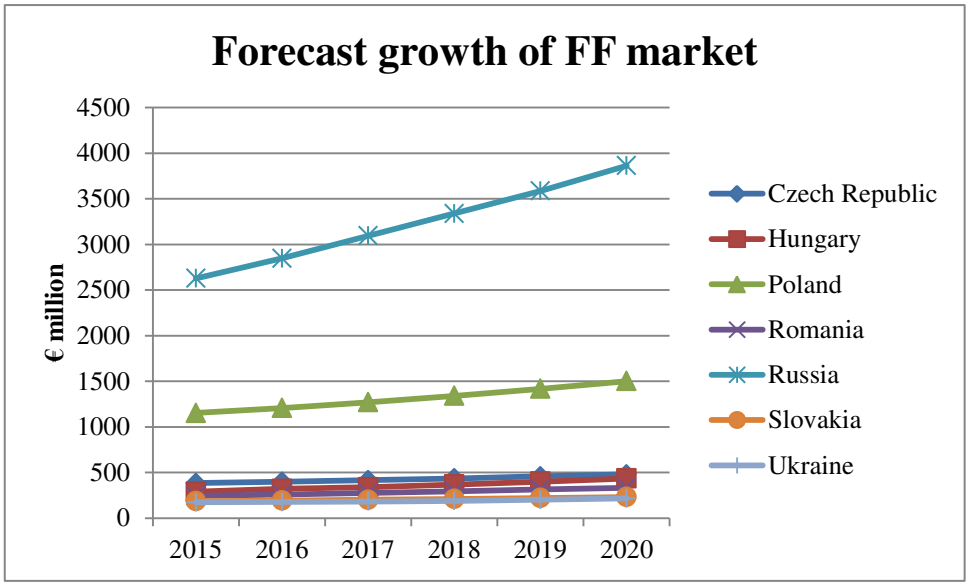


Figure 12 Forecast growth of functional food market in Eastern Europe (Euromonitor, 2015)



Euromonitor International's packaged food data shows that functional spreadable oils and fats, which usually contain cholesterol-lowering plant stanols and sterols and are commonplace on the retail shelves of virtually every Western European supermarket, have not yet established a firm foothold in nine Eastern European countries, such as Estonia, Lithuania, Croatia or Serbia[25]. Two thirds of the €5,8 billion in 2015 regional value sales were generated by Russia and Poland.

1.3.5. The need for functional foods development in Poland

The food sector is one of the key branches of Polish economy. In the past 20 years, this sector has undergone tremendous changes, becoming an important engine for economic growth of our country. The continuing technical, technological and organizational development made it possible for Poland to join the top modern and innovative European food producers. The accession of Poland to the European Union in 2004 contributed greatly to the development of this sector. Grants and subsidies were linked to Poland at that time, thus allowing for the adaptation of the existing production plants to the standards required in the EU. Foreign investment was also a significant source of

[25]Euromonitor, Fortified/Functional foods - Eastern Europe, in http://www.portal.euromonitor.com/portal/statistics/tab, 2015.

innovation. Currently, Polish production plants are among the most modern in Europe, and Polish food has become an export hit. At the same time, Polish producers keep looking for new markets with a view to fully exploit their potential. It is noteworthy that Polish food sector has been less affected by the economic downturn and the forecasts for its development are optimistic. Poland is the biggest producer of agri-food products in Central-Eastern Europe, and the seventh in the world. The most developed branch in the sector is the meat industry which in 2013 generated 24% of the total value of marketed production of the sector. Other important products groups include: dairy products (13%), alcoholic beverages (11%), cereal products (10%), fruit and vegetables, and their products (6%). The popularity of organic farming also keeps increasing, which translates into bigger sales of organic products. Still in 2002, the share of organic farming in the total agricultural area amounted to 0.3% (the corresponding figure for the "old" EU was 3,3%). Today, the value of this indicator is 4%.

The food processing sector is dynamic and competitive. In 2013, 2.523 companies operated in the sector, out of which as much as 94,3% produced food-products. Almost a half (48%) of those companies are micro and small enterprises employing up to 49 people, 41,6% are medium-size enterprises with 50-249 employees, and 11,2% – large enterprises employing over 250 people. It is worth adding that in 2013 large enterprises employed as much as 55% of those working in the entire food sector.

Since the EU accession, the exports of food have increased five folds. In 2014, the value of exports of agri-food products amounted to €21,4 billion (data of Central Statistical Office) – an increase of 4,5% compared to 2013. Main products exported from Poland in 2014 (50% value of the entire exports of agri-food products) include: poultry meat, chocolate and cocoa products, bakery products (biscuits, waffles, etc.), sugar syrups, pork meat, beef, cheese and curd cheese, smoked fish (mostly salmon), wheat, apples, fruit juice (mostly apple juice), processed and preserved meat, milk powder, frozen fruit.

In 2014, the largest volume of agri-food products was sold to Germany. The value of exports to this country was €4,8 billion, a 2,1% increase compared to 2013. Exports to Germany represented 22,5% of the total value of agri-food exports in 2014, followed by: United Kingdom (€1,6 billion), France (€1,5 billion), Czech Republic (€1,3 billion), Italy (€1,2 billion), Netherlands (€1,1 billion), e so on.

From these considerations, Polish market is interesting for developing an understanding of NPD processes for functional foods, because the favorable conditions tied to the technological and organizational development make it a relevant market for the functional food industry. Moreover, it makes products similar to those in other markets, competing successfully in international markets; the economy is that of a developed country with the typical infrastructure and legislative environment of a developed country.

1.4 Functional food development in literature

Over the last two decades different food, pharmaceutical and retail businesses alike have been motivated to enter this lucrative market, with the potential to gain higher returns and to generate a competitive edge[26]. However, the high failure rate of conventional new food products launched into this market does not make easy reading for people managing the NPD process[27]. The product development process for new functional food products has been described as complex, expensive and risky[28].

Functional food product development may be carried out on the principals of radical/discontinuous product innovation process[29] which differ from conventional NPD approach; because the discontinuous innovations have a higher degree of technological uncertainty and a longer development time, with a sequence of innovations[30]. Other factors such as lack of customer familiarity and uncertainty of suitable applications also affect the NPD method for these products. Market assessment and financial analysis prior to beginning of these products rarely possible since the customers and consumers cannot comprehend these products fully[31]. Rather a prototype is developed to explore and formulate the application technology and assess the technical aspect of the product. Functional food product development can be argued to manage from the perspective of discontinuous product innovation as it involves uncertainty in technology and market. It cannot be driven by the customers as is the case for traditional food NPD because customers are usually not fully aware of proprietary new technologies and thus unable

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[26]For further details see: E.V. Kleef., H. C. M. V. Trijp, P. Luning, W.M.F. Jongen, Consumer-oriented functional food development: how well do functional disciplines reflect the 'voice of the consumer'? *Trends in Food Science and Technology, 13*, 2002, pp. 93-101; A. Lagorce, Functional foods bring healthy returns. Retrieved 06-05, 2010, from http://www.marketwatch.com/story/functional-foods-bring-healthy-returns-2009-12-09, 2009.

[27] N. Hardy, Future innovations in food and drinks to 2015, *NPD, trend convergence and emerging growth opportunities* (pp. 152). London: Business Insights, 2010; T.J. Hoban, Improving the success of new product development. *Food Technology 52*(1),1998, pp. 46-49.

[28]I. Siro, E. Kaplona, B. Kaplona, A. Lugasi, Functional food. Product development, marketing and consumer acceptance-A review. *Appetite, 51*, 2008, pp. 456-467.

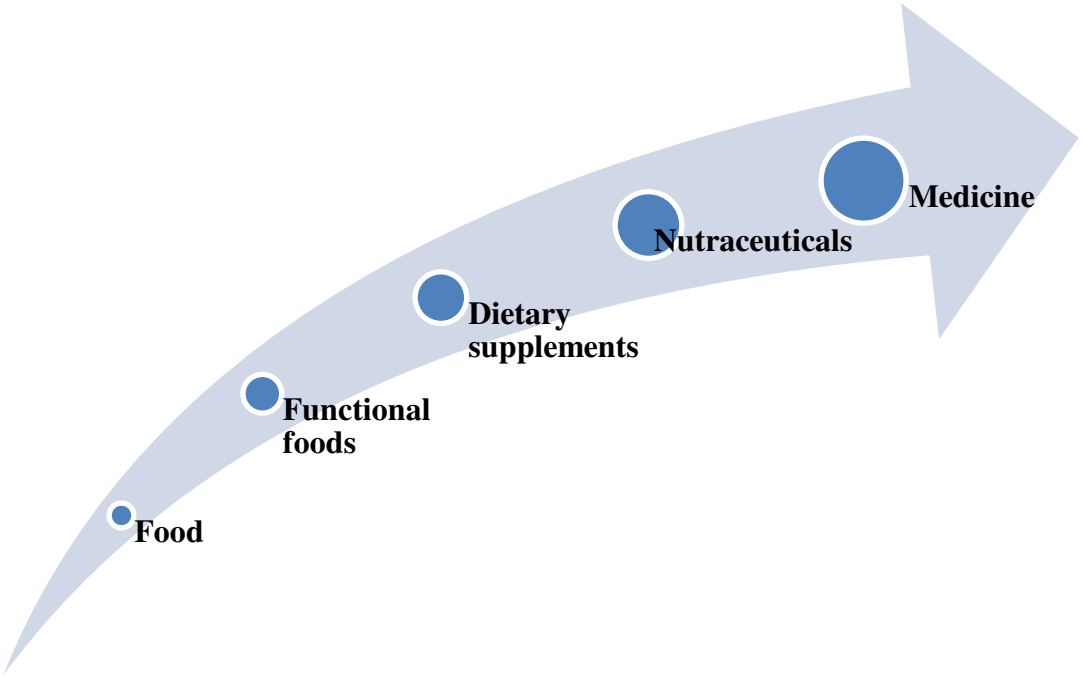
[29] For further details on radical and incremental innovation see among others: J.E. Ettlie, W.P. Bridges, R.D. O'Keefe, Organizational strategy and structural differences for radical versus incremental innovation, in *Management Science*, Vol. 30, n. 6, 1984, pp. 682-695.

[30] R. Garcia, R. Calantone, A critical look at technological innovation typology and innovativeness terminology: a literature review. *Journal of Product Innovation Management,* 19(2), 2002, 110-132; R.W. Veryzer, Discontinuous Innovation and the New Product Development Process. *Journal of Product Innovation Management, 15*(4), 1998, pp. 304-321.

[31] R.W. Veryzer, Discontinuous Innovation and the New Product Development Process, *Journal of Product Innovation Management, 15*(4), 1998, pp. 304-321.

to appreciate these products. Therefore early involvement with customers is not favorable to test product ideas or collect data until a product application is formulated and developed. Hence conventional NPD approach of managing these product innovations may not suitable.

Figure 13 Types of health related products



Furthermore, the literature suggests that the category of functional food products presents different characteristics from traditional food. As described above, they are foods to which a component has been added or has been removed[32], in halfway between traditional foods and drugs (Figure 13), exposed to specific and dynamic legislation[33] and that need a technological development - not only for the production of functional ingredients[34], but also for protect the freshness during the process of storage[35].

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[32] A.T. Diplock, P.J. Aggett, M. Ashwell, F. Bonet, E.B. Fern, M.B. Roberfroid, "Scientific concepts of functional foods in Europe: consensus document", in *British Journal of Nutrition*, n 81, 1999, S1 – S27; M.B. Roberfroid, "Global view on functional foods: European perspectives", in *British Journal of Nutrition*, n. 88, 2002, S133-S138.

[33] T. Bech-Larsen, J. Scholderer, "Functional foods in Europe: consumer research, market experience and regulatory aspects", in *Trends in Food Science & Technology*, n. 18, 2007, pp. 231-234.

[34] U.T. Bornscheuer, "Lipid mofidication by lipases and phospholipases", in Proceedings of the New Functional Ingredients and Foods, 1-A02, Copenaghen, Denmark, 2003; A.S. Meyer, A-K.R. Landbo, Enzymatic enhancement of anthocyanins and other phenolics in black currant juice by improved pre-press treatment and enzymatic clarification, in Proceedings of the New Functional Ingredients and Foods, 1-D02, Copenaghen, Denmark, 2003.

[35] J. Siegrist, M. Wahrendorf, O. Knesebeck, H. Jürges, A. Börsch-Supan, "Quality of work, well-being, and intended early retirement of older employees--baseline results from the SHARE Study", in *The European Journal of Public Health*, Vol. 17, 2007, pp. 62-68.

With particular attention on the nature of functional foods, it is quite clear the similarity between this kind of food and drugs. For this reason, it is suggested to analyze the NPD in pharmaceutical companies. The pharmaceutical companies, like food and beverage ones, have undergone at the same changes such as an increased competitive business environment that has even forced the traditional linear NPD model in pharmaceutical companies to give away discovery, development and commercialization of NPD to specialist organizations.

However these companies already have well established mechanism to ensure intellectual property rights and hence a higher return on investment can be expected if the product meets the unmet needs of population[36].

On similar ground the case of functional food product development in food industry may resemble closely to new pharmaceutical NPD trends where external collaborations in a well secured manner are sought to develop truly new products that can truly meet the unmet needs of consumers. The issues of health regulations and drug regulations pertaining to the development of these products need to be carefully managed by regulatory bodies to ensure protection of the consumer whilst also avoiding undue barriers to NPD innovative practices in the food area. Thus successful development can only be ensured if regulations for these products are brought into some sort of harmony to effectively guide the manufacturers.

In according to Mark-Herbert, the way for developing successful new functional food products is an "Industrial marriage"[37]. This implies collaborative product development by pharmaceutical and food manufacturers, with sharing of resources and skills for effective functional food development. One such example was the introduction of a probiotic product in the USA market by the joint efforts of CAG functional foods and Swedish biotech business. However, this venture suffered serious difficulties among the partners due to intellectual property rights and brand ownership issues[38]. The grey area

[36] A. Gupta, K.S. Pawar, P. Smart, "New product development in the pharmaceutical and telecommunication industries: A comparative study", in *International Journal of Production Economics,* 106(1), 2007, pp. 41-60.

[37] C. Mark-Herbert, "Innovation of a new product category – functional foods", in *Technovation*, n. 24, 2004, pp. 713 - 719.

[38] C. Mark-Herbert, "Development and marketing strategies for functional foods", in *AgBioForum,* 6(1&2), 2003, pp. 75-78.

where food and health markets merge[39] has generated a need for new competencies for personnel and enterprises working in functional food product development (FFPD)[40]. A number of important factors have been offered in the literature for successful FFPD. These include inter-industry relationship[41] and research-oriented collaborative networks[42].

[39] S. Broring, L.M. Cloutier, J Leker , "The front end of innovation in an era of industry convergence: evidence from nutraceuticals and functional foods", in *R & D Management,* 36(5), 2006, pp. 487-498.
[40] C. Mark-Herbert, *Functional food for added value. Developing and marketing a new product category.* (PhD), Swedish University of Agricultural Sciences, Uppsala, 2002.
[41]M. Beckeman, C. Skjoldebrand, Clusters/networks promote food innovations, in *Journal of Food Engineering,* 79(4), 2007, pp. 1418-1425; S. Bhaskaran, Incremental innovation and business performance: Small and mediumsize food enterprises in a concentrated industry environment, in *Journal of small Business Management,* 44(1), 2006, pp. 64-80; D. Marsh, Does New Zealand have an innovation system for biotechnology?, in *Technovation, 23*(2), 2003, pp. 103-112; H. Salavou, G. Baltas, S. Lioukes, Organizational innovation in SMEs: The importance of strategic orientation and competitive structure, in *European Journal of Marketing,* 38(9/10), 2004, pp. 1091-1112; F. Siedlok, P. Smart, A. Gupta, Convergence and reorientation via open innovation: the emergence of nutraceuticals, in *Technology Analysis and Strategic Management,* 22(5), 2010, pp. 571-592.
[42]M. Beckeman, C. Skjoldebrand, Clusters/networks promote food innovations, in *Journal of Food Engineering,* 79(4), 2007, pp. 1418-1425; S. Broring, L.M. Cloutier, J. Leker, The front end of innovation in an era of industry convergence: evidence from nutraceuticals and functional foods, in *R & D Management,* 36(5), 2006, pp. 487-498; F. Siedlok, P. Smart, A. Gupta, Convergence and reorientation via open innovation: the emergence of nutraceuticals, in *Technology Analysis and Strategic Management,* 22(5), 2010, pp. 571-592.

1.5. Specific and dynamic legislation

The issues of health regulation about functional foods have an important role in production decisions. For this reason, it is decided to analyze the legislation about functional foods, its evolution and the difference between countries. As above, there are differences among definitions of functional foods and the same is for regulation. Indeed, the approaches to this issue vary from country to country, in any case, no legislation refers specifically to the category of "Functional foods", but by combining these products with the regulations on "novel foods", "dietary/food supplements" or "natural health products"[43]. Since there are many different definitions in the world scene, it is difficult to determine where to put the functional food from a legal point of view and it depends on the national perception of the concept of functional food.

1.5.1 International legislation

The health benefits of foods and natural health products have been recognized for a very long time in Asia. In particular, as above, **Japan** was the first country interested in defining and regulating functional foods. Actually, Japan established a specific food category for functional foods called FOSHU. The regulation about this category of food stated that every functional product was authorized by Ministry of Health, Labour and Welfare (MHLW) to be recognized as FOSHU.

Specifically, the company that develops and produces a new food with functional properties must be sent a complete and clear documentation that demonstrates the effectiveness on human health of the new product. After that, the product can be inserting in FOSHU register and will have to respect laws about production, commercialization and labeling[44].

It is specified that for Japanese Government any kind of food product is functional because it gives energy and fundamental nutrients for life, so Ministry of Health, Labour and Welfare speaks about FOSHU and not functional foods. For this reason, companies that work at functional food production have to pay attention to specific law and rules. In particular, FOSHU are in the "Foods with health claims" (FHC) category

[43] V. Baker, B. Brady, M. Veling, "Regulatory environment for nutraceuticals and functional foods", in *National Research Council Canada Publications Archive* 11-6536, 2012.

[44] O. Hirobumi, I. Hideko, M. Hiroyoshi, "Health foods and foods with health claims in Japan", in *Toxicology*, 221, 2006, pp. 95-111.

with "Foods with Nutrient Function Claims" (FNFC). The FNFC are defined as food with nutritional claims on label, while the FOSHU have functional and healthy claims on label. Moreover, Japanese government establishes a subcategory of FOSHU, i.e. Foods for Special Dietary Uses (FOSDU)[45] that indicates dietetic foods.

In particular, the authorization process for FOSHU establishes that the Council on Pharmaceutical Affairs and Food Sanitation verifies substantiation of health benefit claims, while the Food Safety Commission monitors the food safety of FOSHU. Four are the fundamental requirements that a new functional product must have to be considered FOSHU:

- the beneficial effect on human organism must be clearly defined and demonstrated;
- the food security must be guaranteed through appropriate toxicity testing;
- the FOSHU must contain functional elements in the correct dose (to avoid effects negative due to a possible over-consumption);
- a control plan of product quality must be defined.

In conclusion, Japan was the only country that defines a specific category for this kind of food, with a specific regulation. Despite Western countries recognize functional foods as a specific category of food product, they haven't a specific regulation for them. Actually, the functional foods regulation presents differences among Western countries such as Canada, USA and EU, although they have recognized the need to a collaborative approach for promoting the FF international market. At present, companies involved in FF production have to take care to the legislative issue. In particular, it is essential to understand as these products are considered by the Countries. Indeed, the same product can be considered as food type, drug or nutraceutical depending on national legislation. Furthermore, companies have to pay attention in future regulatory changes, because FF regulation is currently under review in main developed countries.

Regarding the **United States**, the U.S. Food and Drug Administration (FDA) regulatory scheme does not recognize 'functional food' to be a distinct regulatory category. FDA believes existing food regulations are sufficient to provide for functional food.

[45] N.S. Kwak , D.J. Jukes, "Functional foods. Part 2: the impact on current regulatory terminology", in *Food Control*, 12, 2001, pp. 109-117.

Moreover, the U.S. regulatory framework for products intended for human consumption has a rigid separation between products intended to be used as food and products whose intended use is disease-related (drugs). The distinction between foods and drugs is based largely on intended use rather than on composition. The claims made for the functional effects of a food are one way in which the intended use for a product will be shown. A statement about the function of a food being related to a disease can cause the product to be regulated as a drug even when the product has an established use as a food. Because the food label is a primary vehicle for communicating information about the benefits attributable to a functional food, the food label has a major role in FDA's consideration of whether a functional food will be regulated as a food or a drug.

Although food and drugs are distinct regulatory categories, there are some areas of overlap. One such area is food label health claims in which a relationship between a nutrient and disease risk reduction may be communicated via food labels. Another overlap is the use of foods to affect structures or functions of the body not related to a disease condition. Both foods and drugs may be used to affect a structure or function of the body. Functional foods are likely to be promoted with label claims about what beneficial effects are to be expected from consuming the functional food. Food label claims[46] regulated by FDA fall into three categories:

- structure/function claims, which highlight particular properties of some ingredients (for example, "football is a help to the bones", "fiber favors intestinal transit", "vitamins help the body's natural defenses organism", etc.)
- nutrient content claims, which state the content of a specific substance (for example, "contains sodium", "contains hydrogenated fats", etc.);
- health claims, which describe the relationship between the food and a particular health condition or disease.

There also are two food subcategories - medical foods and foods for special dietary use - that have been considered by some parties as a route for promoting functional foods in the U.S., but neither is available option for functional foods.

The first two types of claims are freely applicable to any food product without the FDA approval. While, as regards the health claim the FDA have to evaluate scientific

[46] A.K. Thompson, P.J. Moughan, "Innovation in the foods industry: Functional foods", in *Innovation: management, policy & practice*, 10, 2008, pp. 61–73.

documentations about food effects on health. If the claim is approved, the food is submitted to specific regulation about labelling and advertising[47].

In conclusion, it is clear that the US adopts a simple regulation for health claims and considers functional foods as traditional ones[48], without specific and strict regulation about production as in Japan.

Different situation regarding **Canada**, where for some types of functional foods there is a complex regulation. For instance, foods containing bioactive ingredients with specific health claims are regulated by the Food and Drugs Act which considers them as a special category of food. At the same time, such products may also be included in the Natural Health Product Regulations, in the legislation that regulates specifically the health-productions of origin vegetable. In this case, they would be classified as "drugs" or "herbal products", i.e. pharmaceutical or herbal products. From these considerations emerges that the borderline situation of functional foods generates confusion and disagreements. Health Canada is working to deepen the regulation about functional foods, developing guidelines to determine when a functional food should fall in food legislation and when in drugs one.

About claim, Canada has two Institutions responsible for controlling the validity of health claim; they are the Food Directorate of Health Canada and the Canadian Food Inspection Agency.

According to the Food and Drugs Act and Food and Drugs Regulations, the claim refers to food are three types:

- Food claim, which states the composition, quantity, quality or the origin of a given food;
- Nutrition claims, which express the amount of specific nutrients in foods, such as carbohydrates, lipids or proteins;
- Health claims, which reaffirmed the relationship between a particular ingredient and consumer health, understood as the improvement of psychological well-being in general or as a reduction in the risk of a specific disease.

[47] V. Baker, B. Brady, M. Veling, "Regulatory environment for nutraceuticals and functional foods", in *National Research Council Canada Publications Archive* 11-6536, 2012.

[48] For further details: J. E. Hoadley, *U.S. regulation of functional foods*, in M. Saarela, *Functional Foods* (2th Edition), Woodhead Publishing Series in Food Science, Technology and Nutrition, 2011, pp. 41-63.

For every claim there are different regulatory requirements. Obviously, the health claims should be subject to more stringent disciplines, in particular for claim linked to the prevention of risk of specific diseases. For example, only five claims for reducing risk of disease are admitted in Canadian regulation[49].

1.5.2 European legislation

The fact that the European markets for functional foods generally are less developed, compared to the US and the Japanese markets, has often been attributed to a restrictive and inconsistent health claim legislation in and between European countries. In particular, food legislation has always lagged behind innovation and product development[50], sometimes by more than a decade. This was particularly true in Europe in the late 1990s, with advances in nutritional science and the general acceptance that some aspects of food could contribute to health in other ways than by providing an adequate supply of the classical nutrients. From a relatively slow start in the mid-1990s the concept of functional foods has been gaining ground world-wide, at the same time attracting the attention of the major multinational food companies. Through the first decade of the twenty-first century there has been an increasing recognition in Europe of the category of functional foods by the authorities, particularly in the area of health claims for the foods. The composition and proposed marketing of many functional foods, particularly those developed outside of the European Union, can introduce a number of anomalies in the application of current EU food legislation. There are also distinct differences in the approach to functional foods between legislators in Europe, the United States of America and Japan.

The functional foods in Europe fall into the category "food", as stated by the ILSI-FUFOSE definition, recognized at Community level. The general legislation that governs all food production is represented by Reg. (EC) 178/2002, entitled "the general principles and requirements of food law, establishing the European Food Safety Authority (EFSA) and laying down procedures in matters of food safety". This Regulation does not provide for the recognition of functional food as a food category of

[49] Health Canada, Question and answer on health claims, http://www.hc-sc.gc.c/fn-an/label-etiqut/claims-reclam/qa-qr-claims-allegationseng.php, 2010.

[50] A. Annunziata, R. Misso, R. Vecchio1, "Alimenti funzionali: aspetti normativi e nuove opportunità di mercato", in Economia e Diritto Agroalimentare, XV, 2010, pp. 57-76.

its own, therefore, functional foods must first of all abide by the general rules laid down for any other production food. In particular, the Reg. 178/2002 regulates "all stages of production, food processing and distribution", with particular reference to food safety management and analysis of risk, in order to adequately protect the health of the consumer. However, there are other rules for regulate production and distribution of functional foods; they are connected to the origin of the functional ingredient or to the level of functionality. For instance, specific regulations have been drafted for dietary foods and novel foods – and functional foods have been inserted in the novel food category because their production began in recent times and their chemical composition is changing continuously, so as they represent a new product without previous history in the market.

In any case, the Reg. 178/2002 establishes that EFSA has the task to monitor the compliance with the legislation for all food products, including functional foods. When a functional product has similar characteristics to a drug, the EFSA leaves the responsibility to EMA (European Medicine Agency), so this one can apply appropriate standards and monitor compliance for them. Since the functional food is a type of product borderline between food and drug, EFSA and EMA often collaborate for the choice of the law suitable for each single production and for the market monitoring, so as to avoid potential irregularities.

Next to Reg. 178/2002, the EU has defined a series of regulations and directives aimed to manage the complexity of functional foods. In particular:

- Directive 2002/46/EC about the approximation of the laws of the Member States relating to food supplements. It is used mostly as a reference for the distinction between functional food and dietary supplement. As seen above, the difference between these two products is substantially in the form, i.e. in the presentation[51].
- Directive 2004/27/CE amending Directive 2001/83/EC on the Community code relating to medicinal products for human use. It defines the basic criteria for the inclusion of a product in the category of drugs, with particular attention on: this product's claims, the properties of the ingredients, the presentation, the packaging, the instructions on the label and the difference between them and other products with similar properties. With particular attention on functional foods, the Directive allows

[51] DIRECTIVE 2002/46/EC OF THE EUROPEAN PARLIAMENT AND OF THE COUNCIL of 10 June 2002 on the approximation of the laws of the Member States relating to food supplements.

to verify if and when a functional food has some characteristics that make it a drug, so it is possible to apply medical regulation and not food[52].

- Directive 2001/83/EC about the Community code relating to medicinal products for human use states that if a functional food can satisfy both the definition of food (Reg. 178/2002) and of drug (Directive 2001/83/EC), it must be regulate by the more restrictive legislation, therefore the legislation about pharmaceutical production[53].
- Regulation EC n. 258/97 concerning novel foods and novel food ingredients. It regulates the introduction of novel foods in the market. Novel foods are defined as «a. foods and food ingredients containing or consisting of genetically modified organisms within the meaning of Directive 90/220/EEC; (b) foods and food ingredients produced from, but not containing, genetically modified organisms; (c) foods and food ingredients with a new or intentionally modified primary molecular structure; (d) foods and food ingredients consisting of or isolated from micro-organisms, fungi or algae; (e) foods and food ingredients consisting of or isolated from plants and food ingredients isolated from animals, except for foods and food ingredients obtained by traditional propagating or breeding practices and having a history of safe food use; (f) foods and food ingredients to which has been applied a production process not currently used, where that process gives rise to significant changes in the composition or structure of the foods or food ingredients which affect their nutritional value, metabolism or level of undesirable substances»[54]. The Regulation states that every novel food, before being placed in the market, must be authorized by the European Commission. The EFSA is working with the Commission to carry the appropriate checks on food safety. Products approved must comply with the additional specific requirements on labeling, as the indication of any characteristic or food property: composition, nutritional value, use of which is intended for food. The total list of novel foods approved by the Commission is available in the Novel Food Catalogue, a database that collects all requests for authorization and the related outcome. In general, the Regulation appears limited,

[52] DIRECTIVE 2004/27/EC OF THE EUROPEAN PARLIAMENT AND OF THE COUNCIL of 31 March 2004 amending Directive 2001/83/EC on the Community code relating to medicinal products for human use.
[53] DIRECTIVE 2001/83/EC OF THE EUROPEAN PARLIAMENT AND OF THE COUNCIL of 6 November 2001 on the Community code relating to medicinal products for human use.
[54] REGULATION (EC) NO 258/97 OF THE EUROPEAN PARLIAMENT AND OF THE COUNCIL of 27 January 1997 concerning novel foods and novel food ingredients, art. 1.

because it defines only general guidelines for requesting the approval on the market and the list of information in the label. For this reason the European Commission decided to deepen the regulation about novel food.

- Directive 89/398/EEC on PARNUTS or Foods for Particular Nutritional Purpose: sets out nine sub-food categories, some of which have led to the development of specific Directives. These Guidelines are considered a valid reference point for the regulation of functional food production and market because relate the food functionality with the risk to food safety, consumer protection, product liability and other important issues for the growing of this business sector. Despite this, they do not guarantee the coverage for all types of functional foods that are currently on the market[55].

The big gap in the European legislation about functional foods is linked to specific legislation lack. Indeed, there is not a specific legislation that recognizes the functional foods as food category[56]. For this reason, every time that the EFSA has to authorize the introduction in the market of a new functional product, spends a lot of time and money in evaluation, selection and interpretation of guidelines and specific laws. This gap is due to the fact that the European legislator has focused his attention on the claim regulation[57] in the food sector, operating a strict analysis and creating restrictions on health claims. A claim has been defined by the Codex Alimentarius in 1979 as «any representation which states or implies that food has certain characteristics relating to its origin, nutritional properties, nature, production, processing, composition or any other quality»[58]. The role of the definition is to give information about the functional product, not only in words, but also through graphical representation or figures. For this reason, firms involved in functional foods production have to pay attention to packaging, marketing or advertising.

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[55] COUNCIL DIRECTIVE 89/392/EEC of 14 June 1989 on the approximation of the laws of the Member States relating to machinery.

[56] I. Siró, "Functional foods: product development, marketing and consumer acceptance. A review", in *Appetite* 51, 2008, pp. 456-467; G. Corbellini, Stili alimentari e salute di genere, Franco Angeli Editore, Milano, Chapter 3, 2002, pp. 65-79.

[57] M.B. Roberfroid, "Concepts and strategy of functional food science: the European perspective1–3", in *The American Journal of Clinical Nutrition*, 71 (suppl.), 2000, 1660S-4S; M.B. Roberfroid, "Functional foods: concepts and application to inulin and oligofructose", in *British Journal of Nutrition*, 87, Suppl. 2, 2002, S139–S143.

[58] A.T. Diplock, P.J. Aggett, M. Ashwell, F. Bonet, E.B. Fern, M.B. Roberfroid, "Scientific concepts of functional foods in Europe: consensus document", in *British Journal of Nutrition*, n 81, 1999, S1 – S27.

The regulation about claim is defined by Reg. 1924/2006, which tries to harmonize the laws and provisions about food claims among European countries, so to ensure proper functioning of the internal market and the consumer protection. Unfortunately, there are some areas of this relatively new regulation that have added to the complication of the issue and that are very dependent upon interpretation of the legislation.

The nutrition and health claims Regulation classifies claims into three categories:

- Nutrition claims, which are claims which state, suggest or imply that a food has particular nutritional properties due to the nutrients it contains or does not contain.
- Health claims, which are defined as any claim which states, suggests or implies that a relationship exists between a food category, a food or one of its constituents and health.
- Reduction of disease risk claims, which are health claims that state, suggest or imply that a food or one of its constituents significantly reduces a risk factor in the development of a human disease.

It is specified that claims which state, suggest or imply that a product can prevent, treat or cure a disease or condition are regarded as medicinal claims and are prohibited for foods.

The use of nutrition and health claims, whether stated, suggested or merely implied, are prohibited in the labelling, presentation and advertising of foods marketed in the EU, unless they comply with the legislation. Only those nutrition claims included in the Annex to the Regulation may be used, and any nutrition claim must comply with the terms and conditions which are detailed within the Annex. These terms are very specific with regard to the quantity of the nutrient or other substance that must/must not be present in the food if a claim is to be made and, most importantly, the terms relate to the food 'as consumed'. This means that the addition of liquids such as water, milk or fruit juice to a product must be taken into account when calculating the quantity of the specific nutrient or other substance per 100 g, 100 ml or 100 kcal in order to make a claim.

The EU Commission holds an appropriate register on nutrition and health claims, where it is possible to find all authorized claims. This list, which is accessible from the Commission's website, not only gives the wording that can be used but also specify the conditions (mainly compositional) that must be met before the claim is allowed. The

claims that are currently held on the Community Register include the nutrition claims as per the amended Annex to the Regulation; health claims which fall under Article 13 but which have been submitted with newly developed scientific evidence or proprietary data[59]; health claims which relate to children's development and health[60]; those which refer to the reduction of disease risk[61]; and a list of rejected health claims and the reasons for their rejection. Health claims authorized on the basis of proprietary data will appear in a separate Annex to the Community Register. There will also eventually be an additional generic list of health claims other than those referring to the reduction of disease risk and to children's development and health[62].

