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The Design of Nutrition Labels

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Cátia Cecília Delgado Lages

Professor Orientador: Prof. Doutora Cristina Sá

Professor Co-Orientador: Prof. Doutora Ana Gomes

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Dedication

I dedicate my dissertation to my family and friends.

To my parents, for their unconditional support and incentive along the academic, professional and personal life.

And especially to my husband, for his patient over these two years, but most of all for his amazing ability to motivate me during the hardest paths.

Acknowledgements

I would like to thank to my advisor Professor Cristina Sá for her excellent and caring guidance during the research. I would like to thank as well to my co-advisor Professor Ana Gomes, for providing the research with scientific insight. I would like to thank MoveLife's team for the constant support and for extending this challenge to me first. And at last, I would like to thank to my cousin Sara do Paco Stevens who revised the English.

My research would not have been possible without their contribution.

Abstract

The main objective of this dissertation was to expose the process involved in the design and the actual design of a nutrition label for restaurant's menus.

The increasing overweight and obesity rates are a major concern for health organizations and governments. In order to fight this epidemic, the Commission of the European Communities outlined a *Strategy for Europe on Nutrition, Overweight and Obesity related to health issues* determining, among others, that providing nutritional information to consumers is a critical factor that may influence healthier food choices. Since the habit of eating out-of-home is related to the increasing overweight and obesity rates as well, the disclosure of nutritional information in restaurants (or mass caterers in general) can provide guidance to consumers while choosing their food.

The process of designing a nutrition label for restaurant's menu was divided in to parts. The first part addressed research on communication, infographics and on the state-of-the-art of nutrition labels. The second part, and supported in the collected information and case studies' analysis, was related with determining the type of information to include in the label and the nutritional criteria in which it was going to be based. It also included the actual design decisions related to the model of a nutrition label for restaurants' menus, to be software generated.

As future work it was pointed the necessity of testing it within the market and consumers and to develop an interactive solution for providing customized nutritional guidance.

Keywords: creative industries; design; nutrition labelling; restaurants;

Resumo

O principal objectivo desta dissertação consistia em expor o processo envolvido no design de um rótulo nutricional assim como desenvolver o seu próprio design.

O aumento das taxas de excesso de peso e de obesidade são uma das grandes preocupações das organizações de saúde e dos governos. De forma a combater esta epidemia, a Comissão Europeia delineou o documento *Strategy for Europe on Nutrition, Overweight and Obesity related to health issues* que determina, entre outras decisões, que a provisão de informação nutricional aos consumidores é um factor crítico para influenciar a escolha de alimentos mais saudáveis. Dado que o hábito de consumir refeições fora de casa também está relacionado com o aumento das taxas de excesso de peso e de obesidade, a provisão de informação nutricional em restaurantes (ou estabelecimentos de restauração colectiva) pode orientar os consumidores na escolha das suas refeições.

O processo de desenhar um rótulo nutricional para incluir no menu de restaurantes foi divido em duas partes. A primeira parte envolveu pesquisa nas áreas de comunicação, infografia e do estado da arte da rotulagem nutricional. Na segunda parte, e com base na informação reunida e análise de casos de estudo, foi determinado o tipo de informação a incluir no rótulo e os critérios nutricionais em que se fundamentaram. Incluiu também as decisões relativas ao design do modelo de rótulo nutricional para menus, que será gerado digitalmente.

Como trabalho futuro foi apontada a necessidade de testar o rótulo nutricional no mercado e juntos dos consumidores e também a de desenvolvimento de uma solução interactiva para a provisão de orientação nutricional personalizada.

Palavras-chave: indústrias criativas; design; rotulagem nutricional; restaurantes

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Abbreviation List

APPS - Applications

DRV - Daily Reference Value

EU – European Union

EUFIC - European Food Information Council

FDA - Food and Drugs Administration

FLABEL – Food Labelling to Advance Better Education for Life

FOP - Front of Pack

FSA - Food Standards Agency

GDA - Guideline Daily Amounts

NLEA - Nuttition Labeling and Education Act

OECD - Organisation for Economic Co-Operation and Development)

UK - United Kingdom

US - United States of America

WHO - World Health Organization

1 Introduction

This dissertation is made on the context of the Creative Industries Management Master and specifically within the area of infographics, with a focus on nutrition label design.

1.1 Dissertation's objectives

The increase of overweight individuals and obesity in the world's population has lead several health organizations to strengthen and enlarge the means of communication used to promote a healthier diet, and to create policies related to food nutrition labelling. The European Union (EU) has been analysing statistical data and afterwards outlining several policies in order to reduce the dramatic rise of overweight levels and obesity. These rising levels are especially prevalent among children, where the estimated rate of obesity was 30% in 2006 (Comission of the European Communities;, 2007). This high value means, most of all, that the population's diet is becoming increasingly poor and the level of physical activity is decreasing. This leads to the growth of chronic conditions, such as cardiovascular disease, hypertension, type II diabetes, stroke, certain cancers, musculo-skeletal disorders and even some mental health conditions. According to the World Health Organization (2010) noncommunicable diseases are the primary global causes of death. In the long term, this translates in a significant reduction in the quality of life of European inhabitants. (Comission of the European Communities;, 2007)

To fight against this trend and following the outlined Strategy for Europe on Nutrition, Overweight and Obesity related to health issues (Comission of the European Communities;, 2007), the EU published a regulation on the 25th of October 2011 in regards to the supply of food information to consumers. The regulation states the demanding need to provide clear and understandable information through food labelling to protect consumer's health, thus assuring consumer's food choices are properly informed.