The authorization process for a health claim in Community register considers that the health claim has to be submitted to the relevant Member States, who forward the claims to the European Commission. The claims are then sent to EFSA, who are tasked with assessing the scientific data that has been provided by the submitter for each claim and issuing an opinion on issues such as: the extent to which the claimed effect of the food is beneficial for human health; the extent to which a cause and effect relationship is established between consumption of the food and the claimed effect in humans; whether the quantity of the food and pattern of consumption required to obtain the claimed effect could reasonably be achieved as part of a balanced diet; and whether he specific study group in which the evidence was obtained is representative of the target population for which the claim is intended. A simplified process of submission was put in place for the Article 13(1) claims, while comprehensive dossiers are required for Article 13(5) and Article 14 claims. However, although the submission process differs, the evaluation by EFSA is the same for all claims. The Commission, after the EFSA opinion, has to present a draft decision to the Standing Committee on the Food Chain and Animal Health. The Commission proposal is then adopted by Comitology (Regulatory Committee) with the scrutiny right of the European Parliament. The process is long and

[59] REGULATION (EC) No 1924/2006 OF THE EUROPEAN PARLIAMENT AND OF THE COUNCIL of 20 December 2006 on nutrition and health claims made on foods, art.13.
[60] REGULATION (EC) No 1924/2006 OF THE EUROPEAN PARLIAMENT AND OF THE COUNCIL of 20 December 2006 on nutrition and health claims made on foods, art.14, a.
[61] REGULATION (EC) No 1924/2006 OF THE EUROPEAN PARLIAMENT AND OF THE COUNCIL of 20 December 2006 on nutrition and health claims made on foods, art.14, b.
[62] REGULATION (EC) No 1924/2006 OF THE EUROPEAN PARLIAMENT AND OF THE COUNCIL of 20 December 2006 on nutrition and health claims made on foods, art.13, 1.

complex, so the companies have to wait long time to know if the new product can be considered functional or not and the claim can be insert in the Register[63].

It is clear that regulatory activity on food claim is very rigorous, in fact the European legislator has already developed amendments to Regulation 1924/2006, with the aim to refine the criteria and the verification procedures about the scientific substantiation of each individual claim, in particular those concerning human health. The amendments have been introduced with Reg. 353/2008 and Reg. 1169/2009. In particular, Regulation 353/2008 establishes the "implementation rules for applications for authorisation of health claims as provided for in Article 15 of Regulation 1924/2006". The EFSA has provided the basic information for writing these guidelines, suggesting to clearly defining the rules for requesting health claim authorization in categories as children health and reduction of disease risk Furthermore, the EFSA sets out the scientific and technical guidelines for the preparation and submission of the request. These guidelines are available in the annex to regulation 353/2008, so all companies interested in requesting authorization for a health claim have to respect them. Another important innovation concerns the scientific data about the health effectiveness of new product; in particular the Regulation establishes that the scientific test has been made on human population samples, which are representative of the target of potential consumers. While, about health claims already authorized, the Regulation fixed further conditions for their use[64].

The Regulation 353/2008 changed with the Regulation 1169/2009, about the activity of National Authority competent in the authorization procedure to the use of specific health claims. The main task is to filter all requests before sending them to EFSA.

In conclusion, at the end of this analysis of the main rules on functional foods emerges the complexity and ambiguity of them, caused by legislative gaps on one side and expensive legislative work on the other. Specifically, the European Community focused his attention on food safety in order to guarantee the consumer food safety and

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[63] P.B. Ottaway, S. Jennings, *EU legislation and functional foods: a case study*, in M. Saarela, *Functional Foods* (2th Edition), Woodhead Publishing Series in Food Science, Technology and Nutrition, 2011, pp. 25-40.

[64] REGULATION (EC) No 353/2008 of 18 April 2008 establishing implementing rules for applications for authorisation of health claims as provided for in Article 15 of Regulation (EC) No 1924/2006 OF THE EUROPEAN PARLIAMENT AND OF THE COUNCIL.

conscious choice. This interpretation also explains the big attention on health claims, in scientific testing and language directions.

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In conclusion, it is clear that the introduction and marketing of functional products in the international environment has prompted a series of efforts by the various national authorities, which have to manage the complexity and ensure the protection of consumers. In this sense, it may be noticed a different approach by the various Nations considered. Japan results the only Country with a specific category for functional foods as Foshu and a specific regulation, while the US and Canada appear more permissive on this topic, even though they are starting supervisory processes on no regulated market areas. Therefore it is therefore necessary to create laws specifically directed to the control of the functional food industry, to be developed in close collaboration with international authorship, in order to facilitate the proper trade in these productions, the industry protection and consumer protection. Therefore, it is necessary to create laws specifically directed to the control of the functional food industry, developed in close collaboration with International Authorities, in order to facilitate the proper trade in these productions, the industry and consumer protection. The European context is characterized, however, by a high degree of complexity because there is no organic connection between the rule definition and management of functional foods and rules which authorize the health claim. Ultimately, the main countries analyzed are working to a better definition of rules for functional foods and for integrating them with health claims legislation, so to ensure a harmonization.

Chapter 2 - Review Of the Literature

2.1 Introduction

In the previous chapter the attention was focused on the description of the main aspects that qualify food and beverage industry, with a particular attention on functional foods. Functional foods represent a new category of product far from the traditional one for many reasons, not only in terms of ingredients' functionality, but on the development and production side.

The interest in investigating this industry is connected to the innovation level of the product and the manufacturing process, because the very important issue for innovative organisations which want to face competition is to invest in the development of new products.

In the functional foods management literature, many scholars focused their attention on consumers' behaviour, while the topic of management control systems has not been explored until now. Hence, it results interesting to reflect on issues related to management control, since the introduction of new products as functional foods might require some adaptations of management control systems, considering differences in business processes and consumers' behaviour between functional and non-functional foods.

In this perspective, the chapter 2 is dedicated to an in-depth literature review for defining the logic model which would be tested at the end of the research. In particular, three are the main pillars of the research: the role of strategic innovation studies, the new product development success factors and the performance measurement framework - for defining what kinds of measures are used to evaluate NPD in functional foods production and how they contribute in corporate profitability.

2.2. Strategic Innovation

The first pillar of the logic model it would be tested is represented by the studies about "strategic innovation". Under this proposition, Utterback and Abernethy (1975), Henderson and Clark (1990) and Markides (1997), intend all phenomena characterized by the discovery of a fundamentally different business model in an existing business, *id est* they identified the gaps in the industry positioning map and ways to fill them like factors driving competitive success and failure.

As Markides noticed, the common denominator of successful attack in different Industries is represented by strategic innovation, as he called it. So, the success is connected no in playing the competitive game better than others but in changing rules of competition. One of the most representative examples is the Starbucks case. Starbucks is in Coffee industry and its main competitors are represented by General Foods (Maxwell House), Nestlé (Nescafé), Procter & Gamble (Folger's) and Sara Lee (Douwe Egberts). The innovative strategy was - and is - based on the opportunity to give to the consumer a quiet and pleasant place where drinking coffee, not only where it is possible to buy this drink. In five years (since 1987), Starbucks grew from a chain of 11 stores to 280 and sales from 1.3 million to 163.5 million. At the moment, the CEO relies on digital, social and mobile tools for staying on top through innovation. The strategy is led by the question "If we were competing with Starbucks, what would we do?". However, many others cases could be analysed for better understanding the phenomenon of strategic innovation, but the intention is to deepen the theoretical framework of this strategic approach.

As any manager knows, there is nothing more difficult than coming up with really new ideas, so introducing a technological innovation allows to attack established industry leaders or to successfully enter a new market where established players exist. However, it is not enough introducing a disruptive innovation for having success in a market, if the strategist must not be capable to change the way of thinking about the issues and to solve them. Therefore it is understandable the relevant role of strategy in defining the position that a company can claim as it owns.

As Markides suggests the soul of strategy is linked with the answers at three important questions: "Who are the company's targeted customers?", "What products or services should the company offer?" and "How can the company efficiently conduct business?"[65].

The generic approaches of the successful strategic innovators can provide clues to redefine the *who* – who is the target consumer – the *what* – what products or services are offered to consumers – the *how* – companies should leverage existing core

[65] D. Abell, *Defining the business: The starting point of strategic planning,* Englewood Cliffs, New Jersey: Prentice - Hall, 1980.

competencies to build new products or a better way of doing business and then find the right customers[66].

About the *who*, the purpose is to identify new customers or to re-segment the existing customer base more creatively and thus form new customer segment. In particular, for research intensive industries, the new customers are identified starting from the definition of new needs, which they did not know to have. Inevitably, if a company identifies a new customer base, it will start behaving in a way that best satisfies the specific needs of those customers. This behaviour will most likely be different from that of established competitors who are serving different customers. Thus the company will be breaking the rules.

About the *what*, the real innovation is to go beyond the obvious, to truly understand what is behind what the consumer is saying and what products or services the company can develop to satisfy the customer's needs. In particular, for innovative NPD is really important to develop a deep understanding of the customer's business and how the customer is satisfying its own customers' needs. In this way, a company can think ahead and identify new services to offer before the customer even thinks of them.

About the *how*, the new product development has a central role, because it represents a lever for companies which want to compete, in particular for high-tech companies which based their activities on innovation. Because this field, in environments of rapid technological change, like in high-tech industries, companies have to be aware to the strategy of developing new products or innovations[67]. According to Cooper, «NPD innovation is one of the riskiest, yet most important endeavours of the modern corporation»[68]. An example of the risk is the uncertainty in the market acceptance of the new product. To minimize risks, managers employ management control systems (MCS) to keep NPD innovation projects on track[69].

Ultimately, the NPD has an important role in attaining the firm's strategic and financial goals as much as manufacturing, distribution and other activities. For this reason the

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[66] C. Markides, "Strategic Innovation", in *Sloan Management Review;* Spring, 40, 3;1997, p. 12.

[67] H. Qin, Q. X. Wang, "Radical innovation or incremental innovation: Strategic decision of technology-intensive firms in the PRC", 2006 IEEE International Engineering Management Conference, 2006, pp. 327- 331; K.E. Knight, "Descriptive model of intra-firm innovation process", in *Journal of Business*, 40, 1967, pp. 478-496.

[68] R. G. Cooper, *Winning at New Products: Accelerating the Process from Idea to Launch*, 3rd Edition, Perseus Publishing, Cambridge, 2001, p. 4.

[69] J.M. Bonner, "The Influence of Formal Controls on Customer Interactivity in New Product Development", in *Industrial Marketing Management*, Vol. 34, No. 1, 2005, pp. 63-69.

NPD process requires management control systems, by which NPD managers can influence their collaborators and other members of the organization to contribute to the firm's success[70].

2.3 Management control systems

The first step in understanding the Management Control Systems is to provide a clear definition of such systems. Indeed, a number of definitions and descriptions of MCS exist, some of which contain overlaps while others are quite different from each other (Abernethy and Chua, 1996; Alvesson and Karreman, 2004; Anthony, 1965; Chenhall, 2003; Emmanuel et al., 1990; Fisher, 1998; Flamholtz et al., 1985; Green and Welsh, 1988; Langfield-Smith, 1997; Merchant and Van der Stede, 2007; Otley and Berry, 1980; Ouchi, 1979; Simons, 1995). In particular, for the research focused on NPD process, it is considered Otley & Berry's approach (1994), where the MCS refers to the set of procedures and processes those managers and other organizational participants use in order to help ensure the achievement of their goals and the goals of their organizations, and it encompasses formal control systems as well as informal personal and social controls[71].

Merchant and Van der Stede (2007) separate management control from strategic control and define the management control as dealing with employees' behaviour. In particular, «it is people in the organisation who make things happen. Management controls are necessary to guard against the possibilities that people will do something the organisation does not want them to do or fail to do something they should do...If all employees could always be relied on to do what is best for the organisation, there would be no need for MCS»[72]. Hence, the employees' behaviour is a key factor for a successful company and managers have the commitment to define guidelines for the employees. The main issues in this framework are: the absence of directives, the

[70] R.N. Anthony, V. Govindarajan, *Management control systems*, 9th edition, Chicago, McGraw-Hill, 1998.

[71] E. Chiapello, "Les typologies des modes de contrôle et leurs facteurs de contingence: un essai d'organization de la littérature", in *Comptabilité-Contrôle-Audit*, 2, 1996, pp. 51–74; D.T. Otley, "The contingency theory of management accounting: achievements and prognosis", in *Accounting, Organizations and Society*, 5, 1980, pp. 413–428; W.G. Ouchi, "The relationship between organizational structure and organizational control", in *Administrative Science Quarterly*, 22, 1977, pp. 95–113.

[72] K. Merchant, W.A. Van der Stede, Management Control Systems, 2nd ed. Prentice Hall, Pearson Education Limited, Harlow, Essex, England, 2007, p. 8.

motivational problems and the personal limits. The way to overcome them is the implementation of an effective management control systems. In particular, Merchant and Van der Stede (2007), propose a control classification about the object to monitor. They may distinguish the controls in: results controls, action controls and cultural controls. According to companies identify "pay for performance" as the most effective method to align employees' behaviour to general goals, and pay for performance is a typical results control. Clearly, the controls mentioned are used for monitoring the employees' behaviour for their empowerment. In particular, people involved in NPD process have responsibilities to a successful new launch, hence the results control are fundamental.

The implementation of these controls follows the four stages below:

- defining the results' dimensions;
- identifying the performance measures;
- setting goals;
- associating rewards to achievements.

About the first step, the results' dimensions are difficult to define, because they need to well balance the organization responsibilities towards their stakeholders. In addition, the choice of valid performance measures is just as hard, because the fixed aims and the done measurements may influence the collaborators' perception about what is important and what not.

After having defined the size of results, it is proceed to the actual measurement that relates to the performance of an organizational unit or a collaborator in a certain period of time. The measures may be financial or non-financial, objective or subjective; it depends on the object to monitor. Merchant and Van der Stede (2007) noticed that the financial performance measures are widely used for high-level managers, while the non-financial ones are useful for monitoring lower-level managers. But generally, the measures are chosen for better understanding the employees' behaviour.

The target to be reached must be fixed, because it influences employees' behaviour. On one hand, the target may increase the motivation in people involved in NPD process, which have clear aims to achieve. On the other hand, the target allows employees evaluating and improving themselves.

Finally, the aims to be achieved must be linked to rewards and incentives, because they push employees' behaviour to be aligned with companies' aims.

The effectiveness of results controls is strictly connected to some conditions. Firstly, the companies must know what are the desirable results in the area/department to monitor, and communicate them to all people involved in it. Secondly, the people monitored must be able to change the results with their work in a specific period. Thirdly, the measures chosen must measure effectively the results. In particular, the performance measurement systems for guaranteeing an effective control must be accurate, objective, timely, understandable and efficient in terms of cost.

In the end, the results controls have many advantages in their applications, because guarantee a specific control with a high freedom in employees' work. But, the only way for having a better control system is that the control systems follow the three conditions above.

Next to the previous approach there are others MCS models proposed in literature. For instance, Amigoni (1977), and many Italian scholars, defined the classic contingent model based on two variables: the structural complexity and the environment dynamism. While, the Maciariello and Kirby's model (1994) is characterized by two levels of control, structural and procedural. Another model has been proposed by Simons (1995), who considered the MCS in a dynamic point of view. The innovative industries need a change in management control systems, which represent an empowerment and not only a monitoring process.

Starting from these consideration, it will be provide a review and analysis about the studies conducted by Robert Simons, who defined a framework for better understanding the strong link between MCS and the innovation, with particular attention in the new product development process, highlighting the central role of innovation in food products.

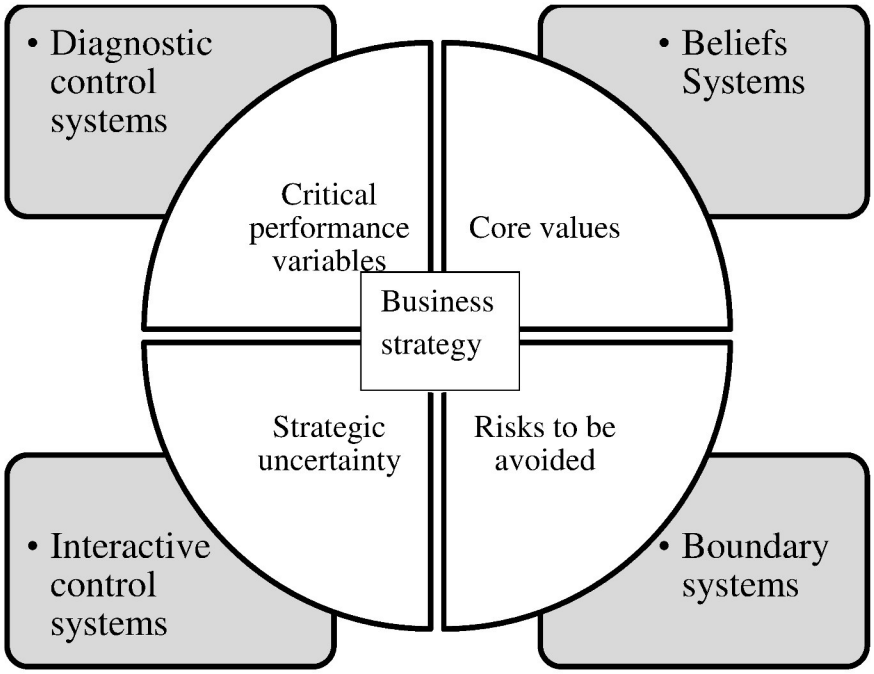
2.3.1 The role of MCS in Innovation

MCS are in general described as information feedback systems, where goals are set in advance, outcomes are compared with present objectives and variances are reported to senior management for action and follow-up (Simons, 1991). Simons (1995) define

control systems as: «the formal, information-based routines and procedures managers use to maintain or alter patterns in organizational activity».

In order to successfully implement a strategy, there are four key elements that must be analysed and understood: core values, risk to be avoided, critical performance variables, and strategic uncertainties (Simons, 1995).

Figure 14 The control levers model



Source 1 R. Simons, Levers of Control, Harvard Business School Press, Boston (MA), 1995, p. 34.

Each of these elements is controlled by a lever, as can be seen on figure 14 above: Belief Systems, used to inspire and direct the search for new opportunities; Boundary Systems, used to set limits on opportunity-seeking behaviour; Diagnostic Control Systems, used to motivate, monitor, and reward achievement of specified goals; and Interactive Control Systems, used to stimulate organisational learning and the emergence of new ideas and strategies (Simons, 1995). The first two systems explicitly demarcate the domain in which the company competes and within in this area the latter two systems help to implement the intended strategy and adapt to competitive environments.

Boundary systems and diagnostic control systems have the purpose of creating constraints in order for the company to be in compliance with existing orders and strategy (Simons, 1995). These systems inform senior management if outcomes are not in accordance with the intended strategy. They constrain innovation and opportunity-

seeking to ensure that the intended strategies are achieved. On the opposite side are the belief systems and interactive control systems, which intention is to create positive and inspirational forces in the company, enabling emergent strategies to evolve. They stimulate search and learning, allow new strategies to emerge as participants throughout the organisation respond to perceived opportunities and threats (Simons, 1995). This is achieved by senior management's involvement in the control systems, i.e. they personally and regularly involve themselves in the decisions of subordinates (Simons, 1991). Together they create a dynamic tension that allows the effective control of company strategy. Below all four systems are thoroughly described and explained in order to get an understanding of how they function and which impact they have.

Belief systems

The first lever of control is the company's belief system and concerns the company's core values. The main purpose of this is to inspire and guide organisational search and direction (Simons, 1995). This is the explicit set of organisational definitions that senior management communicate formally and reinforce systematically in order to provide basic values, purpose and direction for the company, e.g. vision statement, mission statements, credos etc. (Simons, 1995). These core values are linked directly to the business strategy of the firm. The company's vision and mission statements are very inspirational and broad since they should apply to all employees should align their behaviors to organization's objectives. Because of this, the belief system cannot be tied to formal organisational incentives as they are too vague to use as standards against which performance can be measured (Simons, 1995). In order to narrow the company's belief system into more focused activity, Simons developed boundary systems, which impose important limits on the organisational search activity brought by the belief system.

Boundary systems

Whereas belief systems promote opportunity-seeking, boundary systems establishes limits. They deal with risks that should be avoided. The boundary system demarcates the organisational domain within which employees can act, and communicate specific risks to be avoided (Simons, 2000).

Today, employees demand more freedom than ever on the workplace and it is looked down upon if senior management practices some sort of centralized management and in detail specifies how employees should conduct their work. This is solved by senior management setting up outer limits stating what employees should not do and then relying on individual creativity to search for ways of creating value within these boundaries. Therefore, boundary systems are often stated in negative terms or as minimum standards (Simons, 1995).

In order to be able to communicate which risks that should be avoided and what is not in compliance with the belief system, companies have business conduct boundaries and strategic boundaries. The most basic business conduct boundaries are those that define and communicate standards of business conduct for all employees (Simons, 2000). These are often in negative terms, stating action that are forbidden and could potentially damage the well-being of a company by exposing it to loss of assets, reputation or legal liability (Simons, 1995).

According to Simons, the business conduct boundaries should not infringe on the employees freedom because they can still act independently and create value within the stated boundaries (Simons, 2000). Strategic boundaries are set up in order to ensure that employees are engaged in activities that support the basic strategy of the company, and are specifying the range of business opportunities in which the senior management does not want the company to spend resources (Simons, 1995). Senior management have an important task of, on the one hand, letting employees exercise their creativity to solve problems and come up with new ideas. On the other hand, senior management are very focused on the bottom line and unfocused initiatives from employees can waste financial resources. Therefore, they state what types of business opportunities should be avoided, resulting in the strategic boundaries which implicitly define the desired market position for the company (Simons, 2000). However, many companies survive changing market conditions thanks to employees who have thought “out-of-the-box” and created new solutions and products not first desired by senior management. So if improperly set, strategic boundaries can hinder innovation and adaption to changing markets. And by not allowing opportunity-seeking behaviour, senior management may prevent the company from an early advantage in new and unanticipated ventures by killing creativity (Amabile, 1998; Simons, 1995; Levitt, 1960).

Diagnostic Control Systems

This form of control system deals with the critical performance variables in the company. Diagnostic control systems are the formal information systems that managers can use to monitor company outcomes and correct deviations from present standards of performance (Simons, 1995). These feedback systems are designed to ensure predictable goal achievement, and are the backbone of traditional management control (Simons, 1995). The information gathered through these systems is used to monitor, but is not brought up for discussion unless reported events fall below plans or expectations. Any formal information system in the company can be used diagnostically if four conditions are present. It should be possible to: set a goal in advance, measure output, compute or calculate performance variables, and use the variance information as feedback to alter inputs and/ or process to bring performance back in line with present goals and standards (Simons, 2000).

It is important that senior management chooses which control systems to use diagnostically, since it is not possible to review and monitor all measures available. For senior management there are two reasons for choosing to use a system diagnostically: implementing strategy effectively and conserve scarce management attention (Simons, 1995; 2000). The diagnostic control systems are a top-down monitoring tool for implementing strategy as planned. It links strategy with the critical performance goals – the factors that must be achieved or implemented successfully for the intended strategy of the business to succeed (Simons, 2000). Management attention is a scarce resource and must be utilised in the best way possible. Instead of constantly monitoring a large variety of internal processes and comparing results with targets and goals, managers receive periodic reports from staff accountants (Simons, 2000). It is only if there are serious deviations that managers need to invest time and attention to investigate the cause of the deviation. By using this management by exception top managers' time and attention can be allocated most effectively (Simons, 2000). Some of the risks of managing-by-exception are measuring the wrong variables, building slack into targets and gaming the system (Simons, 1995; 2000).

Interactive Control Systems

In the interactive control systems, the strategic uncertainties have a central role. While the diagnostic control systems put constrains on innovation and opportunity-seeking behaviour, the purpose of interactive control systems are the exact opposite. In particular, Simons defines these systems as: «the formal information systems that managers use to personally involve themselves in the decision activities of subordinates».

Their purpose is to stimulate search and learning and allow new strategies to emerge as employees respond to perceived threats and opportunities (Simons, 1995), hence focus is on strategic uncertainties and strategic renewal. Simons defines strategic uncertainties as the emerging threats and opportunities that could invalidate the assumptions upon which the current business strategy is based (Simons, 2000). These uncertainties relate to changes in competitive dynamics and internal competencies that must be understood if the company is to successfully adapt over time (Simons, 2000). While critical performance variables in the diagnostic control systems focus on what to do well in order to achieve the intended strategy, strategic uncertainties are focused on the changes in assumptions that could change the way a company achieves its vision for the future. The information obtained through the interactive systems is constantly used in interaction with employees so managers and decision makers are involved in the process monitored. The interactive control systems are measurements systems which direct attention towards the constant changing information that are of strategic importance to the company. This attention signals the need the employees to focus on the issues addressed by the interactive control systems. Through these senior management can place pressure on employees and then hopefully inspire more dialogue and debate consequently leading to organisational learning and emerging strategies.

Hence, the interactive control systems guide and provide input to new innovation initiatives and NPD (Simons, 1990). After senior management has identified the strategic uncertainties it is imperative that they are communicated throughout the company, which is done by using one or more control systems interactively. The senior management's choice of which system to use interactively relates to the strategic uncertainties the company is facing. With a clear vision of the future, the senior management does not need to oversee every control system personally and can delegate much of it to staff personnel. However, companies with an unclear vision or in a

competitive crisis use all control systems interactively. These companies are in a state of transition and are undergoing revolutionary changes in the business model or marketplace. Using all control systems interactively causes incredible stress since employees are pushed to their limits to respond to the short-term information and actions demanded by senior management (Simons, 1991). It will also make decision makers suffer from information overload as the amount and complexity of information increase (Simons, 1995, 2000). Furthermore, intensive use of interactive control systems makes it impossible for senior management to send clear signals as to what they consider to be the strategic uncertainties inherent in the company's vision, which is the main purpose of using only one control system interactively at the time (Simons, 1991, 2000).

* * *

Diagnostic and interactive control systems can also be explained with March's (1991) analysis about the relation between exploration of new possibilities and the exploitation of old certainties.

In particular, a company, which decides to implement a diagnostic control system, focuses its attention on incremental innovation. This relation is comparable to March's meaning of exploitation[73] and is representative of a top-down knowledge management strategy. Indeed, the link between diagnostic control systems and incremental innovation - i.e. the certainty, speed and clarity of feedback - ties the exploitation to its consequences more quickly and more precisely than in the case with exploration, which is what characterises the fundamental conditions if an information system is to be used diagnostically.

As with exploitation, there is connection between exploration[74] and the definitions of interactive control systems and radical innovation. If a company are using primarily interactive control systems it will lead to more radical ideas in the product development process and, hence, it will preferred the exploration rather than the exploitation.

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[73] March's (1991) definition of exploitation is that «the essence of exploitation is the refinement and extension of existing competences, technologies, and paradigms. Its returns are positive, proximate, and predictable», J.G. March, "Exploration and Exploitation in Organizational Learning", in *Organization Science*, Vol. 2, No. 1, 1991, pp. 71–87.

[74] According to March (1991), «the essence of exploration is experimentation with new alternatives. Its returns are uncertain, distant, and often negative», J.G. March, "Exploration and Exploitation in Organizational Learning", in *Organization Science*, Vol. 2, No. 1, 1991, pp. 71–87.

If the returns from explorations processes are systematically less certain, more remote in time and organisationally more distant from the centre of action and adaption, they can be defined as uncertain. Furthermore, the search for new ideas and markets has more uncertain outcomes and longer time horizons than by further developing existing ones (March, 1991). Hence, interactive control systems focus on strategic uncertainties which must be understood so that the company successfully adapts itself over time, and stimulates new strategies from the employees. Therefore it is likely to argue that there is connection between the two theories.

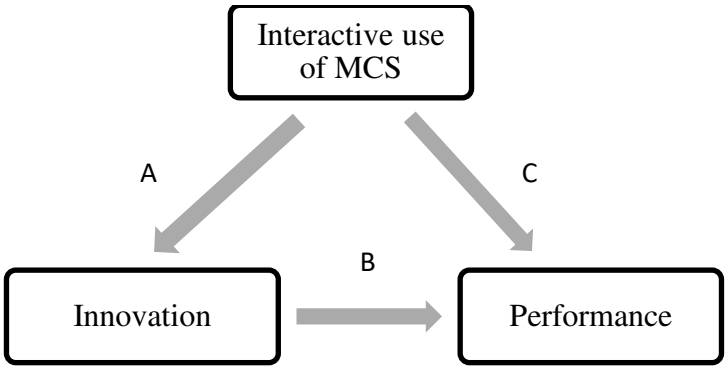
Criticism to Simons' study

Simons indicates that an interactive use of MCS can contribute to successful product innovation. However, missing in his study on MCS an analysis about the role of innovation and the relationship between interactive control systems and innovation itself. In particular, Bisbe and Otley (2004) starting from Simons' study have defined if the relation between innovation, performance and interactive control systems is a moderation or a mediation On one side, interactive use of MCS may cultivate product innovation, which can then increase performance if all goes well, hence a mediating role. On the other hand, the interactive use of MCS can enhance the impact of any level of product innovation on performance, which is the moderating role (Bisbe & Otley, 2004). Both are explained in-depth below. It is important to state that the findings made by Bisbe & Otley cannot be used to draw conclusions on the role of diagnostic use of MCS in regards to product innovation and performance. Since they only analyse the interactive use of MCS, their study does not analyse the relationship between MCS that are used diagnostically and those that are used interactively.

The mediating role

According to Simons (1991, 1995) the use of interactive MCS can stimulate opportunity-seeking and encourage the emergence of new initiatives. Hence, the interactive use of MCS should foster product innovation. The relationship between the interactive use of MCS and product innovation is shown with arrow A in Figure 15. The Figure below represents the mediating role of interactive use of MCS on product innovation and performance.

Figure 15 Direct and indirect effects



Source 2 J. Bisbe, D. Otley, "The effects of the interactive use of management control systems on product innovation", in *Accounting, Organizations and Society,* 29, 2004, p. 713.

Studies have found a positive relationship between product innovation and performance improvement in terms of growth, value creation and profitability (Bisbe & Otley, 2004). This relationship is shown with arrow B in figure 15.

Because innovation is considered to be one of the major determinants of organisational performance, Bisbe and Otley (2004) also research the indirect effect of the interactive use of MCS on innovation on organisational performance. This is shown with arrow C in figure 15.

In their study, Bisbe and Otley did not find any evidence that an interactive use of MCS has a positive effect on innovation, arrow A in the figure above. The results show a complex relationship between the interactive use of MCS and innovation and performance. They suggest that there may be a marginally positive correlation in low-innovating companies, while in high-innovating companies it may have the opposite influence, i.e. a negative correlation between product innovation and the interactive use of MCS (Bisbe & Otley, 2004). These results are highly unexpected when looking at the work previously done by Robert Simons (1987, 1990, 1991, and 1995). In looking for an explanation for this, Bisbe and Otley turn to the 1982 article by Miller and Friesen. They use the term "momentum" as a pervasive force in companies without mitigating mechanisms. The companies that innovate have a tendency of becoming more innovative, whereas those who do not innovate much will do even less (Bisbe & Otley, 2004; Miller & Friesen, 1982). Hence, a momentum in innovation can lead to an extreme case where high-innovating companies will reach too high a level of innovation causing excessive and inadequate innovations. In contrast, low innovating companies

risk that their innovation level sinks so much that it can lead to strategic stagnation (Miller & Friesen, 1982).

This notion of "momentum" is in accordance with the statement from Bisbe and Otley (2004) that the interactive use of formal MCS may contribute to reducing the risk of too much innovation in high-innovating companies. Furthermore, even if the results are less conclusive, some MCS can help reducing the risk of complete innovation stop in low-innovating companies. One of Simons' (1991, 1995) claims is that interactive use of MCS may increase learning and the formation of new strategies in an organisation. The findings made by Bisbe and Otley (2004) seems to confirm that interactive control systems can be a framework for capitalising learning in both high- and low innovating companies and bring about an agenda for proactive acting to the strategic uncertainties that may threaten the company.

As for the indirect effects of the interactive use of MCS on performance acting through innovation, arrow C, Bisbe and Otley (2004) found no evidence that interactive use of MCS have a positive effect. The research found no evidence that an interactive use of MCS favours product innovation and therefore no evidence that an interactive use of MCS increases performance through an indirect effect via product innovation (Bisbe & Otley, 2004).

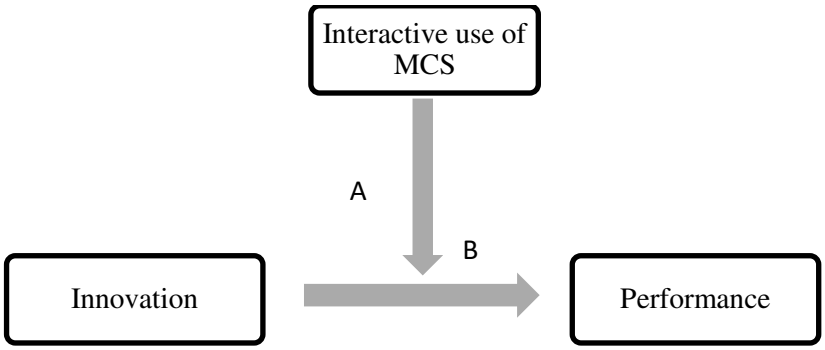
Neither did they find verification of a significant relationship between the interactive use of MCS and innovation or between interactive use of MCS and performance, which is contrary to what Simons' states earlier (Simons, 1991, 1995). Bisbe and Otley claim that a mediating model does not help to comprehend the role of the use of formal MCS in influencing the quantity of product innovation, and is not informative about the role of the style of use of formal MCS, thereby being inadequate in supporting meaningful links between interactive use of formal MCS and performance (Bisbe & Otley, 2004).

The moderating role

Simons states that interactive use of MCS can influence the impact of product innovation on organisational performance (Simons, 1991, 1995). With the interactive control systems, senior management set focus on the strategic uncertainties that may threaten the company's performance and signals this to all employees. Bisbe and Otley (2004) argue that it is possible that the influence of the interactive use of MCS on the

effect of product innovation is achieved through different mechanisms. As mentioned earlier, the interactive control system focuses company attention on strategic uncertainties. This brings along dialogue and debate which brings new learning, which can affect the relationship between product innovation and performance. Furthermore, the interactive control system helps the company being informed about changing patterns of the markets, which gives the company a better chance of responding with new action plans (Simons, 1995). Therefore, the relationship between the level of product innovation and organisational performance can then be expected to be enhanced when the abovementioned focus, learning and integration, and fine tuning are obtained through the interactive use of MCS. It can then be expected that the extent to which MCS are used interactively will influence the extent to which innovation initiatives are effectively translated into improved performance (Bisbe & Otley, 2004). Hence, Bisbe and Otley (2004) studies whether the impact of innovation on performance is moderated by the style of MCS. This moderating effect of interactive use of MCS on the relationship between product innovation and performance is shown by arrow in figure 16 below.

Figure 16 Moderating effects



Source 3 J. Bisbe, D. Otley, "The effects of the interactive use of management control systems on product innovation", in Accounting, Organizations and Society, 29, 2004, p. 715.

Bisbe and Otley (2004) found evidence that there is a significant moderating effect of the style of use of MCS. The association between innovation and performance is significantly higher when MCS are used interactively than in situations where there is no interactive use of MCS (Bisbe & Otley, 2004). The study shows that the variation in performance as a result in variation in innovation levels can be significantly better explained when style of use of formal MCS is used as a moderating factor (Bisbe & Otley, 2004). The more interactive the systems are used, the more positive the

relationship gets. Furthermore, an interactive use of MCS is likely to enhance the impact of product innovation on performance particularly when product innovation is very high (Bisbe & Otley, 2004). As mentioned above, an interactive use of formal MCS appears to have a moderating influence on the impact of innovation on performance when it comes to provision of direction, integration and fine-tuning. Bisbe and Otley (2004) argue that interactive MCS may shape the bottom-up process of emergence of patterns of action in high-innovating companies. Bisbe and Otley (2004) are then in line with Simons (1991, 1995) who point out that the control systems provide direction by signalling senior managements preferences for search and indicate acceptable courses of action consistent with overall company strategy.

Interactive control systems facilitate a forum where employees can have face-to-face dialogue and debate, which is important in product innovation (Miles & Snow, 1978; Simons, 1991, 1995). According to Bisbe & Otley (2004), the interactive use of formal MCS may moderate the impact of innovation on performance by acting as an internal integrative capability, because the collaboration, evaluation of alternatives and integrated problem-solving that result from an interactive use of MCS «enlightens decisions on process efficiency and product effectiveness, eventually improving the impact of innovation on performance».

Competitive markets change faster than ever and as companies become more innovative, the need to make adjustments in strategy and becomes more frequent. Interactive MCS provide a lever to fine-tune and alter strategy as these markets change (Bisbe & Otley, 2004, Simons, 1995, 2000).

They assist in fine-tuning ideas so they can be translated into effective innovations and help in bringing forth new emergent strategies that may be needed due to ever changing conditions of innovative markets. It is clear that the findings of Bisbe and Otley tend to support Simons' statement that successful innovative companies use formal MCS interactively.

However, findings in the Bisbe and Otley (2004) study gives evidence that goes against the claim from Simons (1995) that innovation correlates positively with interactive use of MCS and that the most innovative companies use their control systems more interactively than do less innovative ones. Their analysis show that the relationship between interactive use of MCS and product innovation may vary with the level of

innovation. There is weak evidence that suggests that an interactive use of formal MCS stimulate creativity and product innovation by offering guidance and triggering initiatives (Bisbe & Otley, 2004). At the same time, there is no evidence a strengthening the statement by Simons (1995, 2000) that the interactive use of MCS stimulate creativity and product innovation in high-innovating companies. Creativity, generation of ideas and launching of new initiatives are encouraged by both informal systems and other formal systems than MCS (Bisbe & Otley, 2004).

However, according to Miller and Friesen (1982), without mitigating systems, innovation momentum can lead to excessive and dysfunctional generation and launching of initiatives. In this case, interactive use of MCS can be functional in high-innovating companies in curbing innovation excess. Hence it is not surprising that the most innovative companies within the subgroup of high innovating companies in Bisbe and Otley's study are those that do not use MCS interactively (Bisbe & Otley, 2004). Still, Bisbe and Otley believe that the style of use of MCS is very relevant regarding the relationship between innovation and performance in both low - and high - innovating companies.

While their study shows that an interactive use of MCS does not help high-innovating companies in terms of autonomy and space for generating ideas and innovation, at the same time, it does not prevent that autonomy and space for innovation can have a great emphasis on MCS. The interactive use of formal MCS can have a moderating role that helps translate creativity into effective innovations and enhanced performance. Furthermore, an appropriate use of MCS seems to be very important if the autonomy and space innovation is to be successfully converted into improved company performance. Bisbe & Otley (2004) believe this is relevant for all companies, because «the more innovative the firm, the more relevant the proper use of MCS appears to be».

The results of their study emphasize the considerable importance of formal MCS in the pursuit of innovation that can be successfully translated into long-term performance, especially the emphasis on the relevance of the style-of-use of formal MCS. They have found evidence against the postulate made by Simons (1995; 2000) that an interactive use of MCS favours product innovation. This may be the case in low-innovating companies, but has the opposite effect in high-innovating companies (Bisbe & Otley, 2004). It is possible that an interactive use of control systems may favour innovation in

low innovating companies through guidance for search, triggering and stimulus of initiatives, and provision of legitimacy to autonomous initiatives companies. However, an inter active use of control systems appears to reduce innovation in high-innovating companies, possibly through the filtering out of initiatives that result from the sharing and exposure of ideas (Bisbe & Otley, 2004). Furthermore, they did not find any evidence suggesting that there should be an indirect effect on performance by using MCS interactively. Nonetheless, the proposition that the impact of product innovation on performance is moderated by the style of use of MCS has been supported. The significant moderating effect of the interactive use of MCS on the impact of innovation on performance may result from the direction, integration and fine-tuning that interactive control systems provide (Bisbe & Otley, 2004).

At the end of this deepen analysis; it is possible to resume the strengths and the weaknesses in Simons' framework.

MCS are information feedback systems used to successfully implement a strategy. Four key elements are important here: core values, risk to be avoided, critical performance variables, and strategic uncertainties (Simons, 1995). Each of these elements is controlled by a lever: Belief Systems; Boundary Systems; Diagnostic Control Systems; and Interactive Control Systems. Simons found that interactive MCS such as planning and budgeting are used to set agendas to debate strategy and action plans and that prospectors in general use a lot of forecast data, set tight budget goals and monitor outputs carefully. Simons' research shows that top managers choose between their control systems and make a limited number of them interactive and the remaining part diagnostic. Companies in different strategic settings make different choices as to which control systems should be used interactively and which should be used diagnostic. Missing in Simons' research on MCS and their contribution to innovation is whether the relationship between interactive control systems and innovation is a mediating or moderating relationship. According to Simons the use of interactive MCS can stimulate opportunity-seeking and encourage the emergence of new initiatives. Hence, the interactive use of MCS should foster product innovation. Because innovation is considered to be one of the major determinants of organisational performance, Bisbe and Otley research the indirect effect of the interactive use of MCS on innovation on

organisational performance. They found no verification of a significant relationship between the interactive use of MCS and innovation or between interactive use of MCS and performance, which is contrary to what Simons' states earlier. Bisbe and Otley claim that a mediating model does not help to comprehend the role of the use of formal MCS in influencing the quantity of product innovation.

Bisbe and Otley study whether the impact of innovation on performance is moderated by the style of MCS. The association between innovation and performance is significantly higher when MCS are used interactively than in situations where there is no interactive use of MCS. Hence, there is a significant moderating effect of the style of use of MCS. However, their findings gives evidence that goes against the claim from Simons that innovation correlates positively with interactive use of MCS and that the most innovative companies use their control systems more interactively than do less innovative ones. Their research show that the relationship between interactive use of MCS and product innovation may vary with the level of innovation. There is weak evidence that suggests that an interactive use of formal MCS stimulate creativity and product innovation. However, there is no evidence affirming the statement by Simons that the interactive use of MCS stimulates creativity and product innovation in high-innovating companies. Bisbe and Otley states that the style of use of MCS is very relevant regarding the relationship between innovation and performance in both low- and high-innovating companies. The results of Bisbe and Otley's study emphasize the considerable importance of formal MCS in the pursuit of innovation that can be successfully translated into long-term performance, especially the emphasis on the relevance of the style-of-use of formal MCS. These considerations are important for the thesis, because they explain how MCS work and that they can be used in NPD.

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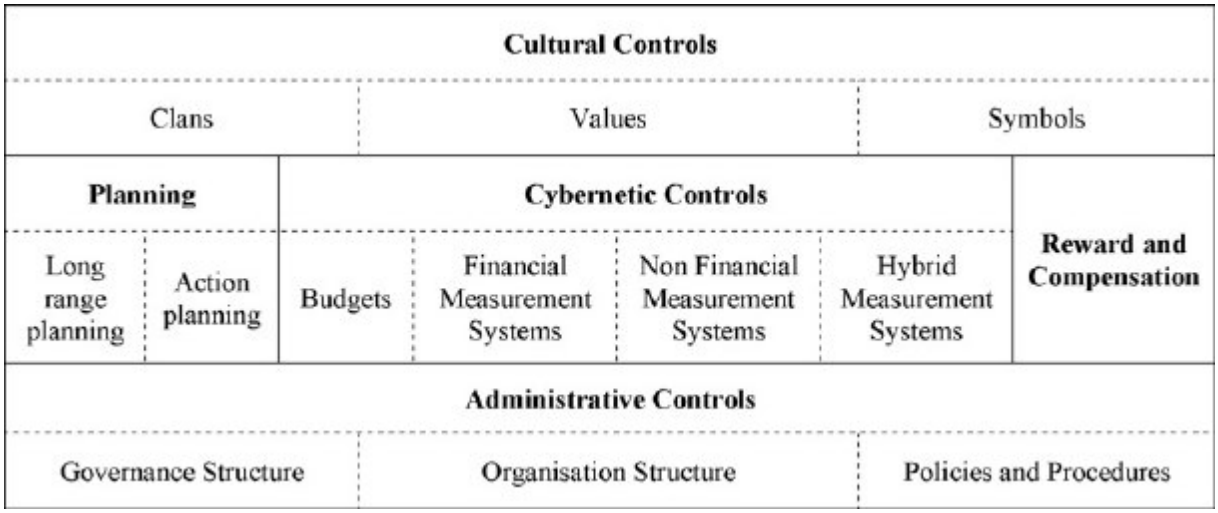
The next section is dedicated to an in-depth analysis of the literature in the management control systems, for better understanding the useful tools in interactively monitoring the NPD process for functional foods producers.

2.3.2 Management control systems framework

Generally, the management control systems are composed of a set of tools distinguishable in those useful to the process of decision-making and to the control.

Considering Malmi and Brown's (2008) framework[75], it emerges that the MCS is composed by 5 elements, each of which has some components (see Figure 17).

Figure 17 Management control systems package



Source 4 T. Malmi, D.A. Brown, "Management Control System as a Package – Opportunities, Challenges and Research Direction", in *Management Accounting Research*, 19(4), 2008, p. 291.

Cultural controls

Cultural controls are broad, yet subtle controls. According to Flamholtz et al. (1985), the organizational culture is defined as «the set of values, beliefs and social norms which tend to be shared by its members and, in turn, influence their thoughts and actions»[76] and it is supported by a range of accounting-related research. Generally, culture can appear as "out of control" but when it is used for regulating behaviours, it can be considered as a control mechanism. In particular, scholars distinguish among value-based controls, symbol based controls and clan controls. About the first one, it is considered the concept developed by Simons defined as belief systems (for further information see the previous paragraph). The impact of values on behaviour, institutionalized through belief systems, works on three levels. The first is when

[75] The MCS is considerd as a package composed by Planning Controls, Cybernetic Controls, Reward and Compensation, Cultural and Administrative Controls. T. Malmi, D.A. Brown, "Managements control systems as a package – Opportunities, challenges and research directions", in *Management Accounting Research*, 19, 2008, pp. 287-300.

[76] E. Flamholtz, A. Tsui, "Toward an integrative framework of organizational control", in *Accounting Organizations and Society*, 10 (1), 1985, pp. 35–50.

organisations deliberately recruit individuals that have particular types of values which match with those of the organisation. The second is when individuals are socialized and have their values changed to fit the organisational values (see Alvesson and Karreman, 2004). The third is when values are explicated and employees behave in accord with them, even if they do not adhere to them personally. For symbol based control, it is intended when the organizations create visible expressions, such as building/workspace design and dress codes, to develop a particular type of culture (Schein, 1997). Finally, it is possible to speak about clan control when Ouchi (1979) developed the concept of a clan in control research. In particular, the clan control is built on the idea that individuals are exposed to a socialization process that raises in them a set of skills and values. This socialization process may relate to groups, such as professions (i.e. doctors or accountants), or groups within organisations which form some other kind of boundary, such as an organisational unit or division. After these considerations it follows that clan controls work by establishing values and beliefs through the ceremonies and rituals of the clan.

Planning controls

The planning represents a form of preventive control, which defines the objectives to be achieved in time fixed. In particular, it sets out the goals of the functional areas of the organisation, therewith directing effort and behaviour; it provides the standards to be achieved in relation to the goals, and clarifies the level of effort and behaviour expected from organisation members. Therefore, planning can enable coordination through aligning a set of goals across the functional areas of an organisation, therewith controlling the activities of groups and individuals to ensure they are in line with desired organisational outcomes. Scholars show two approaches for defining the planning. One focuses the attention on goals and actions fixed for the immediate future (usually 12 moths); whilst, the other one establishes actions and goals for the long term.

Merchant and Van der Stede (2007) propose planning and budgeting as the financial results control systems[77], but, planning can be done with little reference to finance. Furthermore, the planning may have a major role in directing employee behaviour, so it is considered as a separate system in MCS framework analysed.

[77] For further information: T. Malmi, D.A. Brown, "Managements control systems as a package – Opportunities, challenges and research directions", in *Management Accounting Research*, 19, 2008, p. 291.

Cybernetic controls

A cybernetic system would be identified as an information and decision-support system if managers themselves detected unwanted variances and modified their underlying behaviour or activity that influenced the variance (for example in a production process) without anyone else's involvement. The linking of behaviour to targets, and the establishing of accountability for variations in performance takes a cybernetic system from being an information system to support decisions, to a MCS.

Malmi and Brown identify four basic cybernetic systems in MCS research that will be considered in this typology: budgets; financial measures; non-financial measures; and finally hybrids that contain both financial and non-financial measures, i.e. the Balanced Scorecard (BSC). About the first one, they state that is central to, and the foundation of, MCS in most organisations and its use is almost universal. According to Hansen et al., 2003, this is due to its «ability to weave together all the disparate threads of an organisation into a comprehensive plan that serves many different purposes, particularly performance planning and *ex post* evaluation of actual performance *vis a vis* the plan»[78]. Usually, budgeting may have a number of uses, including integration of processes and resource allocation decisions, but as a control mechanism, its focus is on the planning acceptable levels of behaviour and evaluating performance against those plans.

In cybernetic controls are included financial performance measures. Some of these may be related to the budgeting process through using information contained in the budget. However, there is a difference between them, because the budget is a broad, complete technique, whereas financial performance measures can be used in a narrow simple fashion in target-setting.

In recent studies, non-financial measures are becoming an increasingly important part of MCS within contemporary organisations and they may be used to overcome some of the perceived limitations in financial measures and to identify the drivers of performance (Chiesa & Masella, 1996; Hertenstein and Platt, 2000; Davila, 2000). They may also be the result of using other management initiatives, such as TQM (Ittner and Larcker, 1998). Finally, hybrid performance measurement systems contain both financial and non-financial measures. Hybrid forms of performance measurement have been in use for some time, with the earlier approaches including such systems of management by

[78] S. Hansen, D. Otley, W. Van der Stede, "Practice developments in budgeting: an overview and research perspective", in *Journal of Management Accounting Research*, 15, 2003, p. 96.

objectives (MBO) (Greenwood, 1981; Kondrasuk, 1981). In more recent times have been introduced the BSC, useful for translating strategy into action. It is based on four perspectives which are financial, customer, internal business and innovation and learning, oriented to stakeholders (Kaplan and Norton, 1992).

Reward and compensation

In Malmi and Brown's framework, reward and compensation systems are considered alone, because despite they may be strictly linked to cybernetic controls, the organisations may provide rewards and compensation for other reasons, e.g. retaining employees and encouraging cultural control, via group rewards. In particular, this kind of control system is focused on motivating and increasing the performance of individuals and groups within organisations by achieving congruence between their goals and activities and those of the organisation[79]. According to Bonner and Sprinkle, the basic argument is that the presence of rewards and compensation lead to increased effort, as compared to an absence of explicit rewards and compensation.

Administrative controls

In the end, administrative control systems are those that direct employees' behaviour through the organizing of individuals (organisation design and structure), the monitoring of behaviour and who employees are made accountable to for their behaviour (governance); and through the process of specifying how tasks or behaviours are to be performed or not performed (policies and procedures)[80].

The three aspects that compose administrative controls are:

- organisational design, it can be an important control device, as by using a particular structural type an organisation can encourage certain types of contact and relationships.
- governance structure relates to the company's board structure and composition, as well as its various management and project teams. Governance includes the formal lines of authority and accountability (Abernethy and Chua, 1996), as well as the systems which are in place to ensure that representatives of the various functions and

[79] S.E. Bonner, G.B. Sprinkle, "The effects of monetary incentives on effort and task performance: theories, evidence, and a framework for research", in *Accounting Organizations and Society,* 27 (4/5), 2002, pp. 303–345.

[80] R. Simons, "Accounting control systems and business strategy: an empirical analysis", in *Accounting Organizations and Society*, 12, 1987, pp. 357–374.

organisational units meet to co-ordinate their activities both vertically and horizontally.

- policies and procedures are the bureaucratic approach to specifying the processes and behaviour within an organisation.

Starting from the above framework, strictly connected to the aim of this thesis work - exploring management control systems in functional foods production - are the ways that the managers may adopt for monitoring the new product development process[81]. In particular, considering the framework proposed by Bhuiyan (2011), the tools for monitoring a successful new product development process are multiple[82], but, among those, the most used for every stage of development process are the financial and non-financial measures, which are considered under rubric of performance measurement systems (PMS)[83].

* * *

Definitely, in the next section the focus is posed on the performance measurement systems for understanding the tools and considering the detail elements for an efficient and an effectiveness system to implement in firms operating in food and beverage industry, which are developing or developed functional foods.

2.3.2.1 Performance measurement systems

The performance measurement systems (PMS) are considered groups of techniques developed to evaluate organizational performance. Neely et al. (1995) defined PMS as a set of metrics used to quantify both the efficiency and effectiveness of activities. Business organizations have sought to develop a suitable PMS in order to provide managers and employees with necessary information comprising all aspects of main activities at both operational and organisational level. Hall (2008) stated the examples of the popular techniques for defining a wider set of performance measures that are the

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[81] B.J. Zirger, M.A. Maidique, "A Model of New Product Development: An Empirical Test", in *Management Science*, 36 (7), 1990, pp. 867-883; R.G. Cooper, E.J. Kleinschmidt, "Winning businesses in product development: The critical success factors", in *Research-Technology Management*, 50(3), 2007, pp. 52-66.

[82] N. Bhuiyan, "A framework for successful new product development", in *Journal of Industrial Engineering and Management*, 4 (4), 2011, pp. 746-770.

[83] «PMS can be defined as the set of metrics used to quantify both the efficiency and the effectiveness of actions», in A. Neely, M. Gregory, K. Platts, "Performance measurement system design: a literature review and a research agenda", in *International Journal of Operations & Production Management; 25,* 2005, p. 1229.

balanced scorecard (Kaplan & Norton, 1996), *tableau de bord* (Epstein & Manzoni, 1998) and performance hierarchies (Lynch & Cross, 1992). However, the choice of measures of performance is one of the most critical. The challenges for organizations like the measures in it are not a generic independent process that applies to all types of companies. But, PMS is perceived as a system designed for specific organizational characteristics. Hence, the PMS must be structured considering the industry's characteristics for answering to specific needs.

The previous literature ranked measures of performance in terms of financial and non-financial indicators (as above in Malmi & Brown's framework). In this regard, the latter category has been criticized for a long time, because it is ruinous in responding to current developments. But, in another point of view, previous researches have indicated that conventional PMS tend to be folded on itself and the lack of qualitative factors. As a result, the information produced by the traditional approach is often inaccurate and misleading (Drury et al., 1993). In response to these concerns, a number of major innovations in management control have emerged. The measurement of the newly-innovated services, which covering non-financial aspects of operational performance are introduced to provide additional information that could not be provided by traditional approach. Furthermore in early 2000's most recent performance based on non-financial measures have been widely used by the companies over time (Drury & Tayles, 1993; Gomes et al, 2004; Ismail, 2007). A performance measurement system based on a financial/non-financial approach is useful for guaranteeing that the all relevant performance size is considered (Ittner et al., 2003). Therefore, according to Hoque and Adams (2008), this system is capable to provide signals and motivate improvement of crucial activities as the development of a new technology-intensive product. In particular, about the non-financial measures, Banker et al. (2000) argued that the reasons leading proposals for the use of non-financial performance measures are that these measures are better indicators of future financial performance of accounting measures, and are valuable in appraising and motivating managerial performance. This point of view goes against the excessive emphasis posed on the financial measures in the past, which can lead the management to short-term thinking (Gomes et al., 2004). Moreover, Van der Stede et al. (2006) have also shown that non-financial performance

measures are better than financial measures to help companies deploy and manage new initiatives.

For innovative industries the new initiatives are represented by the development of new products, and successful NPD is crucial for the company's competitive advantage (Ribbens, 2000; Ulrich & Eppinger, 2000; Wheelwright & Clark, 1992). Consequently, the use of managerial tools (financial or not) capable of supporting NPD activities has grown in interest as well. For these reasons, it results fundamental focusing the attention on the performance measurement systems for monitoring the development of new products. In particular, a critical issue that manager should confront when attempting to measure NPD process performance is to design a system that fits the context where it is going to be used. Below, it is proposed a table with the suggestions for developing an appropriate PMS.

Table 2 The literature about the PMS design

	References
The basic constitutive elements of a PMS for NPD are: (i) dimensions of performance and related indicators; (ii) structure of the system, i.e., the set of controlled objects whose performance is measured (e.g., individual, functional unit); and (iii) process aspects to be defined for a proper working of the system, i.e., norms to measure performance against, timing and frequency of the measurement, role and tasks of people involved in the system implementation.	Kaplan & Norton, 1992; Kerssens-van Drongelen & Cook, 1997; Kerssens-van Drongelen & Bilderbeek, 1999; Driva et al., 1999; Bremser & Barsky, 2004; Godener & Soderquist, 2004
The design of the PMS constitutive elements should be coherent with the "NPD environment" in which the system is going to be used. This "NPD environment" is basically defined in terms of: (i) critical objectives of the NPD project; (ii) organizational and managerial practices adopted for the NPD process; and (iii) characteristics of the NPD tasks that are going to be internally undertaken.	Kerssens-van Drongelen & Cook, 1997; Frattini et al., 2006
The characteristics of the "NPD environment" depend on a set of higher-level variables e.g., (i) company's business strategy; (ii) competitive context (i.e., rules of competition and competitive pressures); (iii) environmental features (i.e., macroeconomic factors, institutional norms, and social and cultural characteristics). Therefore, these variables indirectly influence the PMS constitutive elements design.	Loch & Tapper, 2002; Sandstrom & Toivanen, 2002; Nixon, 1998; Kerssens-van Drongelen & Cook, 1997
The PMS objectives (e.g., motivating people, supporting decision making, fostering communication) are driven not only by the goals of the NPD project, but also by the adopted management style and the nature of development tasks.	Goold & Campbell, 1987; Frattini et al., 2006
The dimensions of performance traditionally considered in a PMS for NPD projects relate to time, costs, and quality. Moreover, they are generally further disaggregated in order to be actually measured. Economic and financial metrics should be used as well as quantitative nonfinancial and	Soderquist & Godener, 2004; Driva et al., 2000; Loch & Tapper 2002; Sandstrom & Toivanen, 2002; Pawar & Driva, 1999

qualitative measures.	
The elements of the performance measurement system should evolve over time coherently with the progress of the NPD process.	Nixon, 1998
Risk and uncertainty must be considered during the PMS definition.	Davila, 2000
An appropriate definition of the norms (i.e., standards to measure performance against) is necessary to ensure that the measurement system provides useful indications capable of eventually correcting the courses of action. Scenario analysis can be a useful tool for an accurate standard definition.	Burch, 1994; Merchant, 1998
Constraints in human and financial resources available for the implementation and actual use of the PMS influence the design of the achievable objectives and the other constitutive elements.	Kerssens-van Drongelen & Cook, 1997; Frattini et al., 2006

Source 5 F. Frattini, V. Lazzarotti, R. Manzini, "Measuring performance in new product development projects: A case study in the aerospace industry", in *Project Management Journal*, Vol. 38, No. 4, 2007, p. 47.

The table above basically outlines the need to adopt a contextual approach in the design of the PMS. According to Frattini et al. (2007), the managers should consider two main aspects: the characteristics of the NPD environment where the PMS system is going to be used; and, the resources (both human and monetary) that are available for the PMS implementation. These should drive the choice of the PMS' aims, the indicators implemented, the frequency of measurement; and moreover, the PMS internal coherence.

As a consequence, in the last years many studies have been written aimed at discussing the subject and suggesting possible approaches in the indicators choice (among others, Davila, 2000; Hertenstein & Platt, 2000; Syamil *et al.*, 2004; Jorgensen & Messner, 2009, Lazzarotti et al., 2011). In spite of the huge amount of work in the field, the problem of defining a rigorous model for measuring NPD performance in food and beverage industry has not been solved yet. Because the studies focused the attention on the high-tech industry - as: automotive, chemical, pharmaceutical, electric, electronic and telecommunication - without pay attention to food and beverage one, which is venturing in functional foods production.

In general, the performance in high tech industry has been measured considering financial and non-financial measures. As Hertenstein & Platt (2000) showed, in the non-financial measures it is possible to identify ratios that follow the main aspect to measure, for example timing measure or customer satisfaction measures, and so on (Table 3).

Table 3 Financial and non-financial measures for NPD performance

FINANCIAL MEASURES	NONFINANCIAL MEASURES		
Revenue/sales	**Timing Measures**	**Customer satisfaction measures**	**Innovation measures**
Product cost	Time to market	Satisfaction – product	Number of patents
Development process cost - total	Cycle time, by phase	Satisfaction – production of health benefits	Number of new product development
Development process cost – phase	Time to revision	Satisfaction – shelf-life extension	Number of new product introduced
Gross profit – total	Time to break even		Number of new trademarks
Gross profit – new products			Peer evaluation of design work
Cash flow	**Project effectiveness measures**	**Employee – rated measures**	% new health benefits
Net income/Profit	% first projects meet needs	Employee morale	
Economic value added (EVA)	Team assessment of project effectiveness	Team assessment of individual contribution	
Stock price	% project that reach production	Ratio: product managers/ employees	
Market share – product			
Percent sales – new products	**Project efficiency measures**	**Strategic measures**	**Volume measures**
Percent sales – new customers	Number of project modifications	Alignment: NPD project with company strategy	Number of new products in pipeline
Percent sales – repeat customers	Frequency of specification changes	Achievement of specific strategic goals	Number of products started
Percent sales – proprietary products			Number of products completed
Sales to break even			

Source 6 Our adaptation from J. H. Hertenstein, M. B. Platt, "Performance Measures and Management Control in New Product Development", in *Accounting Horizons*, 14 (3), 2000, p. 310.

Many others researches have proposed a different systematization of performance indicators. For instance, Lazzarotti et al. (2011), following the established balanced scorecard approach, classified NPD performance in five perspectives, i.e. financial

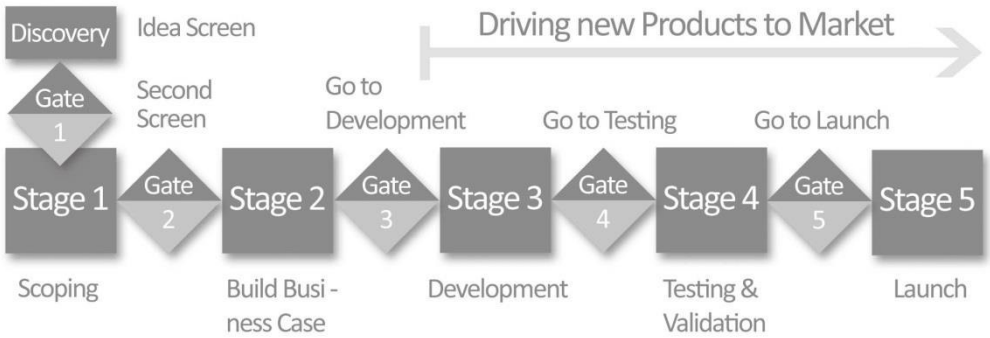
perspective, customer perspective, innovation and learning perspective, internal business perspective and, finally, alliances and networks perspective. In spite of the different ways chosen by scholars for organizing the performance measures, the relevant topic is the need to implement various indexes (financial and non-financial) for better monitoring the main NPD process stages. Indeed, the interactive way for controlling the process is aimed to stimulate search and learning, and to define an inclusive approach for the employees involved in it, in the perspective of improving themselves for solving the continuous emerging issues during the NPD process.

2.3.2.2 The Stage Gate model

Another important management control tool to consider in monitoring the NPD process is proposed by Cooper. In particular, he noticed that many NPD projects are plagued by missing steps, poor organisational design, unreliable data and missing time lines (Cooper, 2008). To avoid or diminish theses consequences, Cooper suggests that companies employ the Stage Gate (SG) model as a conceptual and operational map, in order to provide a more systematic approach, when moving NPD projects from idea to launch (Cooper, 2001) (see Figure 18).

The process is a blueprint for managing the NPD process in order to improve both efficiency and effectiveness. SG is used in many different industries in order to structure the product development and give the decision makers an effective tool for control. The model below is called the SG Development Process and is developed by Robert Cooper through several decades of research into innovation and NPD. According to Griffin (1997) the SG approach is the most widespread system to manage and control the NPD process; consequently it has been selected as the example of formal and structured methods within NPD.

Figure 18 The NPD Stage Gate Process



Source 7 R.G. Cooper, "Stage gate system: a new tool for managing new products", in *Business Horizons*, 1990.

The aim for the SG system is to streamline the NPD process, ensure that all innovation projects pass through standard product development stages, and that decision making and resource allocation process are more uniform for different projects. The system is likely to diminish costs and wastage due to elimination of weaker projects, improve speed to the market, and is a more equitable and efficient way of allocating scarce resources to various projects (Cooper, 2001; Sethi & Iqbal, 2008). Hence, gate evaluation becomes more embedded in the NPD routines as it can improve the company's bottom line.

The SG consists of a series of stages, where project teams obtain needed information and carry out the needed integration and analysis. Every stage in the process is met by a gate. Here the projects potential is analysed and assessed in order to see if it can achieve certain criteria. This can e.g. be profitability, commercial success, value for the company and development opportunities.

In these gates Go/Kill decisions are made in relations to whether to continue with the project or not (Cooper, 2008). Each stage costs more than the previous stage, and the need for commitment increases as you move further in the process. Hence, it is important to design the stages in order to reduce uncertainty and risks (Cooper, 2008). A SG system can vary very much, depending on which industry a company is in and what products that is to be developed. The number of stages and gates can also vary depending on the level of innovativeness and the time to set off the project. In the following a regular SG system consisting of a discovery phase, five gates and stages and a post-launch review will be explained.

The Stages

The SG system as shown above in figure 18 consists of a series of stages, typically four to six, which is individually tailored to the respective company and complexity of innovation. Each of these stages gather information in order to advance the innovation project to the next gate. It is important to keep in mind that the purpose of gathering these information is in order to drive uncertainty down as each stage costs more than the preceding one, which makes it an incremental commitment process (Cooper, 2001). The whole process is cross-functional and consists of a set of parallel activities undertaken by employees from different departments within the company.

The different stages within the SG system are described below.

The NPD process begins with an idea being conceived. This is not an easy task and this stage is pivotal. Companies need great ideas and lots of them. According to Cooper (2001), a prerequisite for idea generation is that the company must have a clear new product strategy, which defines the arenas of strategic focus and tells employees what is in bounds and what is out of bounds.

However, the risk is then that NPD projects will end up consisting of incremental innovation if the arenas of strategic focus are too narrow. Idea generations should be allowed being both top-down and bottom-up in order to secure ideas that are a good mix of creativity and direction, and short term and long-term portfolio planning. Activities in the ideation phase can include seeking new technological opportunities, working with lead users to uncover unarticulated needs, conducting strategic planning exercises to uncover disruptions in the marketplace leading to the identification of gaps and significant opportunities etc. (Cooper, 2001). The ideas that have come out of the ideation process are given on to a person assigned as a focal point whose responsibility is to stimulate, generate and receive new product ideas. This person then brings the ideas to Gate 1, which purpose is to screen the ideas.

Stage 1 is a quick scoping stage determining the project's technical and marketplace value. This stage should be inexpensive and involving almost only desk research consisting of preliminary market and technical assessments and a preliminary financial assessment, which is quick check of the business rationale. This will then culminate in a Go/Kill recommendation and proposed action plans for Stage 2, which will be evaluated thoroughly in Gate 2 (Cooper, 2001).

In Stage 2 all information is gathered and this is the final step before the actual product development begins. If the project is moved on, it enters a phase were much larger investments in the idea is needed. Therefore it is important to have a good business case clearly defining the new product and its attractiveness before starting the development phase (Cooper, 2001). This entails a lot of critical homework which is often neglected in many companies. Market investigations and research are carried out to determine the customer's needs, wants and preferences toward in order to be defining parameters for the new product (Cooper, 2001). Furthermore, it is necessary to make analysis of a company's competitors and do concept testing on potential customers. Together with a detailed financial analysis this comprises the business case, which makes it possible to develop thorough project justification and a detailed project plan (Cooper, 2001). The business case is then presented in Gate 3. The development stage, Stage 3, is where the product comes to life and includes lab and in-house tests. In large projects it is often seen that this stage has built in milestones and periodic reviews in order to have checkpoints for project control (Cooper, 2001). While the development is under way, the marketing activities are also active with continuous market-analysis and customer-feedback.

These activities are iterative so each development prototype is being assessed and given feedback by potential customers in order to reach the best result possible. This ongoing customer feedback and information gathering is essential in order to avoid any surprises including changes in customer preferences or changes in the market due to competing product introductions (Cooper, 2001).

Moved on to Stage 4, the final tests on the actual product is being conducted, which involves in house testing in order to secure product quality and features, pilot production in order to determine product costs and test sales. In Stage 4 it is very possible that some of the tests will give negative results, which implies that the product is being sent back to either Stage 2 for the development of a new business plan or Stage 3 for further development (Cooper, 2001). The purpose of Stage 4 is to validate the project and ensure coherence between development, production and marketing plans, which has been initiated already in the first stages.

Stage 5 launches the product and large investments in marketing may have to be made together with start-up of full production and operations.

The Gates

Following each of the abovementioned stages is a gate, which is often referred to as a Go/Kill decision point. The function of these gates is to control the quality of the ongoing projects, prioritise projects and make the vital Go/Kill decision. They provide an assessment of the quality of the project, ensuring that the company are "doing the right projects" and "doing them right". There is a clear link to efficiency and effectiveness in Cooper's terminology, where efficiency refers to "doing them right", hence focusing on the process and avoiding mistakes and errors.