This regulation is applicable to "food business operators at all stages of food chain" (European Union;, 2011), though this dissertation is focused only on the mass caterers. That is, "any establishment (including a vehicle of a fixed or mobile stall), such as restaurants, canteens, schools, hospitals and catering enterprises in which, in the course of a business, food is prepared to be ready for consumption by the final consumer;" (European Union;, 2011). The main goal of this research is to expose the development process, its study and actual development, of nutrition labels for mass caterers menus in Europe. In order to better achieve it, it is important to enhance the collaboration with the project MoveLife that, among other members, has in its team nutritionists from whom it was possible to get the expertise.

MoveLife's software is able to automatically provide the nutritional profile of a restaurant's recipes, both in detailed information and in the form of the nutrition label proposed in this dissertation.

The nutrition facts label, or as defined by the EU, the nutrition declaration (European Union;, 2011), can vary with each food and it contains the following information as mandatory: energy value (kcal), the amounts of fat, saturates, carbohydrate, sugars, protein and salt, all referring to 100g or 100ml amounts and, in addition and if applicable, to portions.

This is intended to make the consumer easily understand the major importance that food choice has on the energy value and nutritious content of a diet, and therefore to influence them, the nutrition declaration must be clear and objective in its graphic expression. Taking into account Barnard's (2008) enumeration of some of the functions of design, namely information and persuasion, it is possible to assume that design is the right field of action to give an answer to this need.

Taking as reference the study on The Economy of Culture in Europe (KEA European Affairs;, 2006) the Creative Industries field is related to the use of creativity as an essential skill to the performances and innovation factor on sectors like design (graphic design, fashion design, interior design and product design), architecture and advertisement. By adding cultural elements to their production, these sectors are innovating and therefore creating a competitive advantage.

More specifically, design as "a key example of how cultural resources are used in an indirect way to contribute to innovation in non-cultural activities" (KEA European Affairs;, 2006), can play a relevant role in responding to European Union to transform nutrition information into meaningful, graphical forms or symbols that, as a result of their design, are able to convey an information – infographics.

Infographics is an abbreviation of "information graphic" and it consists of the use of visual cues in order to communicate information, independently of its complexity, amount of data or level of analysis (Lankow, Ritchie, & Crooks, 2012).

For Jason Lankow (2012) it is possible to point to three types of infographics:

Static: fixed information in which user interaction is limited to viewing and reading and the output is a still image. Because of its efficiency related to time of development and allied costs, it is the most common used type of infographics, especially for time-sensitive information;

Motion: fixed information in which user interaction stands for viewing, listening and reading in an animated output:

Interactive: fixed or dynamic information and the user interaction consist of "clicking, searching for specific data, actively shaping the content displayed, and choosing which information is accessed and visualized" (Lankow, Ritchie, & Crooks, 2012).

Accordingly, the object of this research is how to create, through static infographics, a nutrition label widely understandable by the general population to be added specifically in mass caterers' menus in order to fight the increasing rates of overweight and obesity and related chronic diseases.

1.2 Overall organization

In chapter number 2 it is possible to find information about communication and more specifically about semiotics' theory on codes, an overview on infographics' evolution throughout time, the state of the art of nutrition labelling in Europe and United States, and an indication of some technologic solutions related with nutrition.

In chapter number 3, it is revealed the methodological approach designed for literature review, case study's selection and the processes to analyse the collected information. It is as well included the methodology for the actual design of the nutrition label.

The fourth chapter refers to the development of the nutrition label for restaurants. The first part includes the decisions regarding the elements to incorporate in the label and the criteria in which they are based. The second part is specifically addressed to the graphic decisions related with each element that constitutes the label.

Chapter number 5 is the conclusion of the research around the design of nutrition labels for restaurant menus.

2 Areas of interest concerning the design of nutrition labels and state-of-the-art of nutritional labelling

The aim of this dissertation is to expose the development process and further design of a nutrition label for restaurant menus. In order to achieve this, it is necessary to understand: (1) the importance of the right communication to convey a message from sender to receiver; (2) viewing information design as a way to democratize knowledge; (3) the evolution of nutrition labels, its regulations and real impact on consumers.

In the first point it is addressed the semiotics' field of study in order to provide an insight on the relation between signs, codes and culture.

The second point approaches the history of infographics and especially the ISOTYPE pictorial system.

At last, the third point includes a synthetic version from the nutrition label's history and its legal framework in Europe and US, although giving more emphasis to the European context.

2.1 Communication or the ability to convey messages

When answering the question "what is communication?" Fiske (1990) first determines that all communication requires signs and codes: signs as signifying constructs, since they refer to something other than themselves, and codes as the systems in which the signs are arranged and how signs relate to each other. Letters are an example of signs and words or a language an example of code.