Effectiveness and "doing the right projects" refers to the quality and achieving the end goal by gathering information on the market, technology and financial issues. Furthermore, the gate is also the place where the path forward to the next stage of the process is decided (Cooper, 2001).

All gates are structured the same and consists of a set of required deliverables, criteria against which the project is judged and defined outputs which includes a Go/Kill decision, action plan for the next stage and a list of deliverables for the next gate. The required deliverables are the visible results that the project team must bring to the gate. These are defined at the previous stage, thereby making management's expectations for the project team very clear. The measuring criteria include both must-meet (mandatory) and should-meet (desirable). The aforementioned is designed to remove misfit projects and revolve around questions such as whether the project is the company's business strategy, are the resources in place etc. These must-meet criteria are Yes/No questions and a single No will trigger a kill decision. The should-meet criteria are desirable factors which are used to prioritise the projects in the company, and could be market attractiveness, ability to leverage core competencies and a sustainable competitive advantage for the product (Cooper, 2001). In particular, the must-meet criteria, in the questions of every stages will be scored and then a decision is taken when the overall project score is determined. Both sets of criteria can include quantitative as well as qualitative criteria. The defined output is the vital Go/Kill decision which comes with an approved action plan for the next stage of the project and a list of deliverables to be discussed for the next gate-meeting.

The people who are making these vital Go/Kill decisions, the gatekeepers, are essential to the whole process. Of course the choice of gatekeepers depends on the industry,

business and organisational structure, but Cooper (2001) has presented some "rules of thumb" that are important:

1 Gatekeepers must have the authority to approve the resources required for the next stage;
2 since resources will be required from different functions, gatekeepers must represent different functional areas;
3 both the amount and seniority can change from gate to gate. In the first gates there are perhaps three or four employees, as spending are relatively low. However, in Gate 3, where financial and resources commitments are more considerable, the gatekeepers are often more senior managers;
4 lastly, there should be continuity in the choice of gatekeepers. The composition of employees should not change totally.

The decision process must neither be too weak nor too rigid. A weak evaluation process will not sort out the projects that are not good enough, hence causing a misallocation of resources, which are scarce. Conversely, having a rigid evaluation process will highly increase the risk of stopping the company's next breakthrough project. This risk is highest in the early stages where the project is only an idea and therefore very fragile if exposed to rigid financial analysis. Furthermore, the evaluation process that takes place in the gates is characterised by uncertainty of information and the absence of solid financial data (Cooper, 2001). Especially in NPD projects with radical innovation, somewhat accurate data are not available for proper evaluation until the end of the development stage or even after testing and validation. The lack of financial data and reliable information is larger in projects with radical innovation than e.g. product extension projects consisting of incremental innovation. Hence, it is possible that there needs to be different evaluation systems and criteria in the first gates than the latter gates if a company wishes to fully benefit from its SG system. There is a review of the different gates and how they differ from each other.

In Gate 1 the idea is examined for the first time and a decision is being taken on whether the project should be moved on, rejected or send back to the ideation stage previous to Gate 1. The knowledge from all the ideas that are not being allowed to move on should be stored in an idea-bank that everyone in the organization has access to and function as a holding tank for inactive ideas. This makes it possible for employees to modify and

update ideas for later use. (Cooper et al., 2002a; 2002b). Ideas pass through a focal point into Gate 1. Here the idea can be passed on to Stage 1, put on hold in the Idea Bank, rejected or send back to the submitter with feedback.

Gate 2 is a second screening much like Gate 1; however here the project is subjected to a more rigorous screen based on the analysis made in Stage 1.

In order to give the green light to the project, Gate 3 has to be passed. This is the final opportunity to reject the project before product development begins and the company ties up a lot of capital, which also means that this gate is a sign-off of the product and the project definition developed in the previous stage. Since it requires heavy investments in the following stages, the financial analysis is an important part of this screening. Just as in Gate 2 there are a set of must-meet and should-meet criteria that has to be approved before a go-decision can be made and the project can be moved on to Stage 3. In the approval of the project in this gate lies also the designation of the whole project team, which will be part of the products development (Cooper, 2001).

In Gate 4 the quality of the development is examined and the financial plans are being reviewed. This gate works as a post-development review with the intention of securing continued attractiveness of the whole project. Testing plans for next stage are being examined and approved and the detailed marketing plans are being reviewed for future execution (Cooper, 2001).

Gate 5 is the final gate which opens the door to full commercialisation, hence also the last gate where it is still possible to kill the product. There is focus on the results from Stage 4 and in order to continue to market launch, the expected financial return and start-up plans are in focus, and marketing and operations plans are reviewed once more and approved for implementation.

Some months after the product has been successfully launched on the market, a post-launch review is conducted, which closes down the new product project and integrating the new product in the company's regular product portfolio (Cooper, 2001). The project group and the product is reviewed one final time based on data such as revenue, sales, profit and product performance.

2.4 New product development context

2.4.1 NPD success factors

In the last three decades, multiple factors (i.e. the first mover advantages, the fast product introductions, more demanding product functionality and shortening life cycles) have promoted greater dynamism in innovative companies. So, the new product development has become an important hinge for achieving competitive advantage.

For these reasons, many scholars considered relevant the process of new product development and focused their attention on the way for doing the process better.

The first studies about the new product development have been conducted as case studies for describing each phase of the process. One of the earliest studies on the success factors of NPD was conducted by Myers and Marquis (1969), who have focused their attention on products and process innovation. They noticed the importance of identifying and understanding the user's needs for a successful NPD process. Moreover, another key finding was the importance of organizational communications, both internal and external. Consequently, Myers and Marquis' research has suggested the need for strong interfaces between the groups/departments involved in NPD process, particularly between R&D and marketing.

A second interesting stream of research about NPD success factors use an opposite point of view. Indeed, Hopkins (1980) and Cooper (1975) analysed the reasons of failure for new product launching. In particular, they identified as the principal causes for failure the poor market research and the ineffective product marketing. Furthermore, the studies highlighted other issues in marketing, for example an inadequate assessment of market potential, a poor understanding of competitor's strengths and weaknesses, and an inaccurate product pricing.

From the previous studies cited it emerges a common denominator, a successful innovation comes from a better understanding of customers' needs and an effectiveness marketing activity.

But, these results should not be generalized because they may be viewed as an attempt to understand the issue, considering only success or failure factors in a new product development. Hence, all researches may not provide a full understanding of the differences in the product development processes, external environments, internal organization structure, firm's strategies and others factor that influence a product's outcome.

The first comparative study of product success and failure was conducted by the Scientific Activity Predictor from Patterns of Heuristic Origins (SAPPHO). They investigated 43 successful and ruinous new product launched. The products were selected from two unrelated industries for identifying possible effects linked to industry. The study concluded that product success was related to the understanding of user needs, the attention to marketing and publicly, efficiency of development, effective use of outside technology and external scientific communication, seniority and authority of the managers' responsible for the development of the product. So, the SAPPHO's research confirmed three of prior researchers' findings and identified two new success factors, which were related to organization's characteristics. Firstly, the role of R&D departments results decisive for developing a new successful product. Secondly, it was emerged the need for an executive champion, as a senior manager who fought for the product. Indeed, he/she facilitates the allocation of resources to the development effort, stimulating the cooperation between the team.

Many others studies have been conducted, in several countries, following SAPPHO's model. One of the most interesting researches that introduced some novelty was conducted by Cooper (1979), who studied pairs of product successes and failures that had been developed by the same firm in the same industry. This methodology allowed identifying differences linked with project team and organization's characteristics. The survey have been conducted through mails, interviewing the general managers, who had to rate the successful and failed products along 77 dimensions, which described the organization, the environment and the characteristics of the NPD process. At the end of the survey emerged that: having a product unique and superior in the eyes of the consumer; having marketing knowledge and proficiency; having technical and production synergy and proficiency; avoiding markets in which many new products are introduced; avoiding pricing the product higher than competitive alternatives; avoiding markets which are very competitive and where customers are very satisfied; avoiding products, customers, markets and technologies which are new to the firm; being in high need, high growth, large market; having marketing and managerial synergy; allowed developing a successful new product.

Moreover, Cooper and Kleinschmidt (1987) replied the study and concluded that the three most important success factors were:

- project definition and "up front" activities;
- marketing and technological synergy;
- product superiority.

Definitively, from Cooper's researches emerged two relevant dimensions of successful product development. On one side, he highlighted that the market conditions such as market segment's potential size and growth are positively related to successful product development programs. On the other side, he underlined the importance of developing a technically superior and innovative product. Farther, the research above suggested that to succeed new products should capitalize not only on market expertise but also on R&D and production capabilities.

Despite the important contribution to the stream research doing by Cooper, he did not considered the other two relevant aspects in a successful NPD process, i.e. the interfaces between functional groups such as marketing and R&D (Rubenstein et al., 1976; Sounder and Chakrabarti, 1978; Gupta et al., 1985), and the influence of a key sponsor like a senior manager (Myers and Marquis, 1969; Rothwell, 1972).

Furthermore, the studies examined did not include a comparison between the major research intensive industries, which represent a fundamental pillar in Western Countries. The technological innovative industry is characterized by a short product life cycle, where a significant portion of their revenues are derived from new product introductions, and with high development costs. Starting from the last considerations, Zirger and Maidique (1990) conducted a study on 330 electronics product successes and failures. The research has been structured in three parts, two exploratory surveys, a case study validation and an empirical testing of the model built. The authors' conclusions have been that the excellent internal organization was important; products that had top management commitment and were built on existing corporate strengths were also likely to be successful; products factors were critical; successful products provided superior customer value through enhanced technical performance, low cost, reliability, quality, or uniqueness; and at the end the market factors also affected product success.

Table 4 A Schematic Rational Plan perspective review

Study	**Myer & Marquis**	**SAPPHO**	**Cooper (1979)**	**Cooper & Kleinschmidt (1987)**	**Zirger & Maidique (1990)**
Sample	567 successful	43 successful/fa	102 successful &	123 successful & 80 failed	86 successful/failure product pairs

	products	ilure product pairs	93 failed products	products	
Context	UK construction, railroad & computer firms	UK chemical & instrument firms	103 Canadian industrial firms	125 Canadian manufacturing firms	86 US Fortune 1.000 electronic firms
Perfor-mance measure	Product revenue or saving in production	Profitability and market share of product	Profitability of product	11 financial measures, including profitability, market share, relative revenues	Profitability of products
Key results	- Market pull -Cross functional	-Understand user needs -Involved senior manager	-Products unique or superior in customer's eyes -Market with high growth, not competitive, unsatisfied customer -have synergy across different functions	-Clear concept -Attractive in size and growth potential -Have synergy across different functions - senior management is supportive - predevelopment planning of work	-Synergy with competencies, better because of cost of quality or uniqueness -Large and growing market -High internal communication in cross functional teams -Senior management supportive

Source 8 S.L. Brown, K.M. Eisenhardt, "Product development: past research, present findings, and future directions", in *Academy of Management Review*, 20, 1995, p. 349.

More recently, other authors have identified specific aspects for a successful new product development in research intensive industries. Overall, according to Brown and Eisenhardt (1995), the successful product development is the result of rational planning and execution. In particular, successful products are more likely when the product has marketplace advantages, is targeted at an attractive market, and is well executed through excellent internal organization. This one is conceptualized as carefully planned predevelopment activities, execution by competent and well-coordinated cross-functional teams playing on the synergies of the firm, and significant support from top management. This broad approach leads to an excellent and a comprehensive overview of the product development process, which emphasizes features of the product, internal organization, and the market.

Definitively, the research stream considered results really important in creating an early and broad understanding in which factors are essential for successful product

development and for emphasizing the role of the market in what is often conceived of as a purely technical or organizational task.

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Understood the success factors for doing the new product development process, it is analysed the specific functional foods context, for defining its main aspects and investigating the opportunities to implement the two management control tools proposed in previous paragraphs.

2.4.2 Functional Food Product Development context

Over the last three decades, the potential to gain higher returns and to generate a competitive edge has led the food, pharmaceutical and retail business to enter in this lucrative market[84].

On the other hand, the new food products launched into this market are characterized by a high failure rate, for this reason it results difficult for people managing the NPD process, and understanding what is the better way for doing it and its probability of success[85]. Furthermore, Kleef et al. describe the product development process for new functional food products as complex, expensive and risky.

In particular, functional food product development (FFPD) may be carried out on the principals of radical/discontinuous product innovation process which differ from conventional NPD approach; because discontinuous innovations have a higher degree of technological uncertainty (Davila, 2000) and longer development time with a sequence of innovations (Garcia & Calantone, 2002; Veryzer, 1998). Moreover, the lack of customer familiarity and the uncertainty of suitable applications also affect the NPD method for these products. Strictly linked to the little knowledge about functional foods by the consumer is the little possibility to do a market assessment and a financial analysis before starting to produce these products (Veryzer, 1998).

According to Veryzer (1998), the firms involved in FFPD can only develop a prototype to explore and formulate the technology application; at the same time, the customers

[84] For further information, see: E.V. Kleef, H.C.M.V. Trijp, P. Luning, W.M.F. Jongen, "Consumer-oriented functional food development: how well do functional disciplines reflect the 'voice of the consumer'?", in *Trends in Food Science and Technology, 13*, 2002, pp. 93-101.

[85] As Hardy shows in his research, N. Hardy, Future innovations in food and drinks to 2015, *NPD, trend convergence and emerging growth opportunities* (p. 152). London: Business Insights, 2010. T.J. Hoban, "Improving the success of new product development", in *Food Technology 52* (1), 1998, pp. 46-49.

have not knowledge about the products analysed, for these reasons the FFPD cannot be driven by the customers as is the case for traditional food NPD. Therefore early involvement with customers is not favourable to test product ideas or collect data until a product application is formulated and developed. Definitively, the traditional new product development process is not suitable for FFPD (Khan, 2014).

Rudder et al. confirm that there is little consensus as to what is the right or wrong way of doing NPD in the food industry[86]. In spite of an intensive academic work about the market size, economic environment and cultural aspects of the firm, the successful FFPD process still remains unresolved for the food manufacturers, academics and researchers alike[87].

In order to better develop the functional food product, a review of current literature about the major critical aspects is presented below.

A. The firm capability to implement a successful FFPD process may be strategically related to the willingness to engage in true innovations. It is strictly linked to the core competencies and orientation of the business. Indeed, as Dess et al. (1999) noticed, a firm active in the industry for years tends to be conservative in developing very innovative products, because it has an inflexible organizational structure, an obsolete culture, the employees' inertia.

[86] A. Rudder, P. Ainsworth, D. Holgate, "New food product development: strategies for success?", in *British Food Journal, 103*(9), 2001, pp. 657-671.

[87]For further information, see: S. Broring, "How systematic innovations require alterations along the entire supply chain: the case of animal-derived functional foods", in *Journal on Chain and Network Science, 8*(2), 2008, pp. 107-119; S. Broring, L.M. Cloutier, J. Leker, "The front end of innovation in an era of industry convergence: evidence from nutraceuticals and functional foods", in *R & D Management, 36*(5), 2006, pp. 487-498; M. Heasman, J. Mellentin, *The Functional Foods Revolution: Healthy people, healthy profits?* London: Earthscan Publications Lt, 2001; C. Mark-Herbert, *Functional food for added value. Developing and marketing a new product category.* (PhD), Swedish University of Agricultural Sciences, 2002, Uppsala; C. Mark-Herbert, "Development and marketing strategies for functional foods", in *AgBioForum, 6*(1&2), 2003, pp. 75-78; C. Mark-Herbert, "Innovation of a new product category - functional food", in *Technovation, 24*, 2004, pp. 713-719; P. Matthyssens, K. Vandenbempt, L. Berghman, "Value innovation in the functional food industry: Deviations from the industry recipe", in *British Food Journal, 110*(1), 2008, pp. 144-155; M. J. Playne, L.E. Bennett, G.W. Smithers, "Functional dairy foods and ingredients.", in *The Australian Journal of Dairy Technology, 58*(3), 2003, pp. 242-264; F. Siedlok, P. Smart, A. Gupta, "Convergence and reorientation via open innovation: the emergence of nutraceuticals", in *Technology Analysis and Strategic Management, 22*(5), 2010, pp. 571-592; C. Stanton, R.P. Ross, G.F. Fitzgerald, D. Van Sinderen, "Fermented functional foods based on probiotics and their biogenic metabolites", in *Current Opinion in Biotechnology, 16*(2), 2005, pp. 198-203.

Generally, the focus of NPD in high tech businesses (with attention on automotive), is responding to customer needs and customer satisfaction[88] (market oriented NPD), or on cost reduction (automotive, Syamil et al., 2004), or high degree of specialization (aerospace, Lazzarotti et al., 2011). These aspects can be identified as part of a process oriented approach to innovation[89]. Instead, Cooper (2003) shows that the market orientation represents a key success factors in NPD, but the functional foods require additional technological capabilities and innovation capacities of a firm to incorporate new nutritional science and technology, concurrent with emerging market demands, into new food products simultaneously. Hence, for a company which wants to introduce truly differentiated product innovations, it is fundamental to make a shift from a dominantly market-oriented NPD to more product-oriented NPD (Bryan & Ferrell, 2000; Gehlhar et al., 2009). These changes can be expected to influence the prioritization of core competences of a company to be built in–house, while outsourcing supplementary skills or competencies (Traill & Mueulenberg, 2002). Other factors such as the size and nature of ownership of a company may play a critical role in its orientation towards FFPD program (Gehlhar et al., 2009). It has been argued that branded manufacturers may have a better chance of developing innovative functional food products by exploiting their product-oriented technological skills and established marketing resources (Gehlhar et al., 2009).

B. Howe describes the knowledge generation in functional foods development process as «the exploration and transformation of diet-disease link/relation or concept, generated by the nutritional, food science or even biotechnology, into consumable food products which will offer unique consumer value with a greater economic activity eventually[90]». The result of knowledge process is the generation of research focusing on the improvement of physiological function in the human body by a functional ingredient incorporated in new food products and tested for its efficacy. In a cascading approach, the knowledge generation could be represented as below:

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[88] K. Sanonpong, "Automotive process based. new product development: a review of key performance metrics", during the World Congress on Engineering 2009, Vol I WCE 2009, July 1 - 3, 2009, London, U.K.

[89] M.J. Gehlhar, A., Regmi, S.E. Stefanou, B.L. Zoumas, "Brand leadership and product innovation as firm strategies in global food markets", in *Journal of Product and Brand Management, 18*(2), 2009, pp. 115-126.

[90] P.R.C. Howe, "What makes a functional food functional?", in *Asia Pacific J Clin Nutr, 9*(Suppl.), 2000, pp.108-112.

Figure 19 General pattern of new functional food development

Source 9: P.J. Jones, S. Jew, "Functional food development: concept to reality", in *Trends in Food Science and Technology*, 18, 2007, pp. 387-390.

In this context, new specialist skills are required to generate analytical knowledge, attaining proven clinical efficacy, extended product development time, securing intellectual property (IP) and lastly financial resourcing of FFPD projects. It has been observed that scientifically proven health claims and subsequent acquisition of exclusivity rights of using novel ingredients in functional food products represent a critical success factor for those foods in the market (Hardy, 2010). Many Scholars noticed that the limited R&D budget and the lack of time to conduct effective clinical trials, which characterized the food industry, have represented a limit for the acquisition of the evidence. While, for instance, the pharmaceutical industry has an extra knowledge in developing new biomedical ingredients and providing clinical efficacy, but lack experience and skills in understanding how to compete successfully in food markets. The research institutes and universities can offer an inexpensive and lower risk source of new scientific and technological knowledge (explorative intent) in accumulating the necessary knowledge for developing truly innovative food products (Nieto & Santamaria, 2007; Tether, 2002). Therefore, the food industry could think to cooperate with research institutes for developing high tech products with the minimum investment in R&D. Clearly, it is only possible if firms have the ability to capitalize those knowledge sources.

C. The definition of resources needed in the new innovation models derives from the integration between the innovation strategy and the business strategy, as well as from the capability to understand if and how integrating the internal resources with the

external. Those aspects are two fundamental pillars in developing innovative products. In particular, the innovative model needs a careful selection process of external partners to efficiently bridge the resources required by business. According to Heasman and Mellentin (2001), the choice of external partners is strictly connected to the kind of innovation approach, which could be open, closed or open source development.

In presence of simple new ingredients and minimum competition among competitors, the collaborations are built with suppliers, who formulate new ingredients and, occasionally, test them in clinical studies. During the last 20 years, the changing needs have led suppliers to become full service providers for fostering radical product innovations (Sadler, 2005). The full-service business model may become more common within the ingredient industry as it offers a wider range of applications to manufacturers including: the ability to create recipes; product samples; and, provide technical assistance and scientific support. These full-service providers have the ability to secure their business innovations with patents and trademarks, which may support the fostering of radical product innovations in the food industry (Mortara & Minshall, 2011; Sadler, 2005). Despite the innovative evolution of food suppliers, the complexity of FFPD, the significant cost of clinical trials, the legislation that gives more importance to product's clinical efficacy and a small one to ingredients' efficacy, may push food manufacturers to work in open collaboration with a variety of external partners and not only with suppliers.

In particular, Chiaroni et al. (2011) have noticed that the heterogeneous networks of collaborative partners in developing innovative food products will become increasingly more prevalent compared to homogeneous network of only one type of partner. Especially, the role of pharmaceutical and nutraceuticals companies, food ingredient companies, packaging companies, nanotech firms and research institutes are important in functional food development (Chiaroni et al., 2011; Mark-Herbert, 2004; Sarkar & Costa, 2008; Tether, 2002). However, the food companies must develop internal capabilities and a receptive company culture to absorb the external

knowledge[91]. Definitely, the external collaborations may become more important in functional foods development, one of fastest growing sector of food industry.

* * *

The table below summarize the critical factors for functional foods development.

Table 5 Critical factors for functional food development

Critical factors for functional food development	FFPD
Orientation towards innovation	More product-oriented NPD – developing new markets by exploiting technological supremacy (Gehlhar et al., 2009; Kleef et al., 2002; Traill & Mueulenberg, 2002)
Knowledge generation	More focus on analytical novel knowledge - learning by exploring (extensive R&D (Traill & Mueulenberg, 2002)), creation of endogenous and exogenous knowledge to build globally unique competencies (Asheim & Coenen, 2005; Siedlok et al., 2010), focused on extensive R&D, time and financial resources (Mark-Herbert, 2004) for developing scientific standards and food technological complexities (Kleef et al., 2002) Generally health awareness trends & technological push (Benkouider, 2003; Jones & Jew, 2007; Kleef et al., 2002; McNaughton & Green, 2002) Out-competing (technological supremacy+ market knowledge) (Traill & Mueulenberg, 2002)
Development of a resource base of a company	Adopt open source development or open innovation (Broring, 2008; Broring et al., 2006) Develop a combination of technical/medical & production skills (Mark-Herbert, 2004; Matthyssens et al.,2008) and marketing skills
Cooperative arrangements	Diverse and multiple stakeholder interactions (Ray, 2004; Sarkar & Costa, 2008; Siedlok et al., 2010), continuous and persistent relationships- building trust (Mortara & Minshall, 2011), stretch the boundaries of industrial competitors: New competitors & partners e.g., pharmaceuticals, ingredients suppliers, research organizations, research institutes (Beckeman & Skjoldebrand, 2007; Broring et al., 2006; Hardy, 2010; Matthyssens et al., 2006; Ray, 2004; Siedlok et al., 2010)

Source 10 R.S. Khan, Characterisation of food product innovation with reference to bioactive functional food product development: an Asia-Pacific study, phd thesis, 2014, pp. 21-22.

[91] For instance, the current literature shows that the open innovation/open source innovation model as adopted by General Mills, Kraft and Cadbury, and the named "connect+develop" model introduced by Procter & Gamble (P&G) have produced promising results in identifying and selecting external partners and developing cooperative networks within the organization as well as outside the organization.

2.5 Research questions / work questions

The main reason can be linked to the traditional view of this industry. Indeed, the new product development process in food and beverage industry is characterized by: little investments in R&D, because the new products launched are "me too" products; a demand driven by consumers (demand pull) (Broring, 2008; Broring et al., 2006; Costa & Jongen, 2006; Gehlhar et al., 2009; Mark-Herbert, 2004; Matthyssens et al., 2008); the knowledge generation influenced by learning by doing approach's (Asheim & Coenen, 2005); collaborative arrangements only with suppliers, who provide services to food & beverage firms starting from developing customized new ingredients to marketing of new formulations (Sadler, 2005).

However, the increasing attention on health and well-being to reduce the risk of disease has led the market growth of a new kind of products, called functional foods (FF). The health-oriented foods are foods to which a component has been added or has been removed (Diplock et al., 1999; Roberfroid, 2002), in halfway between traditional foods and drugs, exposed to specific and dynamic legislation (Bech-Larsen & Scholder, 2007) and that need a technological development - not only for the production of functional ingredients (Meyer & Landbo, 2003; Bornscheuer, 2003), but also for protect the freshness during the process of storage (Siegrist et al., 2007).

Therefore, from these considerations concerning the FF, it would like to investigate the management control systems used in the process of development of functional foods. Considering the literature analysed in the field of MCS (with particular attention on PMS), the authors have focused the attention on industries characterized by:

- a great importance in the development process of new products; a high degree of technological diversity of the sector; and, a variety of product strategies (medical, Davila, 200);
- a complex products; relatively long development times; frequent and costly engineering changes and great emphasis on cost reduction (automotive, Syamil et al., 2004);
- a very strong competition; high degree of specialization; high capability to implement product design features reflecting the evolution developed by large industrial firms or consortia (Aerospace, Lazzarotti et al., 2011).

Despite its characteristics, the functional foods development has not been explored until now. Indeed, the functional foods production is undergone to periodical external controls on ingredients used and the products healthy; characterized by complex ingredients development and laboratories arranged, with high degree of specialization in people involved in NPD.

Moreover, about the development process and, then, the Stage Gate system implementation, some authors investigated industries as: electronical, telecommunication, automotive (Hertenstein & Platt, 2000). But the functional foods development process has not been considered; therefore the aim of the research is to explore the FFPD on the basis of its specificities, for understanding the possibility to introduce the previous system.

According to the literature, a critical factor for the FF development is the orientation towards innovation, because a successful FFPD may be strategically related to its willingness to engage true innovations, which is in turn related to the orientation and core competencies of the business. Market orientation has been one of the key success factors for NPD program (Cooper, 2003); however, successful FFPD requires additional technological capabilities and innovation capacities of a firm to incorporate new nutritional science and technology, concurrent with emerging market demands, into new food products simultaneously. Hence, the FFPD needs a product oriented approach for introducing truly differentiated product innovations (Bryan & Ferrell, 2000; Gehlar et al., 2009). Another relevant aspect to consider is the knowledge generation because the knowledge process in FFPD can be considered as generating research focusing on the improvement of a physiological function in the human body by a functional food ingredient, with successful ingredients then being incorporated into new food products and tested for efficacy (Bech-Larsen & Scholderer, 2007; Heasman & Mellentin, 2001; Jones & Jew, 2007; Menrad, 2003; Siro et al., 2008). Definitively, the knowledge generation activities required new specialist skills to generate analytical knowledge (which can then be converted into fundamentally innovative new functional food products), attaining proven clinical efficacy, extended product development time, securing intellectual property (IP) and lastly financial resourcing of FFPD projects. The collaborative network and arrangements represent an important lever for FFPD success, because understood the health oriented foods features, emerges the need to cooperate

with specialist not only internal at the firm, but external too. For instance, it may be considered the universities and research institutes which invest in new ingredients innovation. In this way, firms can only collaborate with these institutes and have all new ingredients/know-how without direct investments in their R&D department. Strictly linked to cooperative arrangements is the development of a resource base of a company. In particular, in FFPD the single firm could not have enough money for developing new products alone, therefore the firm is based on a different knowledge landscape, with a different logic about the sources and uses of ideas. It is spoken about Open Innovation, that means that valuable ideas can come from inside or outside the company and can go to market from inside or outside the company as well (Chesbrough, 2003). This approach places external ideas and external paths to market on the same level of importance as that reserved for internal ideas and paths to market during the Closed Innovation era.

Definitively, the aim of the research, starting from the literature review, is to explore management control systems in functional foods production, considering the two tools analysed for an interactive monitoring of a NPD process.

Starting from the literature review and the stated aim, the research questions are:

- What effect has the development of the new functional product on management control systems?
- How the FFPD is monitored during itself?
- How the FFPD critical aspects could lead the implementation of interactive control systems (Stage Gate model and/or performance measurement)?

Chapter 3 - Methodology

3.1 Introduction

This chapter initially describes the research approach taken in investigating the aims and objectives of this thesis. The theoretical framework of the research is then presented. A detailed review and description of the cited methods and tools of data collection have also been included with a justification for selecting particular method. Techniques for data analysis are also covered.

3.2 Research Approach

The aim of the research is to explore management control systems for monitoring the performance of new product development processes in food and beverage industry, with particular attention on innovative health-oriented food products, called "functional foods" (FF). The interest in functional foods is linked to their exponential market growth - representing the fastest growing food sector in the last 20 years (Euromonitor, 2015) - led by today's social, cultural and demographic factors[92].

The management control systems proposed for analysing the performance of new product development processes (among others, Davila, 2000; Hertenstein & Platt, 2000; Syamil *et al.*, 2004; Jorgensen & Messner, 2009) have been developed and tested for products of the automotive, chemical, pharmaceutical, electric, electronic and telecommunication industries, that are different from functional foods for many reasons. In particular, functional foods production is exposed to specific and dynamic legislation, the new ingredients represent a discontinuous product innovation as it involves uncertainty in technology and market[93]. Therefore the conventional NPD approaches for managing product innovations may not be suitable[94].

For these reasons, it is defined the need of specific performance measures for functional foods.

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[92] L. Liberatore, Merceologia degli alimenti, FrancoAngeli Editore, Milano, 2015.

[93] R.V. Veryzer, "Discontinuous Innovation and the New Product Development Process", in *The Journal of Product Innovation Management,* Volume 15, Issue 4, 1998, pp. 304–321.

[94] R.S. Khan, *Characterisation of food product innovation with reference to bioactive functional food product development: an Asia-Pacific study* (PhD), Institute of Food, Nutrition and Human Health, Massey University, New Zealand, 2014.

3.3 Principles of case study approach

There are only few studies that have investigated food businesses for the functional food product development[95]. These studies have used mainly a single method approach, qualitative or quantitative, and have left out the characteristics of individual companies operating in the market with interesting results. It is fair to say that this research area is yet to be explored in depth; therefore the newness of this study has led this project to adopt a case study approach. This approach would be preferred to the others when the main research question are "what", "how" or "why" questions, a researcher has a little or no control over behavioral events, and the focus of the study is on a contemporary phenomenon. Doing case study research remains one of the most challenging of all social science endeavors.

For this reason, the methodology for well understanding how the study will be conducted is analyzed.

* * *

The case study is a research strategy which focuses on understanding the dynamics present within single settings[96]. This method embraces the full set of procedures needed to do case study research which includes designing a case study, collecting the study's data, analyzing the data, and presenting and reporting the results.

Doing case study leads to make a choice among different approaches proposed by some authors interested on this method. In particular, Yin's approach is the most methodological because he proposes some steps to follow for constructing a good case study[97]; Merriam proposes to use the case study for qualitative analysis to well understand the strategy[98]; while Stake offers his view of case study as a highly

[95] S. Broring, "How systematic innovations require alterations along the entire supply chain: the case of animal-derived functional foods", in *Journal on Chain and Network Science, 8*(2), 2008, pp. 107-119; S. Broring, L.M. Cloutier, J. Leker, "The front end of innovation in an era of industry convergence: evidence from nutraceuticals and functional foods", in *R&D Management, 36*(5), 2006, pp. 487-498; C. Mark-Herbert, *Functional food for added value. Developing and marketing a new product category.* (PhD), Swedish University of Agricultural Sciences, Uppsala, 2002; P. Matthyssens, K. Vandenbempt, L. Berghman, "Value innovation in the functional food industry: Deviations from the industry recipe", in *British Food Journal, 110*(1), 2008, pp.144-155.

[96] K.M. Eisenhardt, "Building Theories from Case Study Research", in *The Academy of Management Review*, 14(4), 1989, pp.532-550.

[97] R.K. Yin, *Case study research: Design and methods*, Thousand Oaks, CA: Sage, 1984.

[98] S.B. Merriam, *Qualitative research and case study applications in education*, San Francisco: Jossey-Bass, 1998.

interpretative endeavor[99]. Not only the previous authors worked to develop case study methodology, but others focused their attention on it. For instance, Sutton and Callahan pioneered a clever use of a resident devil's advocate[100], the Warwick group added triangulation of investigators[101], and Bourgeois and Eisenhardt developed cross-case analysis techniques[102].

For Yin properly doing case study research means addressing five traditional concerns about case study: by conducting the research rigorously, avoiding confusion with teaching cases, knowing how to arrive at generalized conclusions if desired, carefully managing the level of effort, and understanding the comparative advantage of case study research.

From these considerations, the case study would be conducted following some phases as showed in Figure 20.

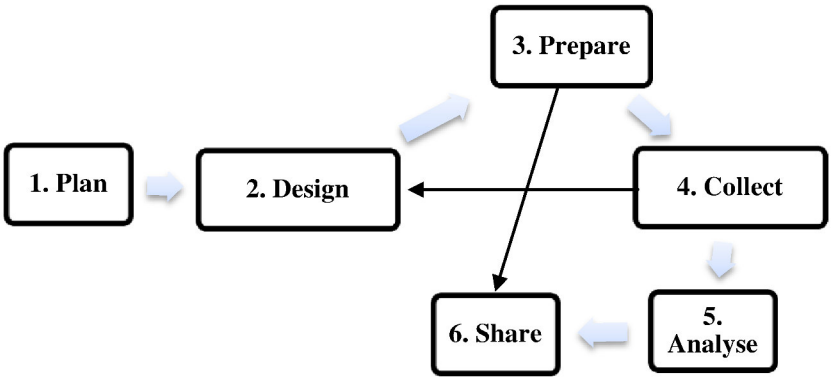
[99] R.E. Stake, The case study method in social inquiry, in R. Gomm, M. Hammersley, & P. Foster (Eds.), *Case study method: Key issues, key texts* (pp. 20-26). London: Sage, 2000.

[100] R. Sutton, A. Callahan, "The stigma of bankruptcy: Spoiled organizational image and its management", in *Academy of Management Journal*, 30, 1987, pp. 405-436.

[101] A. Pettigrew, "Longitudinal field research on change: Theory and practice", Paper presented at the National Science Foundation Conference on Longitudinal Research Methods in Organizations, Austin, 1988. For further information about triangulation of interviews: H. Neergaard H., C.M. Leitch, *Handbook of Qualitative Research Techniques and Analysis in Entrepreneurship*, Edward Elgar Publishing, 2015.

[102] K.M. Eisenhardt, "Building Theories from Case Study Research", in *The Academy of Management Review*, 14(4), 1989, pp. 532-550.

Figure 20 Linear process for doing Case Study Research



Source: R.K. Yin, Case study research: design and methods, Thousand Oaks, CA: Sage publication, 2014.

3.4 Research Design

3.4.1 Doing Case study (Plan)

In every empirical research, the definition of topic to investigate represents the basis of study and it is strictly connected to the choice of more useful investigation methodology. After doing a deepen literature review (Chapter 2) and posing the careful and thoughtful research questions (§ 3.3), would be important dedicate some time to formal and explicit procedures for conducting the research. Along these lines, in this chapter I would show all procedures included in case study method, which allow protecting against threats of validity, maintaining a chain of evidence, and investigate and test rival explanations.

The Case study approach can be used in many situations, for contributing to knowledge of individual, group, organizational, social, political and related phenomena. For these reasons, the methodology has been a common research method in many study fields, for instance in psychology, education, business, and so on.

The reasons for choosing case study approach are linked to three conditions: the type of research question posed, the extent of control a researcher has over actual behavioral events, the degree of focus on contemporary events. About the first condition, "what" questions may either be exploratory - in my case, the research would be explore the effect of functional production on performance management systems – and, "how" and "why" questions are more explanatory and likely to the use of a case study method[103]. As regards the others two conditions, the case study is preferred for examining contemporary events and when the relevant behaviors cannot be manipulated, because case study's strength is its ability to deal with a full variety of evidence, not only documents or artifacts, but interviews and direct observations.

[103] Please note that it is possible to distinguish positive to interpretive case studies. Both types of studies fit Yin's definition, but they use case studies in very different ways. Positive case studies present objective facts which should ultimately lead to generalizable findings, but further quantitative work is usually needed for (statistical) generalization. Hence, the case studies can only be exploratory - providing insights and propositions which could be tested through statistical analysis of large samples. In contrast, interpretive case studies are grounded in subjective understandings, which provide local explanations of the social phenomena of interest. Hence, such case studies should seek to be explanatory; providing ways of understanding the nature of accounting and management practices as social phenomena.

At the end, the benefits to apply case study methodology to social science are: the in-depth analysis of a single or multiple cases, the contemporary set of events emerged, and the little or none control by researcher on results.

After understanding the benefits of case study approach, it is needed to consider risks or disadvantages linked with it. Frequently, case studies are criticized as "not generalizable", because generalizations are usually based on a multiple set of experiments that have replicated the same phenomenon under different conditions. However, case studies are generalizable to theoretical propositions and not to population or universes. Clearly, this approach does not represent a sample and the goal will be to expand and generalize theories[104].

The case study rigor represents a limit to apply the methodology because for a long time there were no systematic procedures to follow, but Yin in his work defined specifics stages to consider for doing a case study rigorous enough[105].

Moreover, the possibility to confuse the case study research with the case study used in teaching also exists. In the last case, materials may be deliberately altered to demonstrate a particular point more effectively; whilst in the first case, the researcher must work hard to report all evidence fairly. If in case study approach the attention is focused on this topic, it is necessary to remember that bias also can enter into the conduct of experiments and the use of other research methods, such as designing questionnaires for surveys or in conducting historical research.

Another limitation for conducting case study research is represented to potential level of effort, because case study can take long time and can result in enormous unreadable document. About last aspect it is true for pass case studies[106], while for modern ones it is completely far because the researcher is focused on specific topics and does not speak about all knowledge. The time required for conducting case study research is not so long, but sometimes it is incorrectly confused with a specific method of data collection, such as ethnography or participant observation.

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[104] Eisenhardt in her work explained how demonstrate a theory through case study approach, for further information: K.M. Eisenhardt, "Building Theories from Case Study Research", in *The Academy of Management Review*, 14(4), 1989, pp. 532-550.

[105] R.K. Yin, *Case study research: Design and methods*, Thousand Oaks, CA: Sage, 2014, pp. 19-20.

[106] For further example: J.R. Feagin, A.M. Orum, G. Sjoberg, *A Case for the Case Study*, Chapel Hills: University of North Carolina Press, 1991.

A fifth possible concern with case study has to do with its unclear comparative advantage, in contrast to other research methods. Indeed, quantitative methods allow to have data easily comparable but the results are limited about explain "how" and "why" something happens. In this way, case study allows investigating these issues and may be used as a complement of a complex research which uses quantitative and statistical methods too.

At the end, case study method presents some advantages and some disadvantages, as others methodologies. The intention was to show the major concerns and suggest possible responses to these concerns. What emerges from the paragraph is that case study research is remarkably hard because for doing it well it is necessary to follow systematic procedures.

3.4.2 Designing Case study

After having analyzed reasons for selecting case study as research method, it is necessary to plan the research design. In contrast to other methodologies, case study research designs have not been codified, so there are only advices to follow.

In spite of this, every type of empirical research study has a research design understood as «*a logical plan for getting from here to there*, where *here* may be defined as the initial set of questions to be answered, and *there* is some set of conclusions (answers) about these questions. Between *here* and *there* may be found a number of major steps, including the collection and analysis of relevant data»[107]. In particular, for case study research five are the most important components of a good research design:

- case study's questions;
- its propositions;
- its unit of analysis;
- the logic linking the data to the propositions;
- The criteria for interpreting the findings.

About <u>case study's questions</u>, the most appropriate are with "how" and "why" for explanatory studies and "what" for exploratory ones. Moreover, a good research question need an in-depth literature review about the topic chosen, then a close examination about two or more key studies on it and, finally, an examination of another

[107] R.K. Yin, *Case study research: Design and methods*, Thousand Oaks, CA: Sage, 2014, p. 28.

set of studies on the same topic, for reinforcing the relevance and the importance of question[108]. Mitzberg noted that «no matter how small our sample or what our interest, we have always tried to go into organizations with a well-defined focus-to collect specific kinds of data systematically»[109], so rationale definition of research questions is the same as it is in hypothesis testing research. Next step concerns the propositions' definition. Each proposition directs attention to something that should be examined within the scope of study. In explanatory study the propositions, besides reflecting an important theoretical issue, also begins to tell you where to look for relevant evidence. At the same time, there are some situations where there are legitimate reasons for not having any propositions. For instance, in exploratory research should still have some purpose but not propositions. Unit of analysis is related to the fundamental problem of defining the case to be studied. Two are the different steps that must be considered for having a clear unit of analysis i.e., defining the case and bounding the case. For defining the case, a good start point is represented to study questions and propositions, but when research questions may be vague or too numerous, establishing the case to analyze results difficult. For Eisenhardt «the case may be chosen to replicate previous cases or extend emergent theory, or they may be chosen to fill theoretical categories and provide examples of polar types. While the cases may be chosen randomly, random selection is neither necessary, nor even preferable»[110]. When the choice of unit of analysis has been doing, it can be revisited as a result of discoveries during data collection and not considered as a fixed decision, maintaining an adaptive posture. Next to definition of case, it is useful underline the need to bind the case. For any topic choose, there are specific time boundaries to define the estimated beginning and ending of the case. Bounding will help to determine the scope of data collection and to distinguish data about the subject of the case study from data external to the case. After having defined rationale research questions and propositions, and chosen unit of analysis, the researcher must developed case study and linking data to propositions. There are some techniques

[108] Gioia et al. propose a rigorous methodology for conducting qualitative research, starting from a well-specified research question. For further information: D.A. Gioia, K.G. Corley, A.L: Hamilton, "Seeking qualitative rigor in inductive research: notes on the Gioia Methodology", in *Organizational Research Methods*, 16 (1), 2013, pp. 19-20.

[109] H. Mintzberg, "An emerging strategy of "direct" research", in *Administrative Science Quarterly*, 24, 1979, p. 585.

[110] K.M. Eisenhardt, "Building Theories from Case Study Research", in *The Academy of Management Review*, 14(4), 1989, p. 537.

for doing it better and easily i.e., pattern matching, explanation building, time series analysis, logic models and cross case synthesis. But the best way is to combine or assemble the case study data as a direct reflection of the initial study propositions. At last, the definition of criteria for interpreting case study findings has a central role for doing a good case study. In particular, the major and important alternative strategy is to identify and address rival explanations for research findings.

Traditional case study research has not usually included the idea of having formal designs, as might be found when doing survey or experimental research, indeed there are some examples of case studies conducted successfully without any formal design. However, attending to the potential case study research designs can make the case study stronger and easier to do. Yin proposes a matrix where are shown 4 kind of research designs, two based on single case and two on multiple case.

The single case study is an appropriate design under several points of view, because it allows doing a critical, unusual, common, revelatory or longitudinal case. As for a single experiment, the same conditions justifying the choice of single case study. In particular, a critical case is conducted when the research have to test a theory or theoretical propositions, so the single case analysis represents a significant contribution to knowledge and allows to confirm, challenge or extend the theory[111]. An unusual case is conducted when the case chosen represents a deviation from theoretical norms or everyday occurrences. While, with a common case, the objective is to capture the circumstances and conditions of an everyday situation i.e., studying a small business can yield insights into innovation and innovative processes. Another kind of case study is the revelatory one. This situation exists when a researcher has the opportunity to observe and analyze a phenomenon previously inaccessible to social science inquiry. Finally, the longitudinal case allows studying the same single case at two more different points in time, so to understand how certain conditions and processes change over time[112]. These five serve a major rationale for selecting a single case study; there are other situations in which the single case may be used as a pilot case.

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[111] For instance Gross, Bernstein and Giacquinta used a single case design to test their theory about barriers to innovation in school. For more information: N. Gross, M. Bernstein, J.B. Giacquinta, *Implementing organizational innovations: A sociological analysis of planned educational change*, New York: Basic Books, 1971.

[112] For example, for food and beverage industry the climate changes and the seasonality influence raw materials production, which affects development and production processes.

The multiple case studies could be considered a different methodology from single case study, because it has distinct advantages and disadvantages. It allows having results more robust but it exploits more resources and time, besides the single case study reasoning cannot be satisfied by multiple cases. The multiple cases expects the adoption of the replication logic, because the research design is defined and then applied to every case, one by one for predicting similar results or contrasting ones, for anticipatable reasons.

Ultimately, for doing a good case study it is better to define rigorously the research design, remember all fundamental components for doing it and the unit of analysis, if it is single or multiple linked to topic to investigate and research question to answer.

3.4.3 Preparing Case study (drafting instruments and protocols)

Because collecting data can be complex, the researcher needs to define skills and values and to cover the preparation and training for the specific case study. In particular, Yin finds 5 important steps for a good preparation i.e., having a clear expression about desired skills and values; training for a specific case study; developing a protocol for the study; screening candidate cases and; conducting a pilot case study[113].

Defining clearly desired skills and values do not mean having a standard position and not changing your mind. For a good case study, the researcher must be open to all possible results from his study. Differently to other methodologies, as surveys or experimental researches, case study data collection cannot be routinized, because every case has different aspects to investigate and there are different environmental situations. For these reasons, conducting an objective case study could be difficult, in particular during the data collection. However, a basic list of desired attributes may be the ability to: ask good questions, be a good listener, stay adaptive, have a firm grasp of the issues being studied and avoid biases. Unlike survey, case study research requires an inquiring mind during data collection, because having the capability to ask good questions is a prerequisite for doing case study research. Indeed, the researcher can follow a protocol for doing case but the relevance of the single information is not predictable. Therefore, being able to ask good questions throughout the data collection could guarantee a real representation of investigated phenomenon. Equally important it is the researcher

[113] R.K. Yin, *Case study research: Design and methods*, Thousand Oaks, CA: Sage, 2014, pp. 72-98.

capability to be a good listener, not only in the strict sense of the term, but to be able to assimilate large amounts of new information without bias. For instance, the listening skill needs to be applied not only during interviews but in inspection of documentary evidence, indeed in reviewing documents; the researcher must be capable to find interesting information between the lines. Moreover, in case study research what is hypothesized almost never matches what is got so, the researcher must stay adaptive with changes during data collection and, if the study needs to shift, he must maintain an unbiased perspective and acknowledge those situations in which could be necessary begin a totally new study. However, the capability to stay adaptive can also be useful during the documents analysis, for example the company investigated allows studying some keys documents for the research, the researcher should avoid to copy and ask permission for using information. An obvious skill for the researcher is to have a firm grasp of the issues being studied, because it is the only way for understanding if some changes in data can be modify completely the research results or not. Also, knowing in depth the issues studied allows to interpret the information when it is being collected and to know immediately if several sources of information contradict one another and lead to the need of additional evidence. Finally, the researcher must be objective, because he knows in depth the aims of the research so, when emerges an issues and he understands it is undesirable, it is important to be ethically correct and not manipulate data.

About training for doing a specific case study, Yin specifies that it is necessary when the data collection is doing to people not involved in research design, because they do not know every aspect of the research. For this reason, a training period can help case study team[114] to understand the project and to find any flaws in it.

A useful tool for conducting case study is the protocol, which is drawn up for a single case or a single respondent. The case study protocol contains the instruments and also the procedures and general rules for doing case; therefore having it is desirable under all

[114] Case study team enhances the creative potential of the study. Team members often have complementary insights which add to the richness of the data, and their different perspectives increase the likelihood of capitalizing on any novel insights which may be in the data. Therefore, the convergence of observations from multiple investigators enhances confidence in the finding. Pettigrew proposes to make the visit to case study sites in team, where two researcher make questionnaire an others observe; or to organize multiple teams, with teams being assigned to cover some case sites, but not others. A. Pettigrew, "Longitudinal field research on change: Theory and practice", Paper presented at the National Science Foundation Conference on Longitudinal Research Methods in Organizations, Austin, 1988.

circumstances, because it is a major way of increasing the reliability of case study research and is intended to guide the researcher in carrying out the data collection from a single case. According to Miles and Huberman, such a protocol should outline the procedures and rules that govern the conduct of the researcher and the research project[115]. Yin provides an example of a case study protocol and suggests that a case study protocol should include: an overview of the case study project including objectives, issues and relevant findings about the topic being investigated; field procedures, including procedures governing access to case study sites; case study questions, data collection forms and sources of information for answering each question; a guide for the case study report including an outline of the report and references. Brereton et al. propose a case study protocol template[116] which deepens the four sections suggested by Yin, as shown in Box 3.1.

BOX 3.1. Case study protocol template
1. Background **a)** identify previous research on the topic **b)** define the main research question being addressed by this study **c)** identify any additional research questions that will be addressed **2. Design** **a)** identify whether single-case or multiple-case and embedded or holistic designs will be used, and show the logical links between these and the research questions **b)** describe the object of study (e.g. a new testing procedure; a new feature in a browser) **c)** identify any propositions or sub-questions derived from each research question and the measures to be used to investigate the propositions **3. Case Selection** **a)** Criteria for case selection **4. Case Study Procedures and Roles** **a)** Procedures governing field procedures **b)** Roles of case study research team members **5. Data Collection** **a)** identify the data to be collected **b)** define a data collection plan **c)** define how the data will be stored **6. Analysis** **a)** identify the criteria for interpreting case study findings **b)** identify which data elements are used to address which research question/sub question/proposition and how the data elements will be combined to answer the question **c)** consider the range of possible outcomes and identify alternative explanations of the outcomes, and

[115] M.B. Miles, A.M. Huberman, *Qualitative Data Analysis: An Expanded Source Book*, 2nd edition, Sage Publications Inc., California, 1994.
[116] P. Brereton, B. Kitchenham, D. Budgen, Z. Li, Using a Protocol Template for Case Study Planning, EASE 2008, Bari.

identify any information that is needed to distinguish between these
d) the analysis should take place as the case study task progresses
7. Plan Validity
a) general: check plan against Höst and Runeson's (2007) checklist items for the design and the data collection plan
b) construct validity - show that the correct operational measures are planned for the concepts being studied. Tactics for ensuring this include using multiple sources of evidence, establishing chains of evidence, expert reviews of draft protocols and reports
c) internal validity - show a causal relationship between outcomes and intervention/treatment (for explanatory or causal studies only)
d) external validity – identify the domain to which study finding can be generalized. Tactics include using theory for single-case studies and using multiple-case studies *to investigate outcomes in different contexts*.
8. Study Limitations
Specify residual validity issues including potential conflicts of interest (i.e. that are inherent in the problem, rather than arising from the plan).
9. Reporting
Using a Protocol Template for Case Study Planning EASE 2008
Identify target audience, relationship to larger studies (Yin, 2003)
10. Schedule
Give time estimates for all of the major steps: Planning, Data Collection, Data Analysis, Reporting. Note Data Collection and Data Analysis are not expected to be sequential stages
11. Appendices
a) Validation: report results of checking plan against Höst and Runeson's (2007) checklist items
b) Divergences: update while conducting the study by noting any divergences from the above steps

In summary, the case study protocol allows to conduct the data collection without problem, because a well-conceived overview may guarantee a complete understanding of the mission and goals of the case study and later it may form the basis for the background and introductory sections in the final case study. Moreover, in the protocol are defined data collections procedures inasmuch the case study considers also the environment during the phenomenon analysis and must evaluate that every interviewer has a different approach to the interview. The heart of protocol is a set of substantive questions reflecting the line of inquiry. These questions are queries to researcher to remind the information that needs to be collected and why. Each question should be accompanied by a list of sources of evidence as documents, observations or interviews[117]. Finally, it is helpful to plan outline, format, and audience for the case study report despite there is not a uniformly acceptable outline.

[117] For further information about protocol: C. Perry, "Processes of a case study methodology for postgraduate research in marketing", in *European Journal of Marketing*, Vol. 32 Iss 9/10, 1998, pp. 785-802; W. M. Tellis, "Application of a Case Study Methodology", in *The Qualitative Report*, 3 (3), 1997,

Another preparatory step is the final selection of the case to investigate in the research. Obviously, there are many reasons for choosing one case rather than another. For instance the selection is straightforward because the researcher chooses an unusual case or has a special arrangement or access about the case.

The last step for a good preparation of case study is to do a pilot case. It helps the researcher to refine data collection plans with respect to both the content of the data and the procedures to be followed. In fact, the pilot case is more formative for developing relevant lines of questions and has the role of a laboratory for detailing the case study protocol, allowing observing different phenomena from many different angles. Methodically, the work on pilot cases can provide information about relevant field questions and about the logistics of the field inquiry.

3.5 Data Collection

Doing a good case study needs an in-depth literature review, a consequent well-specified research question, an articulated research design with a clear definition of aims and objectives, as stated above.

Another column for building a well-done case study is represented by the definition of binding principles for data collection and by the use of multiple sources of evidence.

3.5.1 Collecting Case study evidence

Usually case study evidence can come from many sources. For example, Sutton and Callahan rely exclusively on qualitative data in their study of bankruptcy in Silicon Valley[118], Mitzberg and McHugh use qualitative data supplemented by frequency counts in their work on the National Firm Board of Canada[119], Eisenhardt and Bourgeois combine quantitative data from questionnaires to qualitative data from

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pp. 1-19; H. Maimbo, G. Pervan, Designing a Case Study Protocol for Application in IS research, *PACIS 2005 Proceedings.* Paper 106, 2005, pp. 1286-1290,; R.K. Yin, *Case study research: Design and methods*, Beverly Hills, CA: Sage, 2014, pp. 84-94; K.M. Eisenhardt, "Building Theories from Case Study Research", in *The Academy of Management Review*, 14(4), 1989, pp. 537-538; D.A. Gioia, K.G. Corley, A.L: Hamilton, "Seeking qualitative rigor in inductive research: notes on the Gioia Methodology", in *Organizational Research Methods*, 16 (1), 2013, p. 19.

[118] R. Sutton, A. Callahan, "The stigma of bankruptcy: spoiled organizational image and its management", in *Academy of Management Journal*, 30, 1987, pp. 405-436.

[119] H. Mitzberg, A. McHugh, "Startegy formation in adhocracy", in *Administration Science Quarterly*, 30, 1985, pp. 160-197.

interviews and observations[120], and many other authors have used various sources of evidence to jointly carry out their case studies.

It is understandable that the multiple sources of evidence used in case study research can be various and strictly connected to the topic analyzed. Yin suggests that the ones most commonly used are: documentation, archival records, interviews, direct observations, participant-observation and physical artifacts.

Documentary information results relevant to every case study topic, because this kind of information should be the object of explicit data collection. In particular, it is possible to considere a variety of documents as following: administrative documents, formal studies or evaluation related to the case investigated, news clipping and articles appearing in mass media, written reports of events and meetings, personal documents and letters. These and other types of documents all are increasingly available through internet searches, the problem is to be able to recognize which documents are important and which not, so to avoid waste of time. In case study research, the documentation has the role to corroborate and augment evidence from other sources. The principal advantages to consider documentary information are:

- the help in verifying the correct spellings and titles or names of people and organizations that might have been mentioned in an interview;
- the provision of specific details to corroborate information from other sources;
- the opportunity to make inferences from documents.

If on one side, it is considered the benefits of this source of evidence, on the other one there are some risks linked to its use. For instance, not all kind of documents can be useful for research because every document comes from a specific need and could be a mistake to consider all documents in the same way. Moreover, the casual researcher may mistakenly assume that all kinds of documents contain the unmitigated truth so, it is necessary to have cleared the specific purpose of the case study being done. As above, a newer problem is represented by the abundance of materials available on Internet which can cause a big waste of time on reviewing materials irrelevant.

In case study research, another interesting source of evidence are archival records understood us service records, organizational records, maps and charts of the geographical characteristics of a place, public use files or survey data produced by

[120] K. Eisenhardt, L.J. Bourgeois, "Politics of strategic decision making in high technology environments: Toward a mid-range theory", in *Academy of Management Journal*, 31, 1988, pp. 737-770.

others. As for documentary evidence for this too, it is necessary to remember that they can be used in conjunction with other sources of information in producing case study. The usefulness of archival records change from case to case, for example for some study the records can be so important that they can become the object of extensive retrieval and quantitative analysis, in other studies they may be of only passing relevance. Furthermore, the availability of a big range of records does not mean that the data are careful as well as it should be remembered that these records have been making for specific purposes and a specific audience, so they could be good for our case study research or not.

One of the most important sources of evidence in case study research is represented by interviews, because the researcher has the opportunity to speak directly with the principal characters involved in the topic. There are three kinds of interviews called intensive interview, in-depth interview and unstructured interview[121]. During the interview it is necessary to follow the line of inquiry and ask actual questions in an unbiased manner for avoiding influencing the interviewee. It is important to record interviews, because in this way all information is more accurate than taking only notes. Clearly asking the permission for recording is a step to remember. As above, three are types of interviews and everyone has some advantages and some disadvantages. Yin suggests a different classification for kinds of interview. The prolonged interviews require over 2 or more hours and allow us to ask - in this case study - to R&D manager and other managers involved in new product development process their interpretations and opinions about the process, the tools and the people involved in it. The propositions that come from are the basis for further inquiry. Obviously, the interviewees such as "informants" can give us a lot of information, but can also modified our point of view, for this reason could be better consider the role and the knowledge of every person about the topic and further remember that key informants are often critical to the success of a case study. So the researcher needs to be cautious about becoming dependent on key informants and to cross their information with other sources of evidence. Next to prolonged interviews are shorter ones which require no more than 1 hour. The interviews may still remain open-ended and assume a conversational manner, in according to activity planned in case study protocol. Whether using an interview to

[121] For further information: R.S. Weiss, *Learning from strangers: The art and method of qualitative interview studies*, New York: The Free Press, 1994, pp. 207-208.

corroborate certain findings or using it to capture an interviewee's own sense of reality, it is necessary to minimize a methodological threat created by the conversational nature of the interview. Indeed, the risk is to obtain an undesirable coloring of the interview material. The last type of interview useful in case study research is the survey, with structured questions. Many authors suggest the use of this kind of questionnaire as part of an embedded case study able to produce quantitative data as part of the case study evidence.

Inasmuch as the case study methodology is useful for investigating a phenomenon in its environment, a relevant source of evidence to consider is the direct observation. There are two kinds of observation more or less formal. In the first case, the observational instruments can be developed as part of the case study protocol and can be represented by observations of meetings, factory work, classrooms, sidewalk activity and so on. In the second case, the direct observations might be made throughout the fieldwork, including those occasions during, for example, the interviews. The observational evidence has a most relevant role if the topic analyzed is new, i.e. for a new technology or a new market.

In addition to direct observation, an interesting role is held by participant observation. It is a special mode of observation in which you are not merely passive observer. This technique has been most frequently used in anthropological studies of different cultural or social groups, but it also can be used for analyzing large organizations or small groups. The main opportunities in using this source are linked to the unusual way to obtain interesting information about a phenomenon otherwise inaccessible. Moreover, this source allows perceiving reality from the viewpoint of someone inside a case and non-external to it. Being inside is an opportunity because the observer can be the ability to manipulate minor events. At the same time, being inside could be produce some biases and modify the reality of the phenomenon.

About the last source of evidence considered by Yin, the physical artifacts have less potential relevance in the most typical kind of case study, because they consider the collection of artifacts as technological device, tool or instrument, work art and so on, as a part of a case study.

At the end of this review of the main sources of case study evidence suggested by Yin, it is remembered that is better to use multiple sources of evidence but which are useful for the topic investigated.

Table 6 Sources of evidence

Source of evidence	Strengths	Weakness
Documentation	• Stable-can be reviewed repeatedly • Unobtrusive-not created as a result of the case study • Specific-can contain the exact names, references, and details of an event • Broad-can cover a long span of time, many events, and many settings	• Retrievability – difficult • Biased selectivity • Reporting bias-reflects author • Bias access-may be blocked
Archival records	[Same as above for documentation] • Precise and quantitative	[Same as above for documentation] • Privacy might inhibit access
Interviews	• Targeted-focuses on case study topic • Insightful-provides perceived causal inferences	• Bias due to poor questions • Response bias • Incomplete recollection • Reflexivity-interviewee expresses what interviewer wants to hear
Direct observations	• Reality-covers events in real time • Contextual-covers event context	• Time-consuming • Selectivity-might miss facts • Reflexivity-observer's presence might cause change • Cost - observers need time
Participant observation	[Same as above for direct observation] • Insightful into interpersonal behavior	[Same as above for direct observation] • Bias due to investigator's actions
Physical artifacts	• Insightful into cultural features • Insightful into technical operations	• Selectivity • Availability

Source: R.K. Yin, *Case study research: design and methods*, Thousand Oaks, CA: Sage publication, p. 106, 2014.

The ability to collect data from several sources, including interviews, archival records, documents, non-participant observation and so on, is a major strength of the case study,

not least because it allows for 'triangulation'[122]. Triangulation, in turn, is seen as a way of enhancing construct validity as each source of evidence may be 'tested' against each other source of evidence[123]. Therefore, triangulation is an important issue and tool in qualitative research generally[124]. Many aspects of triangulation closely pertain to the data collection phase[125]. Triangulation refers to the combination of multiple methods, empirical materials, observers or perspectives in a single study and its use is an attempt to obtain a deeper understanding of the studied phenomenon and may add rigor and breadth[126]. Patton discusses four types of triangulation in doing evaluations, in particular triangulation: of data sources, among different evaluators, of perspectives to the same data set and of methods[127]. In this research, it would be realized data triangulation collecting information from multiple sources, with the aim to corroborate the same finding. Because this aim is reached the data triangulation must be done truly and not, for instance, analyzing each source of evidence separately and then making the comparison of conclusions from separate studies. By developing convergent evidence, data triangulation helps to strengthen the construct validity the specific case study. The multiple sources of evidence essentially provide multiple measures of the same phenomenon. At the same time, the use of multiple sources of evidence imposes a greater burden on case study researcher. Firstly, the collection of data from multiple sources is more expensive than data from a single source. Secondly, every case study researcher will need to know how to carry out the full variety of data collection

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[122] R. Scapens, "Researching management accounting practice: The role of case study methods", in *The British Accounting Review*, (22), 3, 1990, pp. 259-281.

[123] D.E.W. Marginson, "The Case Study, The Interview and The Issues: A Personal Reflection", in C. Humphrey, B. Lee, *The real life guide to accounting research, a behind the scenes view of using qualitative research methods*, Elsevier, 2004, p. 329.

[124] M.B. Miles, A.M. Huberman, *Qualitative data analysis: an expanded sourcebook*, Sage Publication, California, 1994; D.L. Altheide, J.M. Johnson, "Criteria for assessing interpretive validity in qualitative research", in N.K. Denzin, Y.S.Lincoln, *Handbook of qualitative research,* Thousand Oaks, CA, US: Sage Publications, 1994, pp. 485-499.

[125] K.M. Eisenhardt, "Building Theories from Case Study Research", in *The Academy of Management Review*, 14(4), 1989; R.K. Yin, *Case study research: design and methods*, Thousand Oaks, CA: Sage publication, 2014, pp. 119-122.

[126] N.K. Denzin, Y.S. Lincoln, "Introduction: Entering the field of qualitative Research", in N.K. Denzin, Y.S.Lincoln, *Handbook of qualitative research,* Thousand Oaks, CA, US: Sage Publications, 1994, pp. 1-17; T. D. Jick, "Mixing qualitative and quantitative methods: Triangulation in action", in *Administrative Science Quarterly*, 24, 1979, pp. 602–611.

[127] M.Q. Patton, *Qualitative evaluation and research methods* (2nd ed.), Thousand Oaks, CA, US: Sage Publications, 1990.

techniques. On the other hand, without such multiple sources, an invaluable advantage of case study research will have been lost.

Doing better the collection of case study evidence is linked to some principles suggested by Yin, not only triangulation but the capability to create a case study database could be useful. Indeed, organizing and documenting the data collected for the case study have some benefits for well understanding the researcher's report and for replicating the study for the researcher or for others scholars. The database can be made up with the data or evidentiary base and the researcher's report, divided in two different sections, for having a clearer representation. As above, this database can allow other people to inspect the entire database apart from reading the case study report. In this manner, the creation of case study database markedly increases the reliability of the entire case study. At the same time, the existence of an adequate database does not preclude the need to present sufficient evidence within the case study report. Definitely, the database's main function is to preserve collected data in a retrievable form. The documents and information in the case study database can be represented by field notes taken by researcher during the interview or direct observations that represent the researcher's idea about the topic investigated. Another database source could be represented by documents about the Company/Companies analyzed. Many documents relevant to the case study are collected during the course of the research and their organization allows a quick recoverability. Also important are narrative materials as bibliographies, cross-references and other classifications that help to organize the other materials in the database or, for example, open ended answers to the questions in the case study protocol.

A third principle to be followed, to increase the reliability of the information in case study, is to maintain a chain of evidence. In particular, «the principle is to allow an external observer – in this situation, the reader of the case study – to follow a derivation of any evidence from initial research questions to ultimate case study conclusions. Moreover, this external observe should be able to trace the steps in either direction[128]». Doing this activity is possible if the report should have adequately cited or footnoted the relevant sources used to arrive at specific findings; these specific sources should contain the actual evidence and the circumstances under which the evidence had been collected;

[128] R.K. Yin, *Case study research: design and methods*, Thousand Oaks, CA: Sage publication, 2014, p. 127.

these evidence should be consistent with the specific procedures and questions contained in the case study protocol and the review of this one should indicate the link between the protocol questions and the original study questions.

Figure 21 Maintaining a chain of evidence

Source: R.K. Yin, *Case study research: design and methods*, Thousand Oaks, CA: Sage publication, p. 128, 2014.

Finally, doing case study research requires the use of data from electronic sources therefore it would be necessary to exercise care when using them. For instance, on Internet you can find a lot of information about the topic investigated, for this reason is better defined how many time spend into various websites. Moreover, on Internet it is possible to find many contents from more or less authoritative sources, for this reason could be better consider the authors of every source.

In short, in doing case study research, the researcher can use many sources of evidence, more or less objective, with strengths and weaknesses. These sources can give the relevant information for a better study if the researcher considers some principles for crossing them. Aboveit it has been spoken about the important role of triangulation, in particular data triangulation, and other suggestions for a well-being case study.

3.5.2 Analyzing Case study evidence

The analysis of case study evidence is the heart of applying this methodology, but it is both the most difficult and the least codified part of the process. Since published studies generally describe research design and data collection, but give a little information about the discussion of analysis and there is a huge chasm between data and conclusion of the study. It is clear that researcher cannot report every document and every note taken during the study[129]. However, several key features of analysis can be identified. In particular, too many times, researchers start case studies without having the foggiest notion about how the evidence is to be analyzed.

A help is represented by the tools that the researcher can use. The tools are important and can be useful, but they are usually most helpful if the researcher know what to look to have an overall analytic strategy. For example, computer-assisted tools which are represented by packaged software as MAXQDA, Atlas and so on, can work as guidance for researcher, because they can help to code and categorize large amounts of data. The software helps with textual data and allows to define an initial set of codes, moreover it will readily locate in the textual data all the words and phrases matching these codes, count the incidence or occurrence of the words or codes, and even conduct searches to show when and where multiple combinations are found. The researcher can do this process iteratively, gradually building more complex categories or groups of codes. Despite this, the software for qualitative analysis cannot give outputs like software for quantitative analysis, because for developing a rich and full explanation or even a good description of the case will require much post-computer thinking and analysis on researcher part.

Gioia, Corley and Hamilton wrote about 2 orders of analysis. The first order analysis is aimed at trying to adhere faithfully to informant terms, so the researcher makes little attempts to distill categories that tend to explode on the front end of the study, therefore it could easily be a huge number of first order analyses that emerges from the first interview and initially it can appear overwhelming[130]. Making progress in study allows

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[129] As Miles and Huberman wrote «One cannot ordinarily follow how a researcher got from 3600 pages of field notes to the final conclusions sprinkled with vivid quotes though they may be». M.B. Miles, A.M. Huberman, *Qualitative data analysis: an expanded sourcebook*, Sage Publication, California, 1994, p. 16.

[130] As Gioia said «You gotta get lost before you can get found», in D. A. Gioia, "A renaissance self: Prompting personal and professional revitalization", in P. J. Frost, R. E. Stablein (Eds.), *Renewing research practice: Scholars' journeys*, Stanford, CA:Stanford University Press, 2004, pp. 97-114.

defining similarities and differences among the many categories and groups of codes[131] that reduces the entropy's level in the data. After this rational process of data classification and organization, Gioia et al. suggest to check if the emerging themes allow defining concepts that might help researcher describe and explain the phenomenon observed. This represents the second order analysis, where the attention is focused on ascent concepts that don't seem to have adequate theoretical referents in the existing literature or existing concepts that emerge because of their relevance to a new domain. Obtained a workable setting of themes and concepts, the researcher can try to resume the emergent second order themes even further into second order aggregate dimensions[132]. After that, the researcher has the basis for building a data structure, which allows configuring data into a sensible visual aid and provides a graphic representation of how the researcher progressed from raw data to terms and themes in conducting the analysis.