The author also assumes that social relationships are about transmitting and receiving signs / codes, envisioning communication as a focal point for any culture since it allows its transmission. Consequently, Fiske's definition of communication is a "social interaction through messages" (Fiske, 1990).

Given that it is the science of signs and meanings, the semiotics field of communication study is considered in this context the more relevant for the purpose of this research. It allows the study of communication as the production and exchange of meanings, or how messages interact with people to create meaning (Fiske, 1990), which is extremely relevant given that the final objective of this research is to create a nutrition label that might influence people's eating behaviour.

Semiotics has its foundations in two thinkers: the American logician and philosopher C.S. Pierce and the Swiss linguist Ferdinand Saussure. Both models differ mainly in their focus: while Pierce is more interested in the meaning, Saussure is concentrated on the sign in itself.

Fiske (1990) is an author that is concerned with providing some coherence to the study of communication, its main models and theories and he therefore approaches both Pierce and Saussure theories. He defends that the three main areas of study addressed by semiotics are: (1) the signs, their variety, how they transmit meaning and their relation to the people who use them; (2) the codes, their creation in order to

satisfy socio-cultural needs and the available channels of communication for their transmission; and (3) the culture in which signs and codes function, and culture's reliance on them to exist in its form.

The message receiver is perceived as a reader, enhancing his importance on the message decoding: it is through reader's interaction that text acquires its meaning (Fiske, 1990).

Codes can be divided into two categories: codes of behaviour and signifying codes. The use of a code by the members of a community, for example traffic lights, depends on the knowledge that those members have of the rules by which the code is driven. The Highway Code or Traffic Code, in which the traffic light colour's convention is included, it is considered in this context a code of behaviour. On the other hand, signifying codes are systems of signs, and can be characterized as: having a number of units (or just one unit) with shared features that determine they belong together (ex. M is an alphabet sign); conveying meaning; depending on an agreement between users with common cultural experience; having and identifiable social and communicative function; and as having the ability to be transmitted through the right communication channels (Fiske, 1990).

In this research the focus is on signifying codes, not only because the nutrition label is a system of signs that convey the food's nutritional profile, but also because they depend on an agreement about the kind of information they convey. Depending on the audience for whom they are designed, the codes can be classified as broadcast or narrowcast. Broadcast codes are simple to understand and don't require a highly educated audience to convey their meaning. Driven for the masses, broadcast codes are adjusted with general concerns, emphasizing what people have in common and connecting them to their own society (ex. television). The audience for broadcast codes is expecting confirmation and guarantees. Narrowcast codes are somehow elitist or socially divisive as they are created for small and specialized audiences that most of the times, choose to learn the codes (ex. medical language). The narrowcast codes audience expects to be enriched or transformed by the communication (Fiske, 1990).

Infographics, as it will be confirmed further, were in the beginning of their history narrowcast codes. Nowadays, with computer technologies and easy access to information, infographics have outburst, becoming broadcast codes.

What both codes have in common is the agreement between its users on their basic elements: the units, the way units can be combined, their meanings and their social or communicative function. According to Fiske (1990), there are three ways in which the agreements can be established.

Convention and use is the agreement resulting from shared experiences by members of a culture, framing the limits in which each member is expected to act or behave. Most of the times codes resulting from convention and use aren't formally stated, which often leads to misunderstandings based on reader's different cultural experiences, and his use of a different code to decode the initial message. Dress codes are an example from this category.

Arbitrary codes can be simple and clearly understood by any culture's member who has decided to learn it. They are symbolic, denotative, impersonal and static, like maths or traffic lights. Their meaning can't be changed unless there is a new set agreement amongst its users. It is probably the closest to a universal language.

And at last, the **Aesthetic codes** can be identified by their fleeting nature, since they are truly affected by their cultural context. They can either be conventional, because they acquired agreement amongst their users (a fashion trend that has many followers), or innovative, if there is a need for gradual learning of new codes (the appearance of conceptual art).

The meaning given to a code depends on the reader's interaction with it. Connotation and denotation values of meaning can be attributed to the codes. Connotation is the type of meaning that relates the individual with a certain culture, and it is through his values and beliefs that a message is decoded. It requires a high "level of cultural knowledge in order to be constructed or understood" (Barnard, 2008, p. 36). Denotation, on the other hand, corresponds to the literal meaning. A photograph is firstly identified as a photograph – denotation meaning - and afterwards within a deeper analysis, the reader searches for what it stands for – connotation meaning. In order to generate a more accurate meaning, some photographs need to rely on language. According to Fisk, *Anchorage* is the term used by Roland Barthes, Saussure's follower, to describe the words used as captions for photographs, arguing that the polysemous origin of visual images can lead the reader to choose some signifieds and to ignore others (Fiske, 1990). In this context, words can help in fixing the photograph meaning but they can also narrow its connotation (figure1). If in some cases this narrowing may seem castrating, in another cases, as in a map's captions, it can be extremely relevant so as to avoid misunderstandings or getting lost.