A helpful starting point for obtaining data structure is to play with the data. Miles and Huberman suggest different kind of manipulation as: putting information into different arrays, making a matrix of categories and placing the evidence within such categories, tabulating the frequency of different event, creating data displays for examining the data, putting information in chronological order or using some other temporal scheme[133]. Another way of starting is connected to write some notes or memos during the observation of the phenomenon investigated[134], because they can help researcher to move from initial propositions to a general analytic strategy.

The needed strategy should guide researcher through his analysis. In addition, Yin suggests four general strategies and specific techniques for analyzing case study data[135]. About applicable strategies one of the most simple is represented to follow the theoretical propositions that led to the case study. The initial objectives and design of

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[131] A. Strauss, J. Corbin, *Basics of qualitative research: Techniques and procedures for developing grounded theory* (2nd ed.), Thousand Oaks, CA: Sage, 1998.

[132] D.A. Gioia, K.G. Corley, A.L: Hamilton, "Seeking qualitative rigor in inductive research: notes on the Gioia Methodology", in *Organizational Research Methods*, 16 (1), 2013, p. 19.

[133] M.B. Miles, A.M. Huberman, *Qualitative data analysis: an expanded sourcebook*, Sage Publication, California, 1994.

[134] J. Corbin, A. Strauss, *Basics of qualitative research: Techniques and procedures for developing grounded theory* (3nd ed.), Thousand Oaks, CA: Sage, 2007. For further information: L.B. Lempert "Asking questions of the data: Memo writing in the grounded theory tradition", in A. Bryant, K. Charmaz, *The Sage handbook of grounded theory*, Thousand Oaks, CA: Sage, 2011, pp. 245-264.

[135] R.K. Yin, *Case study research: design and methods*, Thousand Oaks, CA: Sage publication, 2014, p. 136.

case study supposedly were based on such propositions, which in turn reflected a set of research questions, reviews of the literature and new hypothesis or propositions. Therefore following these propositions allows having an analytic priorities in the definition of data collection plan, because they help to organize entire analysis, pointing to relevant contextual conditions to be described as well as explanations to be examined. In contrast to this, it is possible to adopt an inductive strategy whereby the researcher does not consider any theoretical propositions, but pour through the data. In this way, the researcher may find that some part of the data suggests a useful concept or two and possibly an additional relationship. Corbin and Stauss have provided much guidance over the years for following an inductive approach to data analysis. Initially, the procedures assign various codes to the data, each code representing a concept, and proceeding to distill these allows obtaining variables[136]. In case study, these procedures are relevant for 2 reasons:

1. the data may cover the behavior and events that the case study is trying to explain;
2. the data may be related to an embedded unit of analysis within the broader case study.

A third general analytic strategy is to organize the case study according to some descriptive framework. In truth, the case description is used when the researcher has collected a lot of data without having settled on an initial set of research questions or propositions and he also may not have been able to surface any useful concepts from data. In contrast, there are some case studies that were conducted with the original and explicit purpose to be descriptive[137]. In other situations, the original objective of the case study may not have been a descriptive one, but a descriptive approach may later help the researcher to identify the appropriate explanation to be analyzed.

The last analytic strategy tries to define and test plausible rival explanations, generally works in combination with all the previous strategies mentioned. There are several types of plausible rival explanations, for each one there is an informal and more understandable descriptor which accompanies the formal social science category,

[136] J. Corbin, A. Strauss, *Basics of qualitative research: Techniques and procedures for developing grounded theory* (3nd ed.), Thousand Oaks, CA: Sage, 2007.

[137] For instance, the studied conducted by Lynd and Lynd about a midwestern city, in R.S. Lynd, H.M. Lynd, *Middletown: A study in modern American culture*, New York: Harcourt Brace Jovanovich, 1929.

hopefully making the gist of the rival thinking clearer. Yin suggests 3 types of craft rivals that underlie all of social science research, but he defines also 6 real-world rivals, which have received no attention by other authors[138]. After defining the general strategy, it is necessary using an analytical technique for analyzing data. There are five analytic techniques to deal with the noted problems of developing internal and external validity when doing a case study research i.e., pattern matching, explanation building, time-series analysis, logic models, cross-case synthesis (Table 7).

Table 7 Case study analytic techniques

Five analytic techniques	**Main Features**
Pattern matching	-It compares an empirically based pattern with a predicted one -If the patterns coincide, the results can strengthen the internal validity of the case study.
Explanation building	-Analyzes the case study data by building an explanation about the case -Stipulates a presumed set of causal links, which are similar to the independent variables in the use of rival explanations -Has mostly occurred in narrative form -May lead to starting a cross-case analysis, not just an analysis of each individual case -Disadvantage: may drift away from original focus
Time series analysis	-The objective of time series analysis is to examine relevant "how" and "why" questions

[138] In particular, Yin wrote about «Craft Rivals as:

- The Null Hypothesis – the observation is the result of chance circumstances only
- Threats To Validity – e.g., history, maturation, instability, testing, instrumentation, regression, selection, experimental mortality, and selection-maturation interaction
- Investigator Bias – e.g., "experimenter effect", reactivity in field research

And about Real-World Rivals:

- Direct Rival - an intervention ("suspect 2") other than the target (Practice or Policy) intervention ("suspect 1") accounts for the results ("the butler did it")
- Commingled Rival - other interventions and the target intervention both (Practice or Policy) contributed to the results ("it wasn't only me")
- Implementation Rival - the implementation process, not the substantive intervention, accounts for the results ("did we do it right?")
- Rival Theory - a theory different from the original theory explains the results better ("it's elementary, my dear Watson")
- Super Rival - a force larger than but including the intervention accounts for the results ("it's bigger than both of us")
- Societal Rival - social trends, not any particular force or intervention, account for the results ("the times they are a-changin")».

R.K. Yin, *Case study research: design and methods*, Thousand Oaks, CA: Sage publication, 2014, p. 141.

	about the relationship of events over time -Time series analysis can follow intricate patterns -The more intricate the pattern, the firmer the foundation for conclusions of the case study
Logic model	**-**Stipulate a complex chain of events over time -Events are staged in repeated cause-effect-cause-effect patterns -Match empirically observed events to theoretically predicted events
Cross-case synthesis	-The case study consists of at least two cases

Source: personal elaboration from Yin (2014).

The pattern matching technique compares an empirically based pattern with a predicted one; if the empirical and predicted patterns appear to be similar, the results can strengthen the internal validity of the case study. In more detail, pattern matching always involves an attempt to link two patterns where one is a theoretical pattern and the other is an observed or operational one. The theory might originate from a formal tradition of theorizing, might be the ideas or "hunches" of the investigator, or might arise from some combination of these. The conceptualization task involves the translation of these ideas into a specifiable theoretical pattern. On the other side there is the realm of observation. This is broadly meant to include direct observation in the form of impressions, field notes, and the like, as well as more formal objective measures. The collection or organization of relevant operationalization (i.e., relevant to the theoretical pattern) is termed the observational pattern. The inferential task involves the attempt to relate, link or match these two patterns. To the extent that the patterns match, one can conclude that the theory and any other theories which might predict the same observed pattern receive support[139]. There are three principal kinds of pattern matching: nonequivalent dependent variables as a pattern, rival independent variables as a pattern, precision of pattern matching. In the first one the dependent variables pattern may be derived from one of the more potent quasi-experimental research designs, labeled a

[139] W. Trochim, "Pattern matching, validity, and conceptualization in program evaluation", in *Evaluation Review*, 9, 5, 1985, pp. 575-604; W. Trochim, "Outcome pattern matching and program theory", in *Evaluation and Program Planning*, 12, 1989, pp. 355-366. (For further information: http://www.socialresearchmethods.net/kb/pmconval.php).

«nonequivalent, dependent variables design»[140]. In according to this design, an experiment or quasi-experiment may have multiple dependent variables (variety of outcome). If, for each outcome, the initially predicted values have been found, and at the same time alternative "patterns" of predicted values (including those deriving from methodological artifacts or threats to validity) have not been found, strong causal inferences can be made. In essence, the researcher goal is to identify all reasonable threats to validity and to conduct repeated comparisons, showing how such threats cannot account for the dual patterns in both of the hypothetical cases. About the second one is necessary to remember that each case has certain type of outcome and the investigation has to be focused on how and why this outcome occurred. This analysis requires the development of rival theoretical propositions, articulated in operational terms. Each rival explanation involves a pattern of independent variables that is mutually exclusive: if one explanation is to be valid, the others cannot be. After having analyzed these two kinds of pattern matching techniques emerges that the actual procedure involves no precise comparisons. Whether the researcher is predicting a pattern of nonequivalent dependent variables or a pattern based on rival independent variables, the basic comparison between the predicted and the actual pattern may involve non quantitative or statistical criteria. In the absence of precision, an important suggestion is to avoid postulating very subtle patterns, so that your pattern matching deals with gross matches or mismatches whose interpretation is less likely to be challenged.

The explanation building techniques is a particular type of pattern matching, but the procedure is more difficult than those analyzed above. This involves analyzing case study data by building an explanation about the case. To explain a phenomenon is to stipulate a presumed set of casual links (they may be complex and difficult to measure in any precise manner) about it, for instance how or why something happened. Frequently, the explanation building occurs in a narrative form and the process is complex. Indeed, explanation comes from an iterative process so; the final explanation may not have been fully stipulated at the beginning of a study and differs from the pattern matching approaches previously described. The iterative process can confuse the researcher, who may slowly begin to drift away from the original topic of interest. Yin

[140] T.D. Cook, D.T. Campbell, *Quasi-experimentation: Design and analysis issues for field settings*, Chicago:Rand McNally, 1979, p. 118.

suggest a tip for reducing the threats, the researcher should check frequently with the original purpose of the inquiry, use someone external as critical friends and examine possible alternative explanation.

The objective of time series analysis is to examine relevant "how" and "why" questions about the relationship of events over time. There are three kinds of time series analysis: the simple time series, the complex time series and the chronological sequences. The first can be simpler than the others two because there may only be a single dependent or independent variable, but the pattern can be more complicated in another sense because the appropriate starting or ending points for this single variable may not be clear. In spite of this problem, the capability to understand and trace changes over time is a big advantage of case studies. In case the events have been traced in detail, some type of time series analysis always may be possible. The methodology allows matching between a trend of data points compared to significant trend specified before investigation, rival trend specified earlier and any other trend based on some artifact or threat to internal validity[141]. The second one contains multiple set of variables (mixed patterns) which are relevant to the case study. Each variable is predicted to have different pattern over time and create greater problems for data collection, but lead to elaborate trend that strengthens the analysis. In general, although a more complex time series creates greater problems for data collection, it also leads to more elaborate trend that can lead to a stronger analysis. Any match of a predicted with an actual time series will produce strong evidence for an initial theoretical proposition. The compiling of chronological events is a frequent technique in case studies and may be considered a special form of time series analysis. The procedure can have an important analytic purpose because the basic sequence of a cause and its effect cannot be temporally inverted. Furthermore, this methodology allows covering many different types of variables and not being limited to a single independent or dependent variable; and can be richer and more insightful than general time series approaches. The analytic aim is to compare the chronology with that predicted by some explanatory theory.

The fourth analytic technique usable in case study research is the logic model. In simple terms «a logic model is a systematic and visual way to present and share your understanding of the relationships among the resources you have to operate your

[141] This is what Campbell did in his now-famous study of the change in Connecticut's speed limit law, in D.T. Campbell, "Reforms and experiments", in *American Psycologist*, 24, 1969, pp. 409-429.

program, the activities you plan, and the changes or results you hope to achieve»[142]. Therefore, the model stipulates and operationalizes a complex chain of occurrences or events over an extended period of time, and the events are staged in repeated cause-effect-cause-effect patterns. The model's operation is that the previous event (i.e. the dependent variable) becomes the independent variable in the next stage[143]. The first benefit connected to the use of logic model is the opportunity to define more clearly firm's vision and goals. Using this model in case study data analysis is possible when the study is focused on theory of changes analysis or assessing an intervention. Briefly, the use of logic model as analytical technique consists of matching empirically observed events to theoretically predicted events. Despite of this, the logic model is different from the pattern matching because the first one follows sequential stages and allows to explain how is possible obtain ultimate outcome – while others methodologies give the ultimate outcome without explaining how the process produced it. Three are the logic models applicable in case study research: the individual - level logic model, the firm - or organizational – level logic model and the program - level logic model. The first one assumes that the case study is about an individual person; the second traces events taking place in an individual organization; the program-level logic model analyzes data from different case studies by collecting data on rival explanations. For sharpening the use of logic models is important to focus attention not only on activities but on transitions, because they offer explanations for how events pass from one stage to another.

The fifth technique can be used only for multiple cases because it needs at least 2 cases. The cross-case synthesis is likely to be easier and the findings likely are more robust than having only a single case. Briefly, using multiple case studies will:

- treat each individual case study as a separate study;
- have to create word tables that display data from individual cases according to some uniform framework;
- examine word tables for cross-case patterns;

[142] For further information: W.K. Kellogg Foundation, *Logic Model Development Guide, Using Logic Models to Bring Together Planning, Evaluation, and Action*, January 2004.

[143] K.A. Peterson, L. Bickman, Using program theory in quality assessments of children's mental health services, in H.T. Chen, P. Rossi, *Using theory to improve program and policy evaluations*, New York: Greenwood, 1992, pp. 165-176; D.J. Rog, R.B. Huebner, Using research and theory in developing innovative programs for homeless individuals, in H.T. Chen, P. Rossi, *Using theory to improve program and policy evaluations*, New York: Greenwood, 1992, pp. 129-144.

- rely strongly on argumentative interpretation, not numeric properties;
- be directly analogous to cross-experiment interpretations.

Finally, for trying to do a high quality case study analysis the researcher needs to show that the analysis addresses all plausible rival interpretations and the most significant aspect of it, attends to all the evidence and he uses his prior/expert knowledge in the study.

3.6 Case Study Report

The last step for doing better a case study is to be able to communicate engagingly the findings and results, because it is the moment to highlight the emergent concepts which are new and the existing concepts which have new "appearance". There is no an only way for explaining the researcher's work in doing the case study, but it is possible to follow some advices for writing clearly the case study report[144].

The first important question to which answer for writing a good case study report is: "Who is the audience of the case?", because having clear who are the final readers is useful for composing the case study and allows understanding on what is better concentrate.

Yin identifies four potential case studies audiences as: academic colleagues; policy makers, practitioners, other professionals; special groups as thesis committee; funders of research. Every one of them has different needs and no single report will serve all audiences simultaneously. For instance, the academic colleagues are interested in previous theory and research and, in findings of case study; on the other side no specialists readers can understand the case study report if the researcher reports it in a descriptive way, representing it in some real world situation and focusing attention on the implications for an action. Whilst the members of thesis committee are interested in the way which the research was conducted, if the researcher was cautious in finding gap in the literature and filling it, so the attention is on methodology and theoretical issues. Different position is covered by research funders who are concentrated on results,

[144] D.A. Gioia, K.G. Corley, A.L: Hamilton, "Seeking qualitative rigor in inductive research: notes on the Gioia Methodology", in *Organizational Research Methods*, 16 (1), 2013, pp. 23-25; M.B. Miles, A.M. Huberman, J. Saldana, *Qualitative data analysis: a Methods Sourcebook*, Sage Publication, California, 2014, pp. 323-338; R.K. Yin, *Case study research: design and methods*, Thousand Oaks, CA: Sage publication, 2014, pp. 177-206.

because their objectives are practical. Definitively, a successful communication with more than one group of audience may mean the need of more than one report.

Once identified the final audience of case study report, it is necessary choose the composition form, because there are many types and everyone suggests a different way of explain the research. The first case study reporting form is the classic single case study. It is possible to write the case in a single text for describing and analyzing it, adding some table, figure and everything could be useful for well understanding it. Obviously, it is better know how long it is, because it depends on journal or books where it will be published. A second reporting format is the multiple case versions of the previous. It will consist in single cases also presented as single chapters or sections and a chapter or section dedicated to cross case analysis and results. It can be possible that the report is only about the cross case analysis and the single cases are presented in appendix. Another singular way for reporting the case study finding is to rewrite questions and answers placed during the conduction of the data and collection design. This type of report has some advantages, firstly the researcher does not work hard to write it and secondly, the reader can cross information – in multiple case studies – alone, without third person filter. The last type of format reporting is usable in multiple case studies only. There may be no separate the case in sections or chapters, but it is reported the cross case analysis and the single case are not reported if not only as summary or vignettes.

Analyzing the literature about case study methodology emerge six different structures for case study compositions. The most simple is the linear analytic structure which expects a common framework used for most journal articles in experimental science, in particular it is composed by an introduction to the topic investigated, a literature review, an explanation of methodology used, the data collection, the data analysis, the principal findings and the conclusions. The comparative structure expects the repetition of the same case study more times, comparing alternative descriptions and explanation. There are two approaches: the realist in which the case is repeated two or more times in relation to a different conceptual model[145], while the relativist approach expects that the

[145] An example of realist approach is shown in: G.T. Allison, *Essence of decision: Explaining the Cuban missile crisis*, Boston; Little, Brown.

case study is repeated in the perspective of different participants[146]. Another approach to report the case study is based on chronological activities. The sequence of chapters or sections might follow the early, middle and late phases of a case. The most risk in using this composition is connected to the use of time available, because the researcher could be spend many time in composing the introduction to a case and leave insufficient time to write about the current status of the case. The theory-building structure expects a sequence of sections that will follow some theory-building logic and every section should reveal a new part of the theoretical argument being made. In exploratory case study will be debating the value of further investigating various propositions or hypothesis. The last two structures considered – suspense structure and unsequenced structure – are not applicable in exploratory research. The first one can be used for explanatory studies and expects that the main outcome is presented at the beginning of the chapter. The second one has not a specific structure and is useful for descriptive case studies. As part of compositional structures described above, every case study report will cover at least two topics, the methods used and the related literature review - as in this thesis Chapter 2 about the literature review for supporting the importance of the research and Chapter 3 for describing and explaining the methodology chosen[147]. Moreover, it is possible that case study is a part of mixed methods studies. In this case, the approach for conducting and reporting the case study is completely different, but it is not our situation.

About procedures in composing the case study report, Yin suggests to start the composition during the early stages of the study. For instance, for doing the empirical evidence the researcher needs a research question or some propositions. For having them he must discuss the research literature. At the same time, the literature review allows for having an initial bibliography that can be augmented later. Similarly, the researcher can start describing the methodology at the early stage, which can be useful for the data collection. Also it is possible to start writing the descriptive data about the case, after data collection and before analysis. Definitely, starting the drafting process

[146] An example of relativist approach is shown in: F.J. Wertz, K. Charmaz, L.M. McMullen, R. Josselson, R. Anderson, E. McSpadden, *Five ways of doing qualitative analysis, narrative research, and intuitive inquiry*, New York: Guilford.

[147] The case study methodology may not be familiar for the readers so it is important to well-explaining the strenghtness and the weakness of this methodology. Moreover, its description could be useful for obtaining high-quality results.

early and continue to add the case study progresses could allow in focusing researcher's thoughts clearly on the analysis itself, as well as on the tentative findings and conclusions. Another relevant suggestion concerns the validation procedure. The procedure is to have the draft report reviewed, not only by peers but informants and participants too. If the comments about the report are helpful they could be inserting in the case study too. The role of informants can be relevant, because the opportunity for them to read the draft report allows in beginning a dialogue with the researcher, and the potential result is the production of high-quality case study.

Finally, for having a good case study report it must be significant, complete, consider alternative perspectives (in particular for explanatory case study), display sufficient evidence, and be composed in an "engaging" manner.

3.7 Thesis methodology

The research of this thesis has been carried out in Poland. The approach is exploratory, for this reason it has been used the case study methodology. As Voss et al. suggest, the exploratory study can be conducted when it is met an uncovered area of research and it is desired to develop a theory (Table 8).

Table 8

Purpose	**Research question**	**Research structure**
Exploration Uncover areas for research and theory development	Is there something interesting enough to justify research?	In-depth case studies Unfocused, longitudinal field study
Theory building Identify/describe key variables Identify linkages between variables Identify "why'" these relationships exist	What are the key variables? What are the patterns or linkages between variables? Why should these relationship sexist?	Few focused case studies In-depth field studies Multi-site case studies Best-in-class case studies
Theory testing Test the theories developed in the previous stages Predict future outcomes	Are the theories we have generated able to survive the test of empirical data? Did we get the behavior that was predicted by the theory or did we observe another unanticipated behavior?	Experiment Quasi-experiment Multiple case studies Large-scale sample of population
Theory extension/refinement To better structure the theories in light of the observed results	How generalizable is the theory? Where does the theory apply?	Experiment Quasi-experiment Case studies Large-scale sample of population

Source: C. Voss, N. Tsikriktsis, M. Frohlich, "Case reaearch in operations management", in *International Journal of Operations & Production Management*, 22 (2), 2002, pp. 195-219.

The case chosen in the study is represented by a Polish Company which works in food and beverage industry, in particular focused on cereal-based instant beverages. The Company for a long time has produced only naturally/healthy beverages, but since 7 years ago they decide to introduce functional beverages and to work as first mover in Polish market. This choice allows them to obtain and mantain a relevant competitive advantage.

The kind of case study research conducted is based on an exploratory case for understanding the orientation towards innovation, the NPD process and the performance measurement used for monitoring the development and production of functional beverages.

The definition of functional foods used in the research and proposed in the interview is: «A food can be regarded as functional if it is satisfactorily demonstrated to affect beneficially one or more target functions in the body, beyond adequate nutritional effects, in a way that is relevant to either improved stage of health and well-being and/or reduction of risk of disease. A functional food must remain food and it must demonstrate its effects in amounts that can normally be expected to be consumed in the diet: it is not a pill or a capsule, but part of the normal food pattern (Diplock et al., 1999)».

3.8 Research design and data collection

After having analyzed the general case study methodology, in this paragraph it is proceed to define the specific training for conducting the Polish case. In particular, the main tool prepared is the case study protocol, according to Maimbo and Pervan model (Table 9).

Table 9

Section	Contents	Purpose
Preamble	• Confidentiality and data storage • Publication • Documentation • Layout of protocol	Contains information about the purpose of the protocol, guidelines for data and document storage, publication
General	• Overview of research project • The case research method	Provides a brief overview of the research project and the

		case research method.
Procedures	• Initial approach to organizations a. Selection of cases b. Number of cases c. Establishing contact • Scheduling of field visits • Length of sessions • Equipment and stationery	Detailed description of the procedures for conducting each case. These procedures should be utilized to ensure uniformity in the data collection process and consequently facilitate both within case and cross case analyses.
Research Instrument(s)	• Research instrument(s) that may either be: a) Qualitative – interview guides utilizing either open-ended or close-ended questions b) Quantitative – survey questionnaire applied in face to face interviews	Research instruments developed utilizing guidelines by Neuman (2000) and Sekaran (2000). It is recommended that these research instrument be highly structured to facilitate the data collection process and uniformity in the collection of said data
Data analysis guidelines	• Overview of data analysis processes • Details regarding: a) How convergence of data from multiple sources will be achieved b) How triangulation of perspectives from multiple participants will be achieved • Description of 'Within case' analysis process: a) Descriptive Data b) Explanatory Data c) Individual case report • Description of "Cross case" analysis process • Description of 'Cross sector analysis process (where necessary) • Data schema a) Summary of primary data types, sources and purpose b) Summary of secondary data types, sources and purpose • Description of data displays that will be used in analysis • A priori list of codes that will be used during qualitative analysis	Guidelines for data analysis based on guidelines such as those provided by Miles and Huberman (1994), Yin (1994) and Neuman (2000).
Appendix	• Participation request letter	Template letter sent to potential participants inviting them to participate

Source: H. Maimbo, G. Pervan, Designing a Case Study Protocol for Application in IS research, 2005, p. 1287.

It is shown below the protocol to perform the Case study about Grana Spzoo.

Case study protocol

1. ***Preamble***

The protocol has been prepared on the basis of Maimbo et al. model for better doing the in-depth case study. The choice of a within case study is driven by the need to explore a new context.

2. ***General***

The purpose of this exploratory study is to understand performance measures applied in the new product development, considering firms in food & beverage industry, with particular attention on functional foods, where competition is based on radical innovation.

The main aim of the research is to provide insight into practices that would improve the performance measures in the development of functional foods (considered high technology products). Through:

- understanding the innovation processes and practices currently used by the food manufacturing industry (producing traditional and functional food);
- understanding the current practices in measuring NPD performance of personnel managing functional food development;
- understanding the role and the relations among people involved in NPD process.

The research objectives are:

- to investigate the new product development practices, major aims of NPD, mode of NPD and organizational orientation towards NPD;
- to investigate the cooperative network of food companies - who are the major external partners and what kind of activities are done in partnership with them;
- to investigate the performance measurement, with particular attention on financial and nonfinancial performance ratios;
- to investigate the relation among people involved in NPD process (R&D manager, Marketing manager, Production manager, Senior manager).

There is a lack in the literature about functional food product development, because there are a lot of studies on consumer behaviors (marketing) but nothing on management side (on the production management of new products, on the need for

greater expertise and, therefore, more investment in R&D, on the measurement and control of processes aimed to the development and their production), and since functional foods are products innovative intensive, in contrast with traditional foods, they need different attention.

To shape the research agenda, it is decided to conduct an exploratory case study research. This method is defined "as an empirical inquiry that investigates a contemporary phenomenon within its real-life context; when the boundaries between phenomenon and context are not clearly evident; and in which multiple sources of evidence are used"[148]. The case study research permits to identify and understand management control issues critical to NPD in food and beverage industry.

3. *Procedures*

- Initial approach to organizations

a. Selection of cases → the case chosen is in Polish market (after a 6 months visiting period). The company is Grana and reasons for its selection are: the geographic proximity - only 30 km from Krakow - and the stage of production process in which is located for functional foods.

   Grana is the world's biggest company producing beverages based on cereals and chicory. Each year, they sell thousands of tons of our blends to customers from all over the world. They invest in the development of their employees, research and development activities and their machine park facilities. They aim at enriching the range of soluble products in which they specialize and strive to ensure even better implementation of their company's strategic objectives. For all these reason, Grana is a Naturally healthy producer and it is going to introduce Functional beverages, in their products portfolio, adding inuline from chicory to instant coffee.

b. Number of cases – at the moment only on Grana case,

c. Establishing contact –the direct contact of Prof Sikora (head of Department of Quality Management in UEK) with Mrs Petrow (TQM responsible in Grana Sp zoo) was fundamental.

[148] R.K. Yin, *Case Study Research: Design and Methods*, Sage Publications, 2003.

- Scheduling of field visits – Grana 20th of May 2016 (interviews to Mrs Petrow, Ms Banach and factory visit).
- Length of sessions – Interview 1 hour; factory visit 2 hours.
- Equipment and stationery – Recorder, copies of text interview (for interviewer and interviewee), some definitions and tables for doing easier interview, pens and block.

4. Research instruments

On one side, it is deciding to consider indirect source of evidence as reports, organizational charts and other documents from official websites and internet. On the other side, the qualitative questionnaire, in particular an interview with open-ended questions.

Interview
Information about interviewee Company _____ Job Title/Designation _____ Main job responsibilities _____ Respondent's experience (years) in functional foods development _____ Number of New Product Development projects completed (all NPD project) _____ **A. Firm Orientation Towards Innovation** 1. What kind of new product was developed by your company during the last ten years (2005-2015)? Why the company decided to focus its attention on these products? 2. About functional/healthy products, what are the main aims that your company have led (or lead) to produce them? 3. What are the innovative aspects of the functional food development process in your company? 4. Please rank these aspects from the least to the most important.

Least important Most important

B. New Product Development Process

5. How would you describe the new product development (NPD) process for your company?
6. What are the differences in NPD of traditional and functional one?
7. What are the drivers of the new functional foods product development?
8. For the functional foods production, what cooperative arrangements have been developed (or will be developed) by your company? Why?
9. Which of the innovation related activities best matches your external partner and why?

Innovation related activity	**Relevant external partner**	**Reasons**
Joint R&D		
Joint product development		
Joint marketing		
Joint production		
Others please specify		

C. NPD Performance Measurement

10. How would you describe the performance control system used for monitoring NPD processes?
11. What kind (index or ratio) of **financial performance measures** are used in NPD processes and when?

(Please distinguish measures used for monitoring the traditional foods development and the functional food one)

12. What kind (index or ratio) of **nonfinancial performance measures** are used in NPD processes and when?

(Please distinguish measures used for monitoring the traditional foods development and the functional food one)

13. What do you think about the performance measures adopted in NPD processes? How they could be improved? *(Please give arguments and suggestions)*
14. How does information derived from performance measures influence departments/areas involved in NPD processes (R&D, Marketing, Production,

Top management)? Why?

D. Human Resources

15. Who is responsible for financial and nonfinancial performance measurement in NPD?
16. What is their educational qualification? *(Please identify if there are some differences in people involved in measuring performance for FFPD process)*
17. Do you think educational qualification influence the effectiveness of information? How and why?

- In a sentence, resume your opinion about the topic discussed in the interview (functional food development process).

_____
_____
_____
_____

5. Data analysis guidelines

Details regarding:

a) How convergence of data from multiple sources will be achieved

It was decided to do triangulation of data sources during data collection and data analysis. In the first one, during the interviews, the interviewer ask something connected with information gained from documents and information find on official website and on other databases (as Amadeus or Passport) for understanding the level of connections. So the triangulation will be done between different sources of evidence for defining a chain of evidence.

Description of 'Within case' analysis process: c) Individual case report.

The intention is to analyze the case "Grana" in depth, at the begin on the general side (no strictly connected to hypothesis investigated) analyzing history, production, attention to quality and so on. In second time the analysis will be focused on central topics as orientation toward innovation (to understand the approach to innovative product: open or close innovation), the description of new product development process and the differences in it between traditional and functional products, the performance measurement adopted for monitoring all product development process, from ideation to commercialization and the role of people involved in NPD control. These kind of information emerge from the primary source of evidence i.e. interviews to business

development manager who combines R&D and marketing responsibilities, total quality manager who supervises all procedures and processes from idea to product to insert on market. Finally, it will be verified the propositions and if they are not verified, understanding why.

Data schema

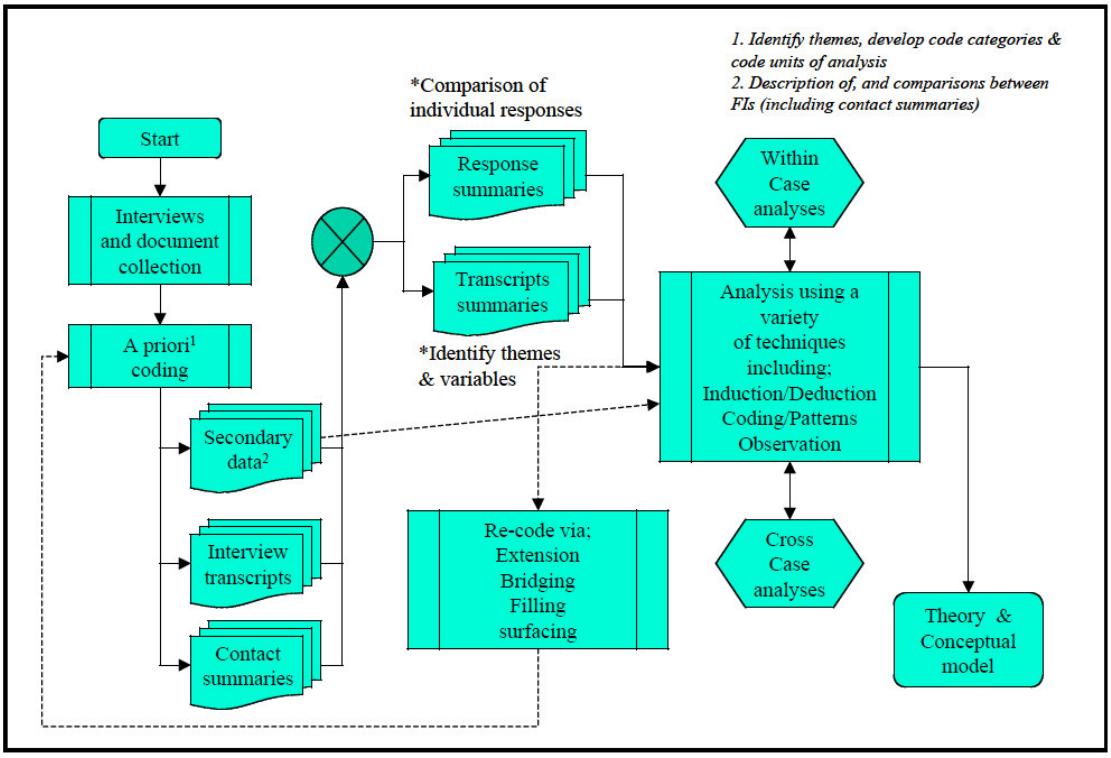
a) Summary of primary data types, sources and purpose: about primary types of data they have been collected during interviews with people involved in NPD process. In particular, as above, the people interviewed are business development manager and total quality manager. The purposes are connected to investigate the point of view of people directly involved in NPD process, so to know their opinions about the process and the control system adopted by their Company.

b) Summary of secondary data types, sources and purpose: secondary data types are represented by official website; documents from "Forbes Diamonds" award (which allows having information about the Company Growth in the last years); business report (from 2010 to 2014).

A priori list of codes that will be used during qualitative analysis:

- Orientation towards innovation
- Knowledge generation
- Cooperative arrangements
- Functional foods product development
- Financial performance measurement
- Nonfinancial performance measurement

Figure. Data analysis process



Source: H. Maimbo, G. Pervan, Designing a Case Study Protocol for Application in IS research, 2005, p. 1288.

6. Appendix

Illustrative Letter of Introduction

Università di Foggia

Subject: Succeeding in a functional product development in food industry

Mr/Mrs … ,

I am currently carrying out research on the prospects of future value added foods (specifically products with added health benefits[149]) for the European food industry, at Foggia University in collaboration with Cracow University of Economics.

[149] *Functional food*: A food can be regarded as functional if it is satisfactorily demonstrated to affect beneficially one or more target functions in the body, beyond adequate nutritional effects, in a way that is relevant to either improved stage of health and well-being and/or reduction of risk of disease. A functional food must remain food and it must demonstrate its effects in amounts that can normally be

This letter is to respectfully request your permission for «Company name» to be part of this research and that we may interview your New Product Development Manager (or equivalent senior manager with primary responsibility for overseeing NPD and introduction in your business), R&D Manager, Marketing Manager and Production Manager.

The completion of a qualitative analysis by the NPD and R&D Managers is not expected to take more than approximately 40 minutes. We assure you the confidentiality of data collected under the Foggia University rules of ethics, where no individual or company will be identified in the results – only called case "A" or case "B".

Your company's participation will be highly appreciated and in compensation of your time, a full and comprehensive executive summary of the results will be provided.

Yours Sincerely,

Ms Lorella Riccio (Principal researcher) **Email**: lorella.riccio@unifg.it

*

* *

* * *

In conclusion, the chapter has been useful to specify the aims of the research and the methodology that will be used for exploring the management control systems in the functional foods market, with a focus on the interactive control systems. In particular, it has been talking about the performance measurement and the Stage Gate model proposed by Cooper, which represent one of the new opportunities for firms which want to compete in the new market.

expected to be consumed in the diet: it is not a pill or a capsule, but part of the normal food pattern (Diplock et al., 1999).

Chapter 4 - Case Grana Spzoo

4.1 Company description

4.1.2 History

Grana Spzoo is the world's biggest company producing beverages based on cereals and chicory. The history of the company began when an Austrian, Heinrich Franck, opened the Coffee Surrogate Factory "Heinrich Franck and Sons" in Skawina (Poland).

The factory based its business activity on production of roasted and ground chicory, which started in 1911, in the same place where the company headquarters are currently located. The business idea came from the European tradition of roasting and drinking chicory roots which was typical since as early as the 16th century. It was strongly believed that drinks made from roasted grains and chicory had a positive influence on human health. The tradition of drinking such beverages has survived to this day; however, it has acquired a modern form i.e. nowadays the drinks are prepared from soluble powder.

During all these years, the company has undergone numerous transformations and, finally, in 1999, it became part of the German Cafea Group that is one of the world's largest companies specialising in the production of instant coffee for their own private label brand. Their range of products also includes: coffee beans, cappuccino, and 3in1 products based on milk and sugar and beverages for children. Cafea owns numerous production plants and several companies selling products in different parts of the world. In particular, the group is composed by the following companies:

- Cremilk Kappeln
- Dek Hamburg
- Dek Berlin
- Edel Lüttich
- Ffi Dunstable
- Grana Skawina
- Intercafe Moskau
- Milcafea Rathenow

The entering in this group allowed Grana under multiple aspects as knowledge, know how about processes, economies of scale, and so on.

Actually, Grana is the world's biggest company producing beverages based on cereals and chicory. Each year, they sell thousands of tons of blends to customers from all over

the world. In recent years, they invested and invest in the development of employees, research and development activities and their machine park facilities. The aim is to enrich the range of soluble products in which they are specialised and strive to ensure even better implementation of their company's strategic objectives. The corporate strategy adopted has allowed the company to expand it, counting 300 employees, a production area of 25.000 m^2, almost 8000 pallet positions in the storage, the 2015 annual income amounts to €50 million and received the "Forbes Diamonds"[150] award for the Fastest Growing Company for two consecutive years.

The company is not listed on the stock exchange and the property is, for 100% of capital, in the hands of Cafea Group. The principal company authorities are Holger Bebensee – the President – Jacek Jozef Hyla and Robert Edmund Ikiert – Board members – Andrzej Marek Grabowski and Ewa Lilianna Stachura – Delegate members.

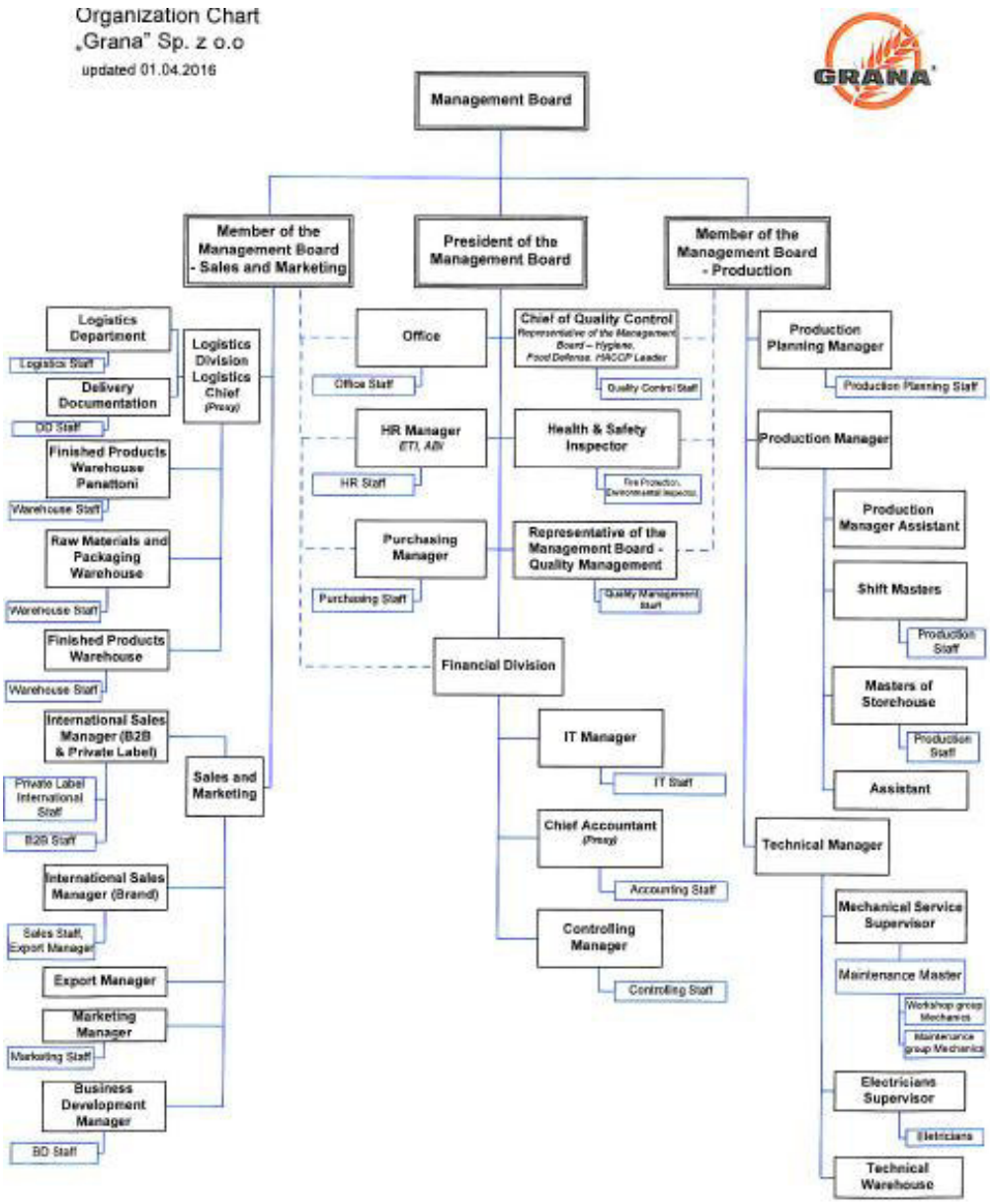
In terms of organizational structure, Grana has a fairly complex structure as illustrated in Figure 22. In particular, they have a functional structure, typical in production based organization as Grana is. The functional organization structure is a hierarchical type of organization structure wherein people are grouped as per their area of specialization. These people are supervised by a functional manager who has expertise in the same field, which helps him to effectively utilize the skills of employees, which ultimately helps him in achieving the organization's business objectives.

In this kind of organization structure, people are classified according to the function they perform in the organization. The organization chart for the functional organization structure shows the management board, member of the management board – sales and marketing, member of the management board – production and president of the management board, and then all division as finance department, sales and marketing department, customer service department, administration department, and so on.

Each department will have its own department head, and he will be responsible for the performance of his section. This helps the organization control the quality and uniformity of performance.

[150] The Forbes Diamonds is an award assigned by Dun & Bradstreet Polska which has collected data on entities that submitted reports to the National Court Register in the past year. This has been used to form a base of companies which were voted as having a positive credibility rating; they were profitable (based on EBIT and ROA), had a high current liquidity, were not in arrears with payments, and produced a positive financial result and value of equity over the last three years.
This award confirms the good condition of Grana as a profitable and reliable company, with high liquidity and a tremendous pace of development.

Figure 22 Grana Sp.z.o.o. organizational chart



4.1.2 Products offer

Grana Spzoo functions in two sectors: the B2B and the B2C. The company, on one side, supports its business clients by delivering products that satisfy their requirements, while, on the other side, for the consumers, it creates brands that will always be at the top of their shopping lists. Grana creates concepts which include ingredients, production technologies and product form, and also provides assistance in the field of graphic design and packaging selection. Moreover, it becomes fully involved in all projects in

order to meet the expectations of its customers.The effects of Grana's work can be found on shop shelves across Europe and in the USA, Canada, Russia, Japan, Malaysia and the Republic of South Africa.

Focusing on products offered, they are distinguished in three big categories: hot drinks, Naturally Healthy instant beverages and Functional beverages. The specific description of products family is summarized in table below.

Table 10 Grana's products offer

Products family	***Description***
Inka Classic	- it is a naturally derived essence of barley, rye, chicory and sugar beet; - it has an high content of nutrients from cereals; - it could be drunk by babies up to three and pregnant.
Inka Pro-health	Inka Calcium and Vitamin → it contains soluble fiber from chicory which is a substitute enriched with extra dose of calcium and vitamin.
	Inka Fiber → it contains soluble fiber from chicory which is a substitute enriched with extra dose of valuable inulin
	Inka Gluten free → in its production process gluten, as the water-insoluble part of the grain, is separated and removed from the product.
	Inka Magne→it is based on the proven recipe Inka. It's an innovative blend of chicory and magnesium. The magnesium contained in its recipe contributes to the reduction of tiredness and fatigue.
Inka Flavoured	Inka Caramel Flavour → it is a composition of cereals, chicory and sugar beet. When combined with milk and a hint of sweetness, it tempts with its aroma and the fluffy foam
	Inka Chocolate Flavour→it is based on the proven recipe of Inka and intensely flavoured with a hint of chocolate which tempts with its taste and aroma.
	Inka Milk→ it is a composition of cereals, chicory and sugar beet.
Other brands	Caféa → a composition of soluble coffee and chicory. It is high in fibre, and it has also been enriched in magnesium, which helps reduce fatigue.
	Chicorycup→ the most important component of the products is chicory, which in many countries is a popular and natural coffee substitute.
	Inkafe→ very soft blend of coffee and cereals. This beverage

	was created for those who do not want to give up the taste and aroma of coffee but want to avoid excessive caffeine consumption in their diet.
	Wild Rose → it is a soluble beverage, which provides vitamin C and antioxidants, substances useful to neutralize free radicals in human bodies.
	Barleycup→ it is an alternative for hot beverages such as coffee or tea. It is composed by cereal & chicory drink, easy to prepare. In addition to its taste, Barleycup has also got other advantages: it is delicate, it does not contain caffeine, and it can be drunk at any time of day by the whole family.

4.1.3 Industry characteristics, level of competition and Company position

As identified in the general description of the company, Grana competes in hot beverages market. In particular, the Grana's products embrace three main categories: hot drinks, naturally healthy drinks and functional beverages.

The **first category** may be considered as the aggregation of flavoured powder drinks and their plant-based powder drinks. Products can be served hot or cold, and can be mixed with water, milk, or other liquids.

The Polish hot beverages market's in number is described below:

- sales of hot drinks increase significantly in retail value terms by 3% to reach PLN435 million (€98 mln) and by 2% in retail volume to reach 13.943 tonnes in 2015;
- chocolate-based flavoured powder drinks remain the most important product group within hot drinks in Poland;
- foodservice volume growth of 2% matches the performance in retail volume terms with sales amounting to 13.944 tonnes with the much lower 355 tonnes in foodservice in 2015;
- retail sales of other hot drinks are projected to record a volume CAGR[151] of 3% and value CAGR of 2% at constant 2015 prices over the forecast period.

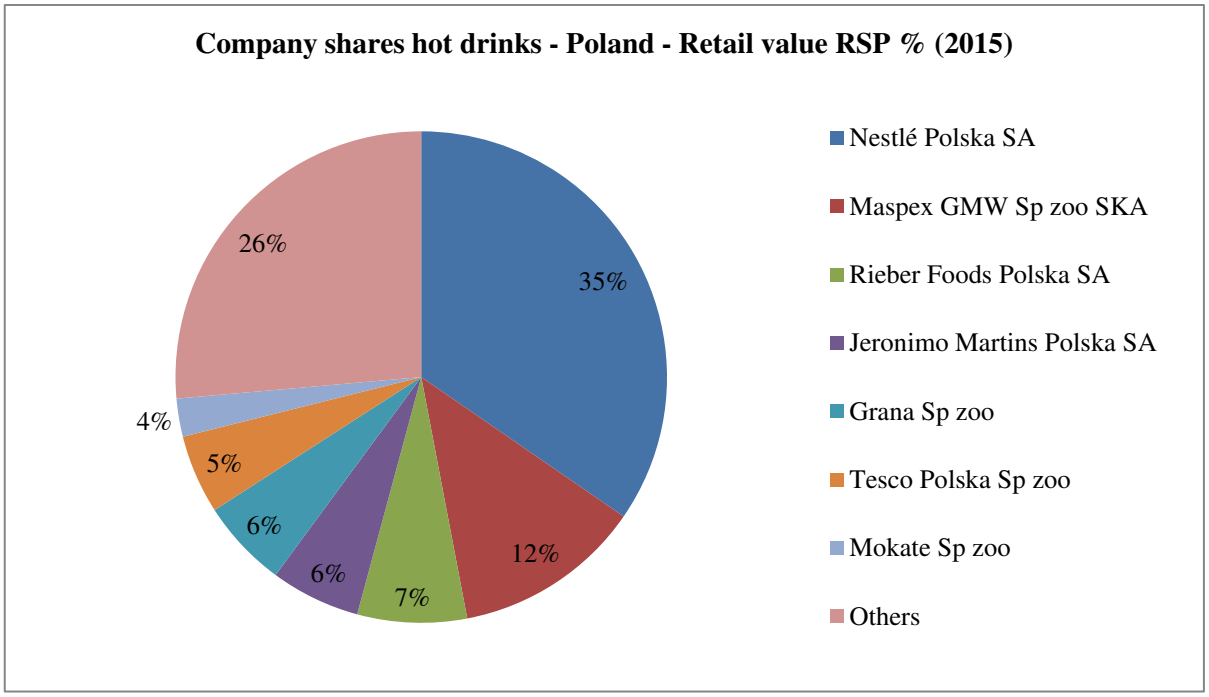
Specifically, the Polish competitive landscape shows that the biggest player in this market is Nestlé Polska, which continues to lead sales in this area, with the company

[151] The compound annual growth rate (CAGR) is the mean annual growth rate of an investment over a specified period of time longer than one year.
To calculate compound annual growth rate, divide the value of an investment at the end of the period in question by its value at the beginning of that period, raise the result to the power of one divided by the period length, and subtract one from the subsequent result.

accounting for a 35% value share in 2015. The multinational has a strong position in chocolate-based flavoured powder drinks, with its most popular brand being Nesquik. Also in other plant-based hot drinks the company holds a strong position due to its popular brand Nescoré. The second position in 2015 was held by Maspex GMW with a 12% value share. The company primarily focuses on chocolate-based flavoured powder drinks offering such known brands as LaFesta, Puchatek and DecoMorreno.

For years the multinational operator Nestlé was the undisputed leader in Poland. Whilst, the third place was taken by other global brand owner Rieber Foods Polska with a 7% value share. These corporations operate well-known brands which are both commonly available and strongly promoted. Nevertheless, the multinationals are fiercely challenged by domestic operators such as Maspex GMW, Grana and Mokate who together accounted for a 21% value share (Figure 26).

Figure 23 The competitive landscape and Grana position on the hot drinks market



Source 11 Passport by Euromonitor international, 2016.

Local manufacturers, despite lower financial capacities, compete with profound knowledge of consumer needs and tailor their products to the expectations of local buyers.

Moreover, the forecast growth is decisively relevant, indeed according to Euromonitor previsions about the retail value of hot beverages in Poland, it will grow by 13,95%.

Understood the general market of hot beverages in Poland, the other important market served by Grana is the **Naturally healthy (NH)** one, whose products are defined as «products which are included on the basis of naturally containing a substance that improves health and wellbeing beyond the product's pure calorific value. These products are usually a healthier alternative within a certain sector/subsector. Products included are: 100% fruit/vegetable juice, superfruit juice (including cranberry juice), natural mineral water, spring water, cereal/pulse-based drinks, other Asian speciality drinks, green tea, other naturally healthy tea, green tea, herbal tea, other naturally healthy tea (eg oolong, gunpowder tea etc), malt-based hot drinks, other plant-based hot drinks. While many of these products are marketed on a health basis, this might not always be the case[152]».

Following the previous structure of hot beverages market's analysis, the Polish naturally healthy beverages market's in number is described below:

- naturally healthy beverages record current retail value growth of 4% in 2014, with sales reaching PLN 5,555 million (€ 1,245 mln);
- changing lifestyles and care for health and wellness drive NH beverage sales in 2014;
- NH bottled water posts current value growth of 5% in 2014;
- average unit prices of naturally healthy beverages increases in 2014;
- Zywiec Zdroj Sp zoo leads NH beverages in 2014 with 10% value share;
- NH beverages projected to see slightly negative to zero constant value CAGR over forecast period to reach PLN 5,531 million (€1,240 mln) by 2019.

The top player in this market is Zywiec Zdroj Sp.z.o.o., which led sales in 2014 with a retail value share of 10%. The company's strong performance was supported by bottled water brand Zywiec Zdroj, which recorded a value share of 58% in NH still spring bottled water in 2014. Zywiec Zdroj's other brand, "Zywiol", held the leading position within NH carbonated spring bottled water, recording a current retail value share of 55%.

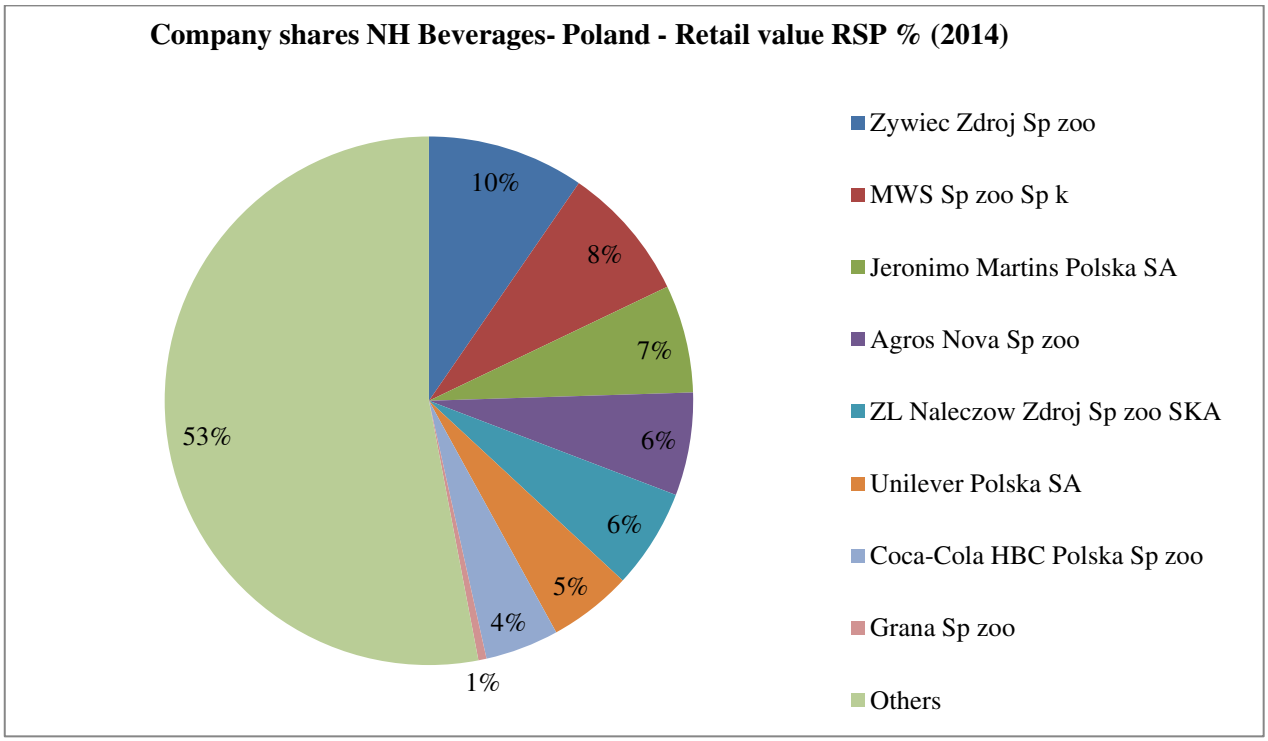
Immediately below is MWS Sp.z.o.o., which held a value share of 10% in 2014. The company has a broad portfolio of NH 100% juice, NH superfruit juice (up to 24%) and NH RTD green tea, but is strongest within NH 100% juice.

[152] Euromonitor, "Naturally Healthy Beverages In Poland", Euromonitor International, June 2015.

In addition, Ustronianka Sp.z.o.o. extended the portfolio of its NH bottled mineral water and introduced brand new Ustronianka z Wapniem (with calcium). Other NH bottled mineral water products introduced earlier in 2012 were Ustronianka z Potasem (with potassium), Ustronianka z Jodem (with iodine) and Ustronianka z Magnezem (with magnesium).

An important position is covered by private label products, which account for a 17% share of sales within NH beverages in Poland, mainly due to the popularity of such products in NH bottled water and NH 100% juice. Private label products have strengthened their positions in NH tea, particularly in NH other fruit/herbal tea (for example Grana is in this niche). However, private label products were also launched in premium areas such as not from concentrate juice. This type of juice is available in Biedronka and Tesco outlets for much lower prices than those offered by branded manufacturers.

Figure 24 The competitive landscape and Grana position on the NH beverages market



Source 12 Passport by Euromonitor international, 2015.

As it is possible to notice in the above figure, Grana represents a small player in naturally healthy beverages market. Because it serves a niche of it, only hot instant drinks, i.e. Wild Rose, Chicorycup and so on.

About future perspectives, the sales are expected to grow over the forecast period. NH beverages will gain popularity due to increasingly frequent public discussions regarding the dangers of artificial sweeteners or colourants. Consumers will continue to care for health and wellness and there will be rising demand for natural products. NH bottled water is expected to drive sales while the growing availability of not from concentrate juice and superfruit juice will meet consumer demand for natural and healthy drinks. Furthermore, the number of persons aged 65 and over is expected to increase by 18% over the forecast period, while the number of people in this age group is expected to grow from 5.9 million in 2014 to 7 million in 2019. This strong increase is likely to be associated with improving living conditions and the development of medicines which improve the quality and effectiveness of treatment. Growth in the number of elderly people is expected to be associated with an increase in the number of people suffering high blood pressure, heart disease or osteoporosis. In addition, rising health awareness among older people and their families is also likely to have a positive impact on certain areas within NH beverages. So, Naturally healthy beverages is projected to see a zero constant value CAGR over the forecast, set to reach PLN 5,531 million (€1,240 mln) by 2019.

The **functional beverages** sector is the last one where Grana compete. About seven years ago, the firm has decided to introduce products not simply healthy but functional, that is at naturally healthy beverages having been additionally fortified, so to fall into the fortified/functional (FF) category.

The Polish fortified/functional beverages market's in number is described below:

- fortified/functional beverages records current value growth of 3% in 2014, reaching PLN 2,237 million (€510 mln);
- FF drinks increasingly focused on healthy features, with more beneficial ingredients added to both new and existing product lines;
- FF non-cola carbonates leads growth in 2014, with current retail value sales increasing by 7%;

- MWS Sp zoo and Hortex Holding SA lead off-trade value sales in 2014 with combined retail value share of 31%;
- fortified/functional beverages projected to see marginal constant value CAGR over forecast period to reach PLN 2,282 million (€513 mln) by 2019.

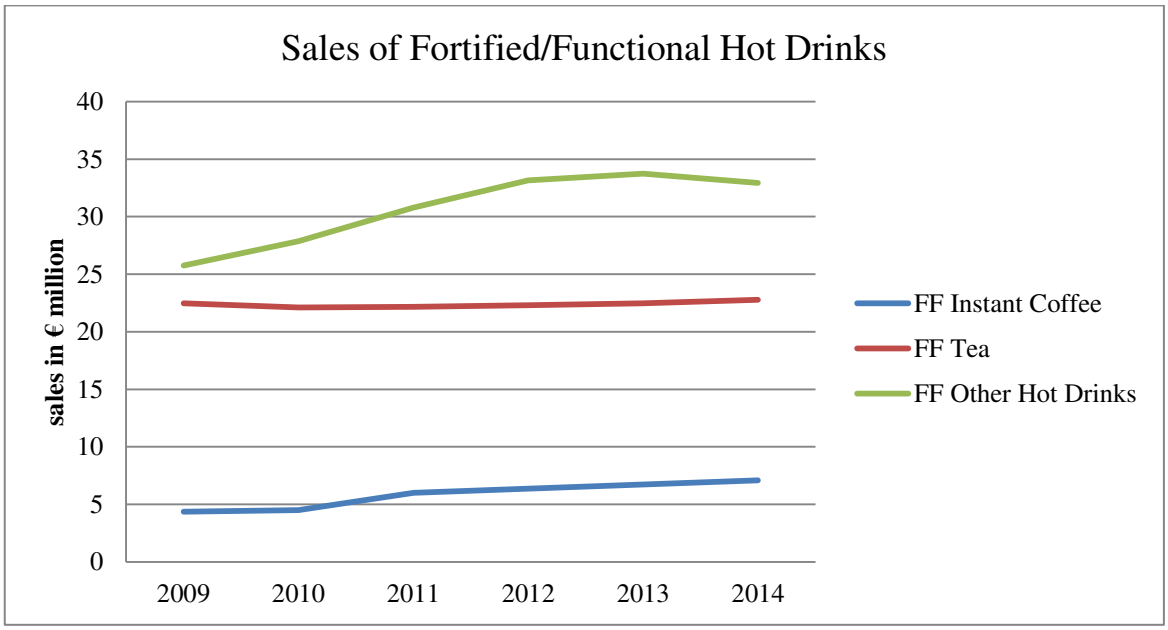
The main players in fortified/functional beverages are represented by companies that offer non-cola carbonates, fortified juices, nectars and energy drinks. Specifically, MWS Sp zoo, Hortex Holding SA and FoodCare Sp zoo led off-trade value sales in 2014 with retail value shares of 23%, 9% and 8% respectively. From the international context, Red Bull Sp zoo had a value market share of 8%, while Coca-Cola HBC Polska Sp zoo and Pepsi-Cola General Bottlers Poland Sp zoo held shares of 6% and 3%.

The category has experienced some interesting launches especially in energy drinks, in which the major operators have introduced products with additional functions, rather than the products offered a simple boost of energy. For example, MWS Sp zoo introduced Tiger Restart with vitamin C and electrolytes; but not only the added ingredients have led the FF beverages success, indeed the protagonists have been also the marketing activities, often hiring people associated with the sport and a healthy lifestyle.

In Poland, production of fortified/functional beverages does not require special approval, despite the European Regulation about it. Access to this environment barrier is rather low, and FF drinks are also produced in private label fields.

About the niche served by Grana, in the last 5 years has been registered an increasing in sales for functional instant coffee and other hot drinks (Figure 28), such as Chicorycup.

Figure 25 Sales of Fortified/Functional Hot Drinks: value 2009-2014



Source 13 Passport by Euromonitor international, 2015.

In particular, the functional/fortified instant coffee has registered the 62.3% sales value growth, representing one of the most increasing markets in the category of functional/fortified beverages.

Moreover, fortified drinks are clearly moving in the direction of increased healthiness and it is expected that manufacturers will develop new product lines containing more substances beneficial to health and beauty, such as vitamins, iodine, magnesium, and so on. A similar trend will be evident in marketing efforts, which will focus on presenting the products as compatible and useful in leading a healthy lifestyle.

The FF beverages category is expected to achieve a marginal constant value CAGR at constant 2014 prices over the forecast period. This is expected to be the result of a general increase in consumer awareness. Polish consumers perceive FF drinks rather as supplementary products than solutions.

Similarly to Western European countries, Poland will face the problem of an ageing population, which is expected to boost the popularity of anti-ageing drinks in coming years. Demographical data show that the significance of this problem will moderate over the forecast period, materialising around 2030. However, even public debate regarding the ageing population may increase interest in products and solutions aimed at decreasing or delaying the negative effects of ageing.

Starting from these considerations, the future perspectives for FF beverages and, in particular, for FF hot drinks is to growth of the 23.4% in the next four years (2015-2019), focusing attention on FF instant coffee where operates Grana.

4.2 Innovation management system

4.2.1 Firm orientation towards innovation

The annual investment in research and development (R&D) carried out by the company is increased, in a growing way in the last ten years. In addition to this, 10-15 employees working in facilities dedicated to R&D to which are joined collaborations with employees in Hamburg's plant. Moreover, the team organized for developing new products is composed by employees from different departments, R&D, Marketing, Production and Quality dept. Clearly, the project team involved in NPD cooperates with some external partners, represented by research agencies, marketing agencies and suppliers (about the functional ingredients).

Analysing the company business report, it emerges that in the last 5 years (2010-2014) the costs in intangible assets, specifically about patents and trademarks, are increased from €37,7 thousands to €126,1 thousands (about 70%)[153], so underlining the importance of innovation in Grana. On the same way, the new products projects carried out in the last ten years have conducted to 20 new products launched, 7 of which are in functional beverages' category. These numbers are significant of the importance of developing new products to Grana and how the investments made in this direction are rewarded by successful new products launched.

The company appears to be aware of the importance of knowledge in the innovation process and how important is the sharing of the same within the people involved in NPD. In this direction will guide the choices made by senior management with regard to staff training, and the attempt to spread the knowledge about the world of functional products to its customers, so they are able to make the most of the products that company offers. Since the last one is characterized by highly innovation, the company must be able to manage the know-how about technical aspects of product composition, and the know-how about the market. In particular, the consumers' needs and behaviour are important to monitor, for understanding the probability of success in a new

[153] EMIS, Business Report: Grana Sp zoo, London, UK, 2016, p. 3.

production. At the same time, the high innovative products proposed by Grana answer not only to consumers' needs, but anticipate them with products that give more than they expect. Moreover, starting from the interviews, it emerges the management's idea to codify knowledge for avoiding the troubles linked with the employees' turn over.

4.2.2 NPD process

A generic process of the new product development, undertaken by the company, usually consists of five distinct phases. Each phase has a linear path, but the trial-and-error type cycles are numerous and are necessary to hone solutions developed by the company.

In the **first stage** is expected to work on a set of ideas coming from the external and the internal environment. A cross-functional team is created for analysing the ideas and the findings from the market, for understanding what ideas may be developed and what are not feasible, because need more investment or more complex technology, which company do not have. This step is particularly interesting because it is understood the company capability to take novel elements from the environment and use them for obtaining competitive advantage. So, the main aspect to consider in this phase is the knowledge about the market and consumer needs. In synthesis, in the first stage the company focused the attention on:

- the identification of unfulfilled consumer needs;
- the definition of the gaps in Grana's offer;
- the analysis of Grana business criticises;
- the new idea of target and product;
- selection of the project leader;
- creation of a work team;
- drafting of a product file.

The **second phase** is dedicated to develop the principal aspects that the new product must have. The starting point is dedicated to the concept description defined in the first stage. Exploiting the capabilities of all people employed in project team, it is possible to align and refine the previous ideas, and moreover it is possible to give an economic value to choices made. Indeed, the definition of consumer needs and market answers result basic for new product success. Therefore, the company tries to make the most, to

use in the best way its tools and competencies for developing new successful ideas. In particular, during the second stage are defined:

- economic objectives for the project;
- conceptual consumer test;
- first draft of commercial terms;
- first idea for packaging.

After that, the concepts developed are submitted at evaluation. A group of managers coming from different company's departments perform the feasibility analysis about the interesting projects studied in the previous stage. Specifically, during the **third phase**, the activities are:

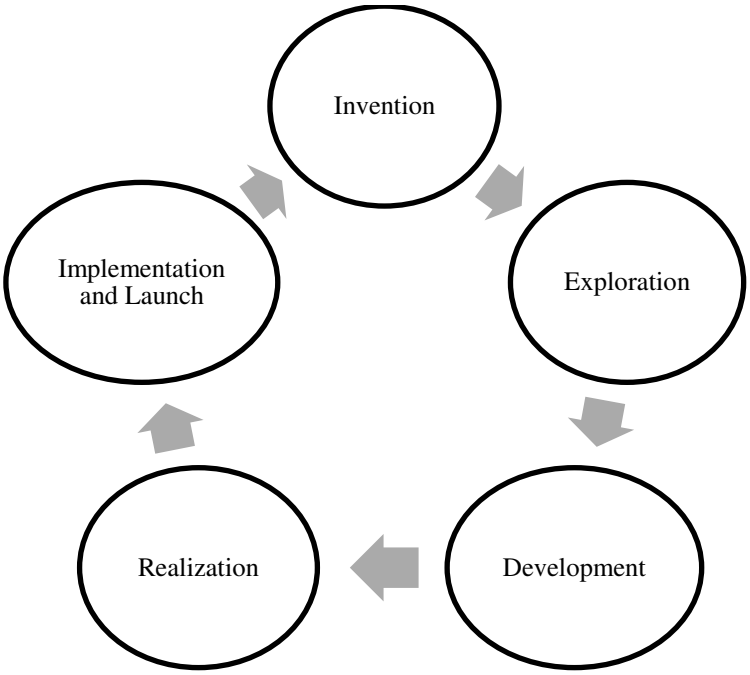
- experimental trials on the product and pack development;
- ingredient analysis;
- definition of durability;
- list of the ingredients, nutritional label, sales denomination, allergens;
- analysis economic-financing feasibility;
- analysis technical-industrial feasibility;
- conceptual consumer test;
- authorization by external bodies;
- risks and opportunities management;
- audit of raw material suppliers, ingredients, packaging;
- audit of food safety assessment on the premises;
- recommendation for launch.

At this point, company has the opportunity to realize the product. A product manager and a project manager are employed to effectively guide a team in the realization of the product (**fourth stage**). The prototype is subjected to an internal team, which analyses the characteristics of the new product, the ingredients composition and the real functionality of the beverage. In particular, Grana pays great attention to the high quality of its products and is determined to constantly improve the processes implemented in the company. For these reasons, in this stage, it focuses the attention on:

- issue of HACCP plan and control plan;
- specific emissions and specifications.

The **last stage** regards the implementation and the launch of the product. The new product developed may be validated and the commercial plan is defined. The packaging is chosen for better representing the new product qualities and the analysis of launch risks are evaluated. The composition and a sample of the product is send to the Ministry of Agriculture, which examines it and decides if is possible to insert it in functional products or not. After that, the company approves the launch plan and places on the market the new product (Figure 26).