Figure 2.1 - "Their first Murder" by Weegee (Arthur Felling), New York City, October 9, 1941[1]

[1] Retrieved from: http://www.worcesterart.org/Exhibitions/Past/weegees_world.html [accessed in: 20-11-2012]

2.2 Information Visualization and knowledge

The design of a map probably resulted from someone's need to register and define a certain course in order to be able to repeat it or to leave it as a legacy, like explorers did. The common tourist maps available in tourist information centres, were most likely designed for travellers to see the city's very best without getting lost or missing important spots. In both cases the map stands for the visual solution given to answer the need of navigation.

By giving the example of data maps, like the maps reporting deaths from cancer in the different regions of the United States (figure 2.2), Tufte (2001) shows that the visual display of data can lead to a better understanding into the causes, and therefore the avoidance, of cancer. The visual display of data is capable of transmitting valid knowledge. Data refers to a collection of details that result from experiments, measurements and observations of a set of variables. As complex systems consisting of numbers, words or visuals, the information designer has to organize data in a meaningful way (Petterson, 2012).

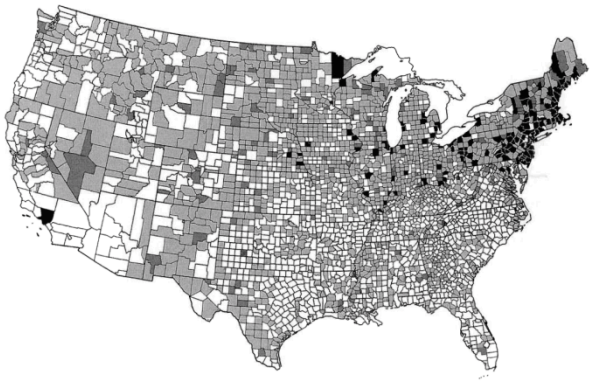

Figure 2.2 – "All types of cancer, white females; age adjusted rate by county, 1950-1969"[2]

Information visualization is a research field where the objective is to improve cognition of "patterns and trends in abstract datasets, by developing effective mapping techniques for representing values in visual forms" (Mol, 2011, p. 21). That is a system of visual representations that help humans to understand and analyse complex, abstract data.

Data visualizations (figure 2.3) and infographics (figure 2.4) are two different types of information visualization, but there is a lack of consensus on what distinguishes them.

[2] Maps from Atlas of Cancer Mortality for U.S. Counties; designed by Thomas J. Mason, Frank W. McKay, Robert Hoover, William J. Blot, and Joseph F. Fraumeni, Jr. (Washington, D.C.: Public Health Service, National Institutes of Health, 1975). Redesigned and redrawn by Lawrence Fahey and Edward Tufte. (retrieved from: Tufte, Edward R. (2001) The Visual Display of Quantitative Information. Connecticut: Graphics Press LLC)

In a post by Alex Williams in the blog ReadWrite[3], there is part of a discussion around what might differentiate data visualization from infographics. Benjamin Wiederkehr of Datavisualization.ch[4] (a resource for news and knowledge on data visualization and infographics) considerers that their difference stands mainly on the objective. That is, while information graphics rely on a context and are used to tell a story or answer a question, data visualizations display measured quantities through the combined use of a coordination system, points, lines, shapes, digits, letters quantified by visual attributes. Hjalmar Gislason, founder and CEO of DataMarket.com[5], agrees with the previous definition of data visualization but concerning infographics, he considers them as graphic representations that can combine one or more data visualizations with other type of information, like graphics or text, in order to establish relationships or tell a story. Normally, data visualization is a representation more abstract than infographics.

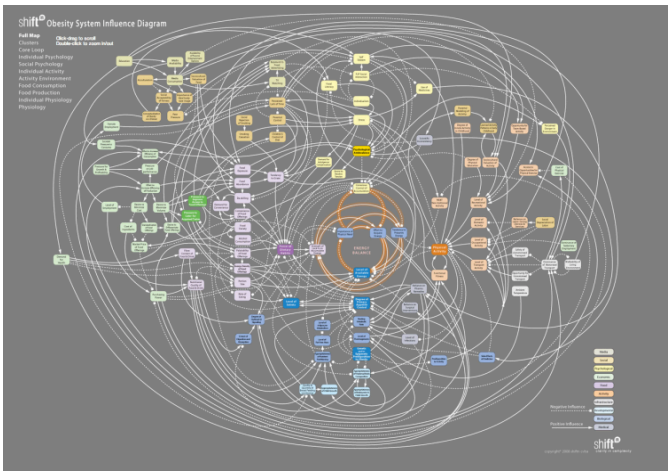

Figure 2.3 - Obesity System Influence Diagram, by ShiftN, 2008[6]

[3] http://readwrite.com/2011/01/07/difference-between-datavisualization-infographics?&_suid=135958447516700608539581298828 1

[4] http://datavisualization.ch/

[5] http://datamarket.com/

[6] Retrieved from: http://www.shiftn.com/obesity/Full-Map.html [accessed in: 13-02-2013])

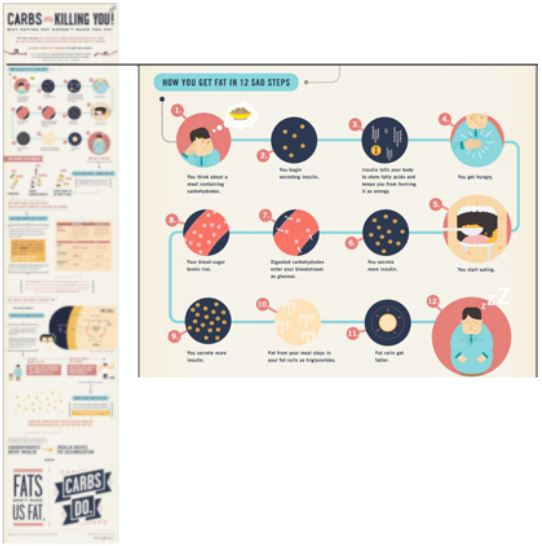

Figure 2.4 - Carbs are Killing You, designed by Column Five to Massive Health, 2012[7]

Since the purpose of this investigation is the study and analysis involved in the design of a nutrition label, infographics seem to be the type of information visualization that betters fit the nutrition label purpose: besides providing accurate information about the food's nutritious profile, it also has to establish associations – tell a story – between the different elements included in the label in order to influence people's behaviour when choosing their foods.

[7] Retrieved from: http://blog.massivehealth.com/infographics/Carbs_are_killing_you/ [accessed in: 13-02-2013])

An overview on infographics history

Educating (and persuading) through pictures goes back to 1658 when Johann Amos Comenius published *Orbis sensualium pictus* (figure 2.5), an atlas consisting on illustrations of the visible world. Transforming society features into pictorial statistics has been, since then, a major concern for several authors (Jansen, 2009).

Figure 2.5– "Orbis sensualium pictus", by Johann Amos Comenius, 1658[8]

In the XVIII century William Playfair detached his graphics from the physical world and invented different types of graphs and charts, popularizing their use through his writings on political and economic topics (figure 2.6). The rise of infographics, or information graphics, was seen some years later, when the Irish writer, journalist and statistician Michael George Mulhall, published the Dictionary of Statistics, illustrating quantities through smaller or larger pictograms (figure 2.7) (Jansen, 2009).

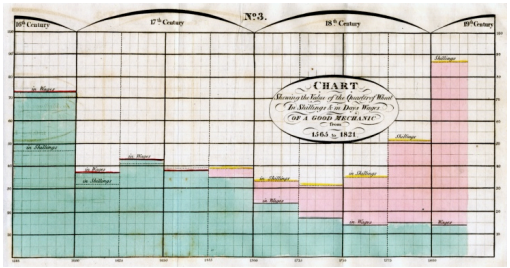

Figure 2.6 "Chart Shewing the Value of the Quarter of Wheat in Shillings & in Days Wages of a Good Mechanic from 1565 to 1821.", William Playfair, 1821[9]

[8] Retrieved from: http://commons.wikimedia.org/wiki/File:Orbis-pictus-004.jpg [accessed: 13-02-2013])

[9] Retrieved from: http://libweb5.princeton.edu/visual_materials/maps/websites/thematic-maps/quantitative/sociology-economics/sociology-economics.html [accessed in: 13-02-2013])

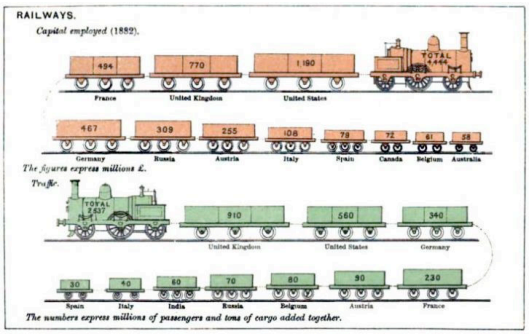

Figure 2.7– "Railways", by Michael George Mulhall, 1884[10]

But it wasn't until the 1920's that it was developed a methodology for displaying statistic effectively: ISOTYPE. The system was created by Otto Neurath, an Austrian social scientist that can be considered the father of infographics.

Born in Vienna in 1882, Otto Neurath was a sociologist, mathematician, philosopher and urban-planner. During and after the First World War, Vienna was demanding a social rebuild after gipsy occupation. Otto Neurath along with his peers Hans Kampffmeyer, Adolf Loos, Gustav Scheu and Max Ermers were the major exponents of self-help urbanism. They believed that urban reform through communal efforts was the only possible way to transform life in the modern city. Neurath also understood that the only meaningful way to do it was by fostering the ability that Vienna had to communicate with its people (Vossoughian, 2008).

His economic philosophy was based on the concept of Global-Polis, a collectivity based on an economy-in-kind where knowledge was to be democratized and globalize. The industrialized city, on the other hand, was to be guilty of diffusing dehumanization among workers, of encouraging natural resources' over-exploitation and of objectifying "human ties and relationships" (Vossoughian, 2008, p. 11).

Somewhere along his way, Neurath directed his interest to museum education and exhibition design. Through these areas he could create some fuss around social and economic hierarchies. If in the past the museum was for the erudite to see rare artefacts, for Neurath, the modern museum spotlight should be the everyday expression in order to promote democracy and scientific literacy: museums should be the interface where the masses could see and understand their aspirations and achievements.

When nominated as the director of Museum of War and Economy in 1918, Neurath's main goal was to show the masses how a market economy turned into a centralized economy-in-kind during the war period. In order to make the information easy to understand, he was going to use visual media like lantern slides, chats, photographs and models (Vossoughian, 2008).

[10] Retrieved from: http://euclid.psych.yorku.ca/SCS/Gallery/images/mulhall1884-pictogram-p379.jpg [accessed in: 13-02-2013]

Neurath believed that knowledge was only available through symbols: he saw verbal language as a disfiguring medium for knowledge related to its lack of consistency in structure and vocabulary (Lupton, 1986).

Throughout the museums existence it only sponsored one exhibition that took place in Germany in 1918. The show explained city policies to local citizens through the illustration of the impact that the blockade measures set against Germany trade, considerations on the role that in-kind transactions, recyclable materials, folk know-how and local technologies played during war, etc. (Vossoughian, 2008).

With the end of the war in the same year, the museum closed its doors. Despite his constant connection with museum education, it wasn't until 1923 that Neurath established the Vienna's Museum of Settlement and Town Planning, afterwards renaming it to the Museum of Society and Economy. According to Vossoughian, the Museum objective set by Neurath was to educate "the working-class masses about production, emigration, mortality, interior furnishing, unemployment, the fight against tuberculosis and alcoholism, diet, the meaning of sport, physical and mental development, schooling… [and] the state of industry" (Vossoughian, 2008, p. 57).

The museum included a skilled work group of researchers constituted from mathematicians to artists, aiming to include science in daily life, which was a clear result of the Logical Positivism, a philosophical theory that Neurath helped to found. This school of thought joined two positions that were previously seen as contraries: the rationalism, that studies reality through logic, geometry, and mathematics disregarding observation; and empiricism (or positivism), which declares direct human observation as the only way to access knowledge (Lupton, 1986).

When talking about the Museum of Society and Economy on Vossoughian's (2008), Neurath highlights that modern man is used to the comfort of getting educated in their leisure time through cinema and illustrations. So, in order to spread socio-scientific education, he enhances the need to use similar ways of representation. This is a clear statement of his intentions to use mass media in order to reach a broader audience As previously mentioned about the semiotics approach about codes, Neurath's communication intent is a perfect fit on the broadcast type of codes, which are simple to understand and don't require a highly educated audience to convey their meaning.

Turning into visuals "invisible phenomena" was a problem that Neurath faced when designing the exhibitions. To solve it, he established a "Department of Transformation" were the *transformer* (the worker responsible for the transformation) had to organize the information to be presented in the most effective way. Neurath resorted on statistical data to provide a more complete knowledge to be understood by the masses. To represent this data and worried with the gap between reading and seeing, he felt that iconic signs were a better, more effective way to convey information. Not only they could stimulate imagination more than text, but they could be understood by different classes and nationalities.

On Vossoughian's book (2008) there is a quote from Neurath that stresses the importance of pictorial language: "A man coming into a strange country without a knowledge of a the language is uncertain where to get his ticket at the station on the

harbour, where to go in the post office. But if he sees pictures by the side of the strange words, they will put him on the right way" (Vossoughian, 2008, p. 61).

And so was born the Vienna Method of Pictorial Statistics, which in 1935 was renamed as a System of Typographic Picture Education (ISOTYPE), and was inspired by military cartography, innovations on information graphics and the New Typography movement (Vossoughian, 2008). For Lupton (Reading Isotype, 1986), ISOTYPE is a popular version of logical positivism: an ISOTYPE symbol "is positive because, as a picture, it claims a base in observation; it is logical because it concentrates experienced detail into a schematic, repeatable sign" (Lupton, 1986, p. 49).

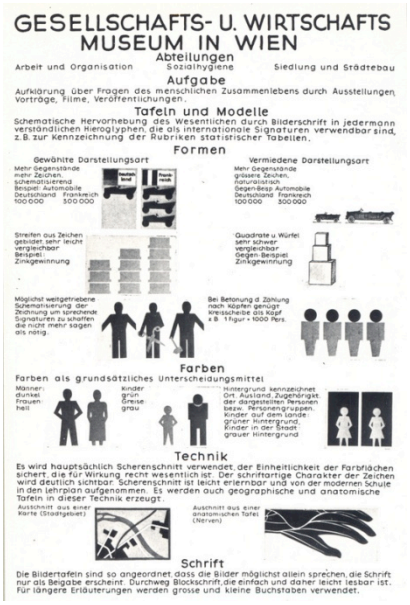

Figure 2.8– "Gesellschafts- und Wirtschaftsmuseum", by Otto Neurath, 1925[11]

With the intention to make his communication techniques easier to imitate, in 1925 Neurath made a diagram (figure 2.8) listing the goals and representational techniques of the Museum of Society and Economy. The first rule is "more objects, more symbols" (Vossoughian, 2008, p. 63), that is, if one symbol represents a certain quantity, increasing that quantity has a proportional increase on the number of symbols. Consistency in form and meaning, besides simplifying the design process, allowed the reading of pictures as information, enhancing their ability to be universally legible (Lupton, 1986). Every sign should be reduced to its simplest expression "in order to create speaking signs that say no more than necessary" (Vossoughian, 2008, p. 63), opting for two-dimensional, flat signs (like silhouettes), as the third dimension is distracting. And "colour should be used as a fundamental tool for differentiation" (Vossoughian, 2008, p. 63). The alphabetic quality of

[11] Retrieved from: Vossoughian, Nader (2008). Otto Neurath - The Language of the Global Polis. Rotterdam: NAi Publishers)

ISOTYPE is enhanced by the elimination of perspective and superfluous details, and like in writing, "the size, scale, or position of a given sign relative to other signs is not meant to be interpreted spatially" (Lupton, 1986, p. 54). Later, also Tufte (2001) pointed the use of two or three dimensions as "a weak and inefficient technique, capable of handling only very small data sets, often with error in design and ambiguity in perception" (Tufte, 2001, p. 71).

The diagram shows ISOTYPE similarity to a scientific formula by turning direct experience into a concise, repeatable and generalized scheme. In the light of semiotics theory, ISOTYPE charts stand for a code made of signs (pictograms) that relate to each other in a meaningful way. ISOTYPE symbols are replacing abstract numbers by figures. And because the symbol stands for a number those charts have scientific value (Lupton, 1986).

Otto Neurath believed that through ISOTYPE, knowledge could be easily spread across different cultures since it relied in the objectivity of vision rather in the interpretation mediated through culture.

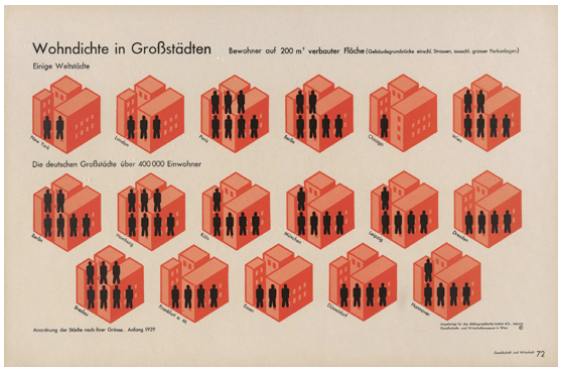

Figure 2.9– "Wohndichte in Großstädten" (Population Density in the Metropolis). Otto Neurath, 1930[12]

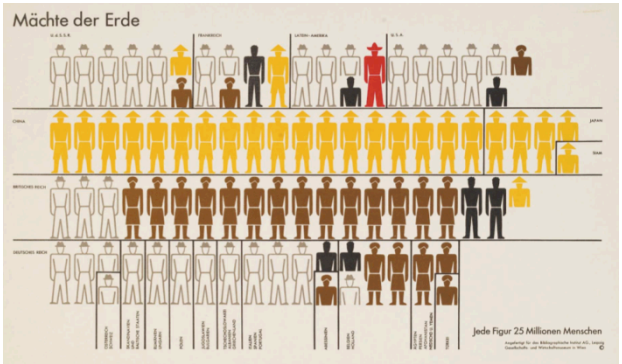

Figure 2.10– "Machte der Erde" (Powers of the Earth). Otto Neurath, 1930 [13])

[12] Retrieved from: Vossoughian, Nader (2008). Otto Neurath - The Language of the Global Polis. Rotterdam: NAi Publishers

[13] IDEM, *Ibidem*

Although ISOTYPE is considered by many as overrated, strongly attached to the Soviet Propaganda, obsolete in the internet era (Jansen, 2009), Neurath left to modern design theory one of its deepest principles: the concept of vision as an autonomous and universal faculty of perception (Lupton, 1986). “Seeing comes before words” (Berger, 1972, p. 7).

The main goal of information visualization is to provide knowledge through viewer’s understanding of abstract information. But what are the main reasons why information visualization is so meaningful in providing knowledge?

According to Laura Mol (2011) it is the human perceptual and cognitive system that makes visual information efficient in knowledge transmission. The human eye is the one mainly responsible for its effectiveness. When in the presence of some visual stimuli, like bright colours or movements, the eye will automatically focus on that. Another pointed reason is related with Gestalt’s theory of perception, where the whole is different from its parts. That is, the way the whole is perceived is substantially different from each individual element. This theory includes concepts like proximity, similarity, connectedness, enclosure and continuity, which won’t be taken into deeper analysis in this investigation. At last, Mol (2011) defends that seeing in colour is a human capacity that needs to be leveraged. Colour can make information easier to understand through its contrasts, and turn it more appealing and attractive as well.

Through information visualization, it is possible to make instantly available large amounts of data, enabling the perception of possible cause-effect connections, or even to understand if the data collection was made properly.

Mol (2011) quotes J. Thomas and A. Cook to explain that information visualization assumes that “visual representations and [interaction techniques] take advantage of the human eye’s broad bandwidth pathway into the mind to allow users to see, explore, and understand large amounts of information at once. Information visualization focused on the creation of approaches for conveying abstract information in intuitive ways” (Mol, 2011, p. 21).

It was before computer technologies appeared that George Rorick set the tone to modern infographics. He was the creator of the modern weather map launched in 1982 in the American newspaper USA Today (fig. 11). To Rorick, infographics play a very important role in news presentation to the public. His main objective is to help readers understand a part of a story in a fast, concise and clear way (El Mundo;, 1999).

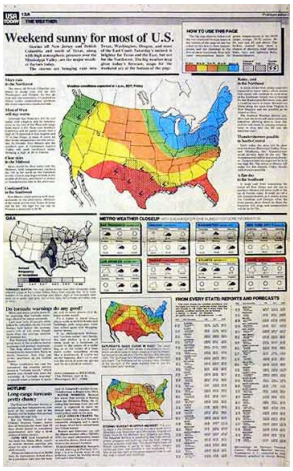

Figure 2.11- Weather Map by George Rorick, USA Today, 1982[14]

With the rise of digital technologies, the creation of infographics was made easier and with the Internet they became fairly popular. Data became open to everyone with access to the Internet. Newspapers keep using infographics as an essential part of news communication, especially in their online versions, where some interactivity can be added. The online version of The Guardian has a section fully dedicated to infographics: Data Store[15]. The New York Times[16] online has a section on learning and teaching where infographics are used as a tool to spread knowledge.

Since the individual's experience of the world has become more complex, infographics tend to also show higher levels of information based on increasingly complex data.

Straightforward information, like the charts produced by Excel, are no longer enough to generate interest. Nowadays, pretty much everything has been turned into a graph: from social network and communication habits to a spider courtship dance. Infographics tend to use visual metaphors, sometimes focusing on the aesthetic side: "if we can show data as blocks, spheres, rivers nets or landscapes, we open up a new and rich visual language through which the external world is brought into our internal world of understanding" (Klanten, Bourquin, Tissot, & Ehmann, 2008, p. 7).

For Tufte (2001), most of the graphics produced in the last years would be proficient in providing redundant data-ink. To the author, everything that is not the core of a graphic (data-ink) is redundant, therefore erasable. Tufte's concept of 'graphic excellence' consists in the ability to communicate complex ideas in a clear, precise and efficient way, giving the viewer the "greatest number of ideas in the shortest time with the least ink in the smallest space" (Tufte, 2001, p. 51). Achieving 'graphic excellence' also requires, among others things, showing actual data, making the

[14] Retrieved from: http://www.datavis.ca/milestones/index.php?group=1975%2B [accessed in: 15-02-2013]

[15] http://www.guardian.co.uk/data

[16] http://learning.blogs.nytimes.com/tag/infographics/

viewer think about the content rather than the methodology or graphic design, encouraging comparisons, turning coherent great amounts of data, avoiding data distortion and providing different levels of reading. He defends that graphical decoration results in *chartjunk,* defined as redundant representations of the simplest data. He points moiré vibration, the use of dark grid lines, and self-promoting graphics (that enhance the technology instead of the data), as the main causers for *chartjunk*.

Andrew Vande Moere, on the other hand, has detected some relation between the aesthetic qualities of an infographics and how well it is understood (Klanten, Bourquin, Tissot, & Ehmann, 2010).

Independently of the visual representation of information, making it visible, easily understandable and enjoyable to use, are major steps in order to change people's behaviour.

Like infographics are visual representations of a story in a certain context, according to Barnard (Graphic Design as Communication, 2008), graphic design is the response of a society and culture, "a mirror or indicator of something going elsewhere, in 'society' and 'culture'" (Barnard, 2008, p. 58). If there wasn't an obesity problem, was food labelling so necessary?

2.3 Origin of Nutrition Labels

When food labels were first introduced, their goal was to inform consumers about food nature and composition, enabling a better understanding about the consequences of certain product consumption. The emergence of food labelling as it is known today came along with mass industrial food production, the spread of low temperature and other preservation technologies and, as well, with the development of packaging materials and techniques (Cheftel, 2005).

Recently, the paradigm of food labelling has become more focused in consumer's health protection and his right to access information "on ingredients and additives, philosophical or ethical concerns (mode of production, absence/presence of given ingredients, including genetically modified foods); nutrition information, and declaration of potential allergens" (Cheftel, 2005, p. 531). Plus, in a market soaked in pre-packaged food, with a great amount of new and multinational products appearing every week, with high levels of competition between food producers and the use of new preparation methods, more than ever, food labels play a critical role in the consumer's buying experience. These changes in the food industry and consequently in consumers' habits, has resulted in the increase of obesity rates and other chronic diseases, which are central concerns for health organizations and policy makers. For example the document "White paper on: A Strategy for Europe on Nutrition, Overweight and Obesity related issues" by the Commission of the European Communities (2007) there are established four priority measures that can be utilised by the European Union (EU) Member State to prevent the increase of overweight, obesity and other chronic conditions like cardiovascular diseases, hypertension, type II diabetes, stroke, certain cancers, musculo-skeletal disorders and some mental health conditions.

These actions have to (1) address the origin causes of the health related risks, like excess weight; (2) to work across government policy areas, engaging