Figure 26 The NPD process in Grana Spzoo



4.3 Case study Analysis

4.3.1 The role of Grana case

Grana Spzoo for its characteristics results interesting to be analyzed, because it is new in functional beverages. Over the last 10 years they developed and launched over 20 new products, 6 of them healthy and functional one. In particular, the first functional beverage produced was Inka magnesium, which represents an important success for the Company, because it is the first launched on the Polish market in its category and consumers very appreciated its benefits. Moreover, Grana has an internal department of R&D, composed by 2 people involved in laboratory researches for new ingredients to

add in instant beverages. The new product process is every time conducted by 10-15 people in the team project, coming from 3 main departments - R&D, Marketing and Production. The investment in research is increased in last 10 years.

According to Company's mission statement, it "creates innovative, safe and high quality products to support the health conscious customers in their everyday choices" and serves, not only B2C consumer, but the business to business one, i.e. USA, Canada, Russia, Japan, Malaysia and the Republic of South Africa.

Grana SpZoo was thought to be a very suitable company for the empirical analysis because it is a first mover in hot functional beverages in Polish market and, it has a positive credibility rating; it is profitable (based on EBIT and ROA), it has a high current liquidity, it is not in arrears with payments, and produced a positive financial result and value of equity over the last three years. Starting from these conditions, it is expected an ideal context for exploring and implementing management control systems.

4.3.2 The coding

The field study was conducted over a period of six months: from November 2015 to May 2016. During this period, it has been visited the firm and conducted the interviews with the business development manager, the total quality manager and the marketing manager. Some days have been spent for observing the daily activities. In particular, the research focused on specific MCS, i.e. NPD Stage Gate model and performance measurement systems. To further increase the sensitivity to the finer points of NPD, a previous in-depth research was conducted through polish databases about NPD process.

Before starting the data collection, a case study protocol was developed, which contains the instruments and also the procedures and general rules for doing the case. It is a desirable tool, because it is a major way of increasing the reliability of case study research and is intended to guide the researcher in carrying out the data collection from a single case. In particular, the protocol is written for the specific case and it is composed by 6 sections: preamble, general, procedures, research instruments, data analysis guidelines and appendix.

Information was collected using three main sources: interviews, internal documents dealing with Grana and publicly available data, systematically compared in an iterative triangulation process. The basic approach to data collection applied in the case study

consists of gathering, prior to personal contacts, as much information as possible from internal and publicly available documents. Direct interviews were used to discuss and analyse previously obtained data. All interviews were conducted with the total quality manager, the business development manager and the marketing manager; they mainly focused on the FFPD critical factors, the performance measurement systems and the role of human resources.

In particular, the interviews were recorded. Notes were taken during the interviews and, on most occasions, more detailed notes were made immediately after the interviews in order to captures ideas that emerged during the conversations. The internal documents and publicly available data were primarily concerned business reports and management reports for understanding the NPD projects, the R&D investments and the firm's results.

However, there are some limitations to the applied research methodology. First, the empirical basis was mainly direct personal interviews with the company's top managers, allowing for empirical results to be likely biased by distorted reconstructions and rationalizations. An effort has been made to mitigate these undesired effects, i.e., the triangulation of data drawn from different informative sources. Secondly, as with most single case studies, the empirical research does not allow for any systematic generalization. Nevertheless, the aim to the study is to explore the specific situation for defining a model to test on many firms involved in FF production.

The process of data analysis may be divided into two major stages. Stage one refers to the initial coding and first attempts to aggregate codes into themes. This went on in parallel with the empirical work. Stage two refers to the period following the fieldwork. Here the "final" coding and theorizing were carried out - without further empirical input other than what was received by email or phone to clarify any ambiguous points in the material.

As regards the step of data reduction, as suggested by the literature (Huberman & Miles, 1994), it was followed the guidelines of the Coding procedure. For obvious reasons of space, determined by the intrinsic length of this procedure, in this section it will not be shown all the steps of analysis carried out, which have been described in chapter 3. Instead, the main categories identified will be shown below.

Table 11 summary of main themes/codes

RESEARCH CATEGORIES	MAIN CODES
NPD process	- Informal process - Customer driven NPD
Orientation towards innovation	- Investments in R&D - Employees training - Knowledge generation
Drivers of FF development	- Customer and competitors - Market trends - Brand image
Cooperative arrangements	- Major partner - Customer oriented - Need-driven approach
Management control systems in FFPD	- Financial and non-financial measures - Stage gate model

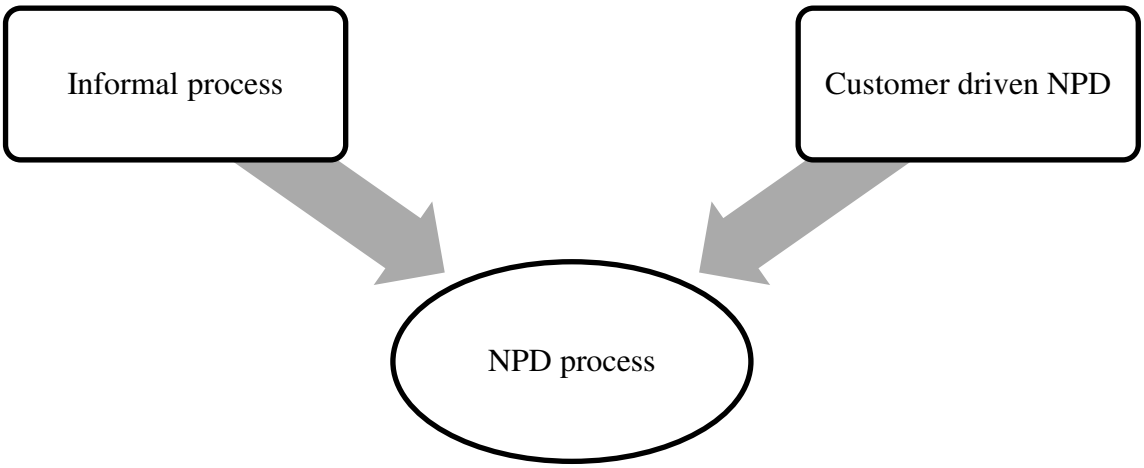
4.3.3 The within case study

A stepwise discussion of these main categories with codes is presented as below.

Themes related to new product development process (NPD)

The main categories extracted from the transcriptions were informal process and consumer driven approach, which characterized the new product development process.

Figure 27 Themes related to new product development process



New product development activities seem to be running through informally generated groups defined by informal processes.

> "The process has a lot of phases/stages but is not so complicated like in IT industry or something like that. I would say that are standard procedures, we have goals, the idea from client, (internal or external client), I mean marketing management or business development or client itself, which they try to work out some ideas of product, then we set up goals for this process and then just work with production, with quality department, with research agencies, with marketing agencies and then we just evaluate the product". (Business development manager).

On the other hand, the marketing manager underlines the complexity of the process and underlined that

> "the product development process is difficult and long term".

However, agree with the first statement, the total quality manager describes the NPD process as

> "complete, systematic, and based on experience of people involved in it and capable to involve many departments".

The marketing manager point of view could be connected to the difficulties that his department meets for better representing the new products in the market and convincing the consumer about its healthy properties.

It was found that most of the NPD is driven by the market where customers give the basic input/concept to start a NPD project.

> "For consumer needs, everything is driven by consumer needs, it is obvious. In this case (functional foods) it was also to take away a part of the market shares to our main competitor, which is "Anatol" coffee, actually they decide to put on the market the instant form of their products and we decided to go in their category".

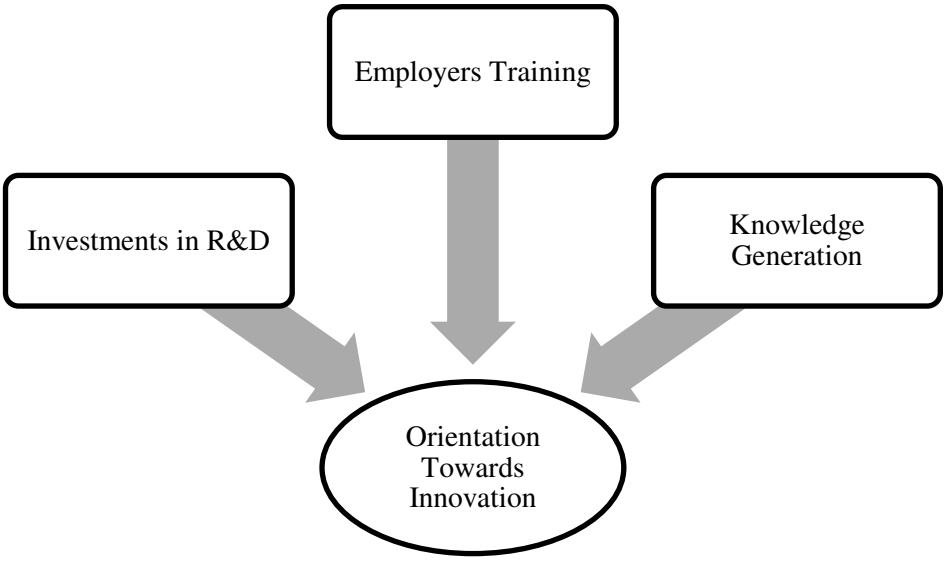
Moreover, customers' inquiries and general market trends together drive the NPD projects.

> "With direct needs it is during the qualitative research or survey stages, we see together with consumer how they answer questions. In particular during focus groups with 6/10 consumer, and just it is a qualitative approach" (Business development manager);
>
> and
>
> "we would like to be a flexible company, so the way wrote which we have the information about the product and some ideas, it is from a lot of ways, so customer sales, our clients also the trends of the markets and others" (Total quality manager).

It can be concluded that customers occupy the central position in driving NPD projects by their control over mass access to consumers. However, this reflects, certainly in the cases quoted here, a lack of direct relationship between consumers and product developers in order to understand consumer needs in a more comprehensive manner, because the focus group is composed by a small number of people while the complete "population" interested in it is not considered, except for the opportunity to write ideas on the facebook page.

Themes related to orientation towards innovation

Figure 28 Themes related to orientation towards innovation



The technological capabilities and innovations capacities of a firm to incorporate new nutritional science and technology, concurrent with emerging market demands, into new food products simultaneously are relevant. In particular, it emerges that the employees training and the knowledge generation are two pillars for successful new products.

> "We prepare everything by ourselves, so the Corporation is strict in our Company. Of course we train our people a lot, because is a special thing and you must know legislation, all parameters which we must control but I think it is a big benefit for us and also decrease the cost of functional product" (Total quality manager).

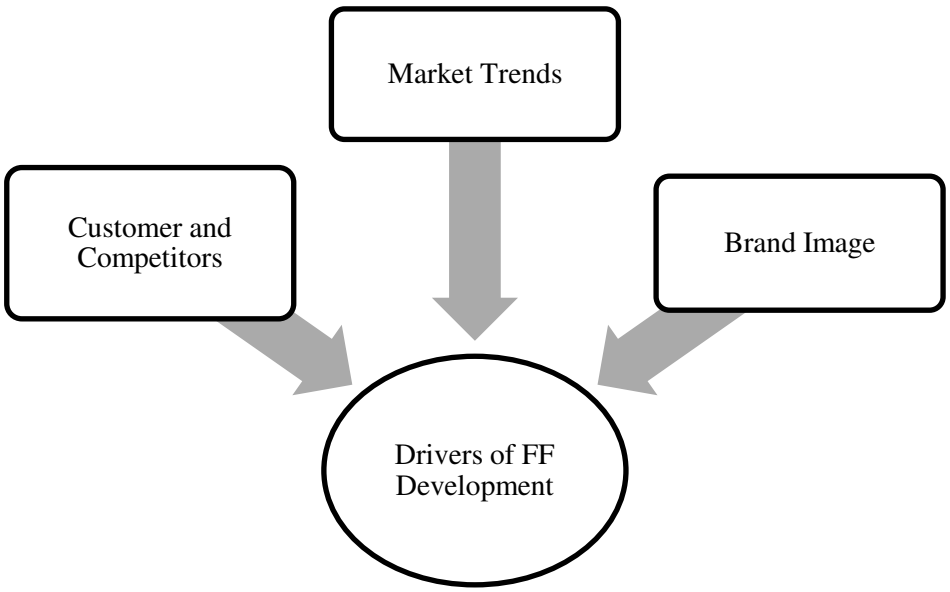
Moreover, people involved in FFPD hold knowledge about new ingredients and new procedures, while

> "it is more about the idea for the product; it is more about that here we need inside market research agencies but if we talking about the product it would be complicated. It is better to get knowledge internally then to teach somebody about our company it would take ages" (Business development manager).

Hence, the knowledge about ingredients, new recipes and procedures are developed and improved internally, with people qualified. The image of new functional product and the communication are entrusted to marketing agencies, which have more knowledge about consumer's needs.

Themes related to drivers of functional foods development

Figure 29 Themes related to drivers of functional foods development



The drivers of functional food development seem to be through responding to customer demands or competitors pushing new products.

> "The most important are the consumer needs, it is the easiest way to do the business, when your consumers tell you «we really need it, I really need magnesium, coffee flashes out magnesium from the body and I really have beneficial, I stay better»" (Business development manager).

Moreover,

> "of course the competitors. To enter in a new category is always beneficial for the brand, for the company, so especially if you are first. If you are first with the functional substitutes in Poland, it is a very good strategy to be the first, that's the idea".

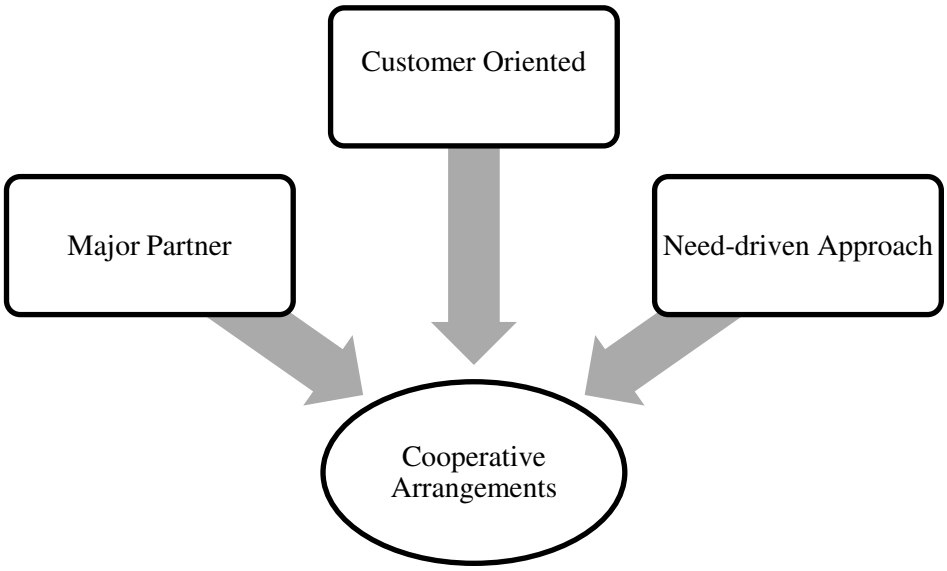
The marketing manager speaks about the "demography trend", despite the customer demands as a driver for functional foods development.
Another driver for functional food development is represented by brand image, because the consumer associates the brand to a food category. So,

> "the very important driver was to support Inka image as healthy beverage, because it is already in consumer mind that Inka is healthy natural product but if you have on the shelf product with magnesium, with fiber, with calcium, with vitamins, it really works well with brand awareness and also the positioning of the brand, we want to move Inka because is an instant product so some consumer are afraid of that maybe they are no natural … we support the brand in that way to give more to the consumer".

Finally, the market trends are propulsive of functional foods development; indeed the total quality manager and the marketing manager underline the relevance of the consumer lifestyle in Poland and the role of their competitors. The increase of healthy foods production has represented a pushing for them in the respective market.

Themes related to cooperative arrangements

Figure 30 Themes related to cooperative arrangements



It was found that reported collaborations for new product development as a part of the NPD strategy were very few indeed. Food companies mostly run their NPD activities independent of external help. However in a few cases it was reported that marketing agencies and suppliers are the main external partners. In particular,

> "we need to cooperate with our suppliers, if you talking about functional ingredients because we need to work out the special brand, for example for vitamins, to fulfill the norms for shelf life of the product, the taste also and so on. In our case, most we just work with suppliers of the functional foods" (Business development manager).

The total quality manager underlines, also, that

> "… in our company it depends on the project, of course we also trying to cooperate with academic institutions, but with functional we haven't this kind of cooperation".

Next to suppliers, the other main player in initiating new product projects and thus become the central focus for all external collaborations and inputs into NPD are marketing agencies.

> "Only with suppliers and marketing agencies or research agencies but more about testing the consumer and about the products". "They have extra knowledge about speak to the consumer. We can work out so good claims, marketing claims, consumer claims".

The internal partners are represented by Group's people or departments, because Grana is a firm in Cafea Group, and

> "sometimes we work with R&D in Hamburg, in our Company. But it is in the same group of company and no more" (Business development manager).

As Total quality manager says

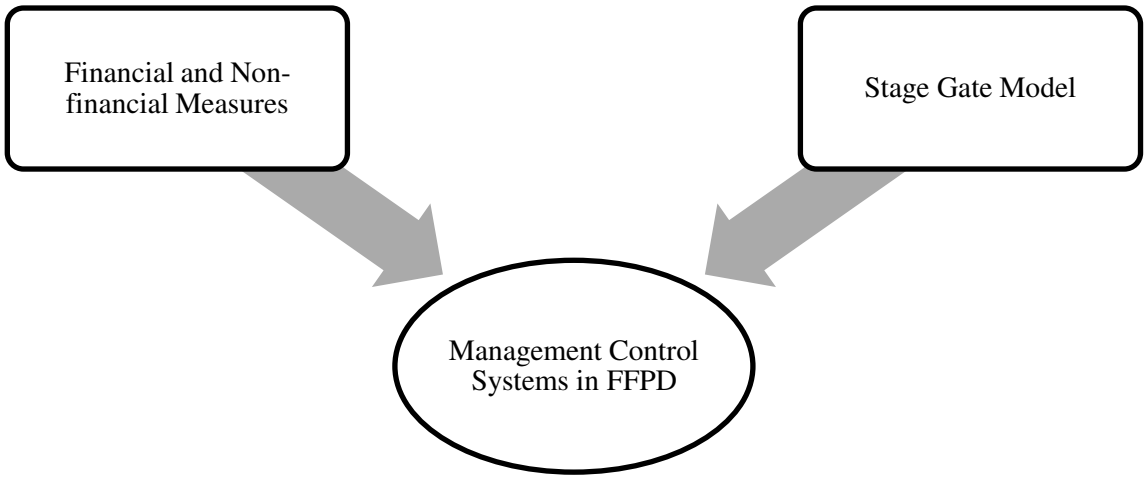
> "rather we try to internally do everything, but sometimes when we have the idea and even the possibility to do it in our company we also cooperate with external laboratory, also with University, etc."

So, a need-driven approach in some situation results the solution to development issues. Customers are the main players in initiating new product projects and thus become the central focus for all external collaborations and inputs into NPD. As above, through internet they

> "have a lot of opportunities with Inka quite of which can ask on facebook website "what taste do you like to have?". It is a great idea because people are very responsive and it's very nice".

Themes related to management control systems

Figure 31 Themes related to management control systems



It was observed that the company implements simple management control systems unlike high technology industries analysed by Davila, Syamil et al., Lazzarotti et al., Hertenstein & Platt, and so on. In particular, the performance measurement systems do not provide a defined budget for the development of a new product, but in a simply way, the project team expects some results from the process, implementing only a small range of indexes to monitor the financial results at the end of it.

> "In Grana ... we just check the gross margin (profit) and, of course, cost of development of the new product, but they are just included in the margin ... Furthermore, we check the level of the sales, because you can have great margin but you can sell it" and "Definitely, I put Consumer satisfaction about new product, also

> market shares and Company image also is very important, because with the new functional products we can show ourselves as good partner. For our clients, we always can show our products already implemented in the market, for example with Inka, with whole range of Inka from Poland, we go to the United States, to the UK and just show the ready products and the idea for the line to our clients and they really open (us the market) and start to think about the implementation to their own products in the same way. So we just can, for example, in Japan we also implemented some products with magnesium, with fiber and so on".

The people interviewed spoke about financial and non-financial indexes, but they knew the measures adopted are insufficient, because they allowed having information about the process only at the end, while they need a monitoring during the process for modifying or changing the project development.

> "Just more about the goals to set up of the project and evaluation at the end but nothing process or any other tools for monitoring the NPD, no yet. Definitely, we'll need to implement something like this but not yet" (Business development manager).

As regards the second tool supposed, starting from the consideration about the complexity of FFPD, the managers interviewed underline the unused of a systematic model for managing the whole NPD process, nor in traditional production nor in functional one. But,

> "For Grana, we are at very beginning of changing idea for new product development and for us was ever the change of all procedures, all processes, also changing people because we noticed that no every person can be a good leader of the project. At the end of the project we need to compare goals to achievements and we can easily see where there is the space to improve. Now we have a problem for finding a good ingredient for the process, we really try to react immediately not wait the end of the process of searching new ingredients for the pursuing department, but we just try to set up a meeting in the middle of this stage and said "how is the gaining of new suppliers, we have a problem, so we try to … ok so let figure out maybe a new ingredient, a new version of the product". For this reason, it is really important to monitor every stage because you can no point to wait for the end of process".

Summing, the case study analysis has shown that in the Company investigated a proper structured NPD process is lacking. In particular, the external collaborations exist, but they are mainly dominated by customers and ingredient suppliers. Moreover, the external collaboration lacked a proper strategy to develop them. Rather a needs-based approach is evident, i.e. if there is a need to find a solution to a problem which cannot be solved within the company, and then outside resources are consulted to find a solution to that particular problem. In addition, a strong secrecy as a form of protecting IP and customer relationships dominated discussions. The main drivers of functional foods production are represented by customer's demands and suppliers advice, while low resources, complex regulation and mistrust in external institutions, as laboratories, universities and so on, represent barriers to a systematic and well organized functional foods development process.

For the new product characteristics, the Stage Gate model could represent the best way for developing and monitoring new projects and ideas. Moreover, the Company, maybe for the small size, the early stage of functional production and the simplicity of functional ingredients, has implemented a primitive control system, using only some performance indexes, underlining the relevance of nonfinancial measures about the customers.

Definitively, the future company trend is to improve management control systems for better monitoring every stage of FFPD process. In particular, the people interviewed have no idea about what could be the way for do it, but they have the awareness to need it, because as Business development manager said

> "usually we just work by intuition, but we need to have some parameters to our process because now we have no more".

4.4 Conclusions

The case study conducted, has allowed exploring the management control systems in a Company leader in functional beverages production and distribution in Poland.

The study highlighted the dominance of customers for generating NPD projects, external cooperation and commercialization activities. This kind of approach renders the company to be preoccupied with incremental innovations, i.e. line extensions and "me too" type innovations. According to Laforet (2008), the formalization of the NPD

process could be affected by the size of the company and thus could be related to degree of novelty being pursued in product innovations.

Moreover, it establishes that the current features of the FFPD means that the Company has serious limitations in terms of its ability to develop diverse resources and skills that are essential for novel food product innovations. Grana, in order to improve its innovation capabilities and capacities, would require taking a step back and rethinking the innovation strategies. This may require a shift in the NPD approach where direct contact with consumers and opening up the innovation process to diverse external partners for developing differentiated resources and skills. This can be expected lead to an enhanced degree of novelty in product innovations and can double the success rate (Huston & Sakkab, 2006).

The FFPD critical aspects discussed above are relevant for better understanding the management control systems implemented for monitoring it. The main mechanism for monitoring the whole process are represented by performance measurement systems and, in particular, the Stage gate model – very popular in high tech industries. At the moment, Grana results unawares of Stage gate system for developing new products, but uses a management control systems based on cost determination and financial control[154]. In particular, they emphasized the results control without a proper definition of the objectives, using some financial and nonfinancial measures for monitoring the process but only at the end of it. Hence, the results of monitoring cannot help to solve issues when they come from, but only at the end of the process. So money, time and resources may be lost. Furthermore, the Stage Gate model, which is widely used to structure NPD practices in high tech industries (Hertenstein & Platt, 2000; Cooper, 2001), results no implemented in Grana, despite the central role that the tool has in managing the process development, helping to define issues and solve them during it.

The people involved in FFPD understand the need to implement well structure control systems, but the small range of new functional products, the simply ingredients added to instant beverages and the early stage of functional production can justify the absence of better management control systems.

[154] In particular, according to Abdel-Kader & Luther (2006), this kind of management accounting systems may be considered the first one in an evolutionary analysis of MAS, where the cost determination and the financial control results the first stage in a path composed by 4 stages, where the most evolutionary kind of MAS is the creation of value through effective resources use.

RESEARCH CATEGORIES	Results
Orientation towards innovation	The knowledge about ingredients, new recipes and procedures are developed and improved internally, with people qualified. The image of new functional product and the communication are entrusted to marketing agencies, which have more knowledge about consumer's needs.
Drivers of FF development	- The increase of healthy foods production has represented a pushing for them in the respective market; - brand image, because the consumer associates the brand to a food category; - consumer needs and suppliers pushing.
Cooperative arrangements	The cooperation is internal between departments for developing the new product, while the suppliers result important for new ingredients and marketing agencies for speaking to the consumers.
NPD process	New product development activities seem to be running through informally generated groups defined by informal processes. It was found that most of the NPD is driven by the market where customers give the basic input/concept to start a NPD project.
Management control systems in FFPD	The performance measurement system adopted is represented by a small range of financial & non-financial indexes. The new product development process is managed in a traditional way, without the implementation of the Stage gate model, despite the complexity of the process of ideation and realization of functional beverages. The managers interviewed underline the unused of a systematic model for managing the whole NPD process, nor in traditional production nor in functional one.

Discussion and conclusions

In the actual context, the innovation has a central role for obtaining competitive advantage in every industry. Indeed, the innovation has multiple forms, ranging from the creation of new processes and products, the generation of new organizational structures, the discovery of new sources of supply, and so on. But innovation also means abandoning the past and traditions of the enterprise to undertake new paths of development and affirm the new solutions that create value for the customer.

In this competitive environment, international food and beverage industry is having the opportunity to became an innovative sector, introducing products characterized by innovative ingredients, complex composition, in the half way to food and drug. Hence, the senior managers in food and beverage have the chance to choose this way for making the company competitive in the market with innovative productions, which answer at new consumer needs linked with an healthy life.

Clearly, the functional foods development results completely new for the traditional F&B industry, accustomed to develop and launch products simply, in the most of cases "me too", where innovation is not so important and the R&D is underdeveloped.

The idea to introduce FF represents an important change in the industry, so to require a more improvement in R&D, and also in managing the whole process.

Starting from these considerations, the study focused the attention to define the critical aspects in functional foods production, for exploring the management control systems adopted in the new product development process. Specifically, the study after having analysed the functional foods market in Europe, and in the World, has focused the attention on the MCS tools for better managing the process and ensures a successful product. In particular, it has been studied the MCS usually implemented in high technology industries for manage the NPD process, which presents some similarities in terms of product's complexity. However, the food and beverage industry presents some specific peculiarities - i.e. the FF are undergone to periodical external controls on ingredients used and the products healthy; are characterized by complex ingredients development and laboratories arranged, with high degree of specialization in people involved in NPD - whereby is necessary to adapt performance measurement systems at the specific context.

Therefore, after having analysed a stream of research in MCS, with particular attention on interactive control systems, it was analysed what effects the FFPD has on management accounting systems and how the process is monitored.

The Grana case is interesting for understanding the sophistication level of MCS because works in hot beverages industry and decided to introduce functional beverages in the last years, the investments in R&D results increased over the period considered and the people involved in the process are engaged in a continuous training process. Despite the expectation, the management control systems implemented are at their infancy and not considered the need of clear guidelines. In particular, it is used the result controls with a small definition of previous aims and the monitoring is doing only with some financial and non-financial indexes. The Stage gate model results complex to implement because the products, in spite of the functionality of new products, come from a simple development process.

Starting from these considerations, following an approach more deductive than inductive, some guidelines are elaborated for improving management control systems in functional foods production and, moreover, better monitoring every stage of FFPD process. In particular, the aim is to define some indicators/variables to consider for every stage of new product development process, having understood the main characteristics of FF productions. Distinctly, the model, which will be proposed, must be inserted in a larger framework where the fundamental precondition is the management's will to monitor and control the process. Indeed, if the management does not understand the relevance of this activity for the success of a single product and the whole firm, it may not be possible to implement a control system in the development process. Therefore, the first thing to consider in a company, which introduces functional foods, is the will to better monitoring the product development at the end of every stage, for summing up the successful or unsuccessful choices made during the process itself and starting a feedback mechanism for correcting any bad choice made during the ideation, development and launch, for improving the final result of it.

About the first step, the invention, it is characterized by two main aspects to consider: what kind of new product developing and the creation of a work team. Starting from these, it is proposed a set of variables, which answer to the top management questions. In particular, the invention stage needs some preliminary information about customer

needs, gap in company production, know-how in new ingredients or new production techniques and, consequently, the employees knowledge and capabilities in developing innovative products.

The second stage, dedicated at the exploration, is focused on the first aspects to consider in developing a new product, in particular the consumer test and the definition of commercial plan or the idea of a new packaging, which save the freshness and the functionality of the new product. For these reasons, the things to highlight at the end of this stage are the sustained costs for the consumer test and the number of team people involved in commercial planning and in realizing the packaging prototype.

The development stage results the most important in the process because it allows clarifying the principal characteristics of the new product. Indeed, the main aspects to consider are many, starting from the number of new ingredients developed and the number of experimentation, up to licenses acquired and patents registered.

The realization provides for the actual implementation of the new product, a prototype, which has all characteristics defined in the previous stages but it is only an embryonic product. In particular, the team project focuses the attention on the production quality, evaluated through the number of quality certifications hold by the firm. But an important attention is dedicated to the tests done on the prototype for understanding the real functionality of the product.

At the end, the implementation and launch require a team project responsibility about every aspects that concerns the success of the new product on the market, so it is considered the number of people involved in marketing, commercial and packaging activities, or the sustained costs for every activity done.

In the table 12 there is a summary of the short considerations done in the lines before, with the clear definition of variables to consider for every stage of NPD process. Obviously, the variables considered come from the literature review – which gives information about the relevance of Stage Gate Model in monitoring in the right way the development process at the end of every stage – and the Grana case – which provides practical examples of activities done during the development process for better defining variables to pay attention on.

Table 12 The Main variables to consider at the end of every NPD process stage

Stages of the	Main characteristics	Indicators/variables

FFPD process		
Invention	- The identification of unfulfilled consumer needs - The definition of the gaps in company offer - The analysis of company business criticises - The new idea of target and product - Selection of the project leader - Creation of a work team - Drafting of a product file	- Number of cooperation agreements with suppliers and marketing agencies
		- Number of employees dedicated to external relationships in R&D
		- Training costs in favour of people dedicated to innovation
		- Costs for market investigations aimed at generating innovation
		- Costs to promote knowledge about the innovation created by firm
Exploration	- The definition of economic objectives for the project - The definition of conceptual consumer test - The first draft of commercial terms - The first idea for packaging	- Costs to draft the conceptual consumer test
		- Number of employees in the team project involved in packaging development
		- Number of employees in the team project involved in defining preliminary commercial terms
		- Investments in packaging development
Development	- Experimental trials on the product and pack development - Ingredient analysis - Definition of durability - List of the ingredients, nutritional label, sales denomination, allergens - Analysis economic-financing feasibility - Analysis technical-industrial feasibility - Product consumer test - Authorization by external bodies - Risks and opportunities	- Number of experimentations for new ingredients
		- Number of new ingredients developed in laboratory
		- Number of the legal advices
		- Number of suppliers consulting
		- Number of employees involved in analysing financial feasibility
		- Costs for analysing financial feasibility
		- Number of employees involved in analysing technical-industrial feasibility
		- Costs for analysing technical-industrial feasibility
		- Number of employees involved in risks and opportunity analysis

	management - Audit of raw material suppliers, ingredients, packaging - Audit of food safety assessment on the premises - Recommendation for launch	- Costs for risks and opportunity analysis
		- Number of alliances dedicated to explore innovation
		- Number of licences acquired for innovative production
		- Number of patents registered
Realization	- Issue of HACCP plan and control plan - Specific emissions and specifications	- Number of employees involved in analysing: characteristics, ingredients and the real functionality of the prototype
		- Costs for analysis about characteristics, ingredients and the real functionality of the prototype
		- Number of quality certifications obtained for the product development
Implementation and launch	- Validation and commercial plan - Product and packaging specifications - Risk management - Approval of the launch plan - Launch	- Number of employees involved in drafting the commercial plan
		- Number of employees involved in evaluating and validating the commercial plan
		- Number of external collaborations for analysing the new market
		- Number of external collaboration for defining the pack specificities
		- Number of employees involved in approving the launch plan
		- Costs for evaluating launch risks
		- Costs for launching the new product (marketing, production)

In conclusion, the empirical evidence allowed understanding that in medium size companies, with a simple ingredients composition of functional products, the MCS is under developed and the control regards the final results, without pay attention on every NPD stages. Furthermore, the final results controls are submitted to senior manager, who analyses them at the end of the process without having the opportunity to improve the product during the development.

Despite it, the literature review combined with the empirical evidence allowed building a theoretical framework, according to which the success of a new functional product passes from: a senior manager's wish to monitor the whole process and to the implementation of a new product development model, such as the Stage Gate Model, that defines the relevant aspects to monitor at each stage of development, as reported in the table above. In this way, some adjustment can be made *in itinere,* allowing the development of a successful functional product.

In conclusion, as the Business development manager in Grana said "*usually we just work by intuition, but we need to have some parameters to our process because now we have no more*" and this research has precisely this aim, defining a systematic model for monitoring the new product development process for FF-oriented companies.

Limitations and future research

This study was exploratory in nature and the results presented are from a medium size Company in Poland. The data were collected from: interviews with business development manager, total quality manager and marketing manager, involved in functional beverages development; and internal documents dealing with Grana and publicly available.

This research was a first step towards understanding the characteristics of the innovation process of the food manufacturing industry in relation to value creation for FFPD. In particular, the attention was focused on the main aspects of functional foods production and the company's adaptations to manage the whole process. For these reasons, the study made an in-depth analysis of common management control systems in industries characterized by high technology and innovation. Further investigations on a big sample should be done in more depth by academia, government institutes and relevant industry experts to provide guidelines for the food industry to develop differentiated policies of

innovations, to define control systems, which answer to food and beverage industry needs for better managing the new product process, to support development in this important emerging area.

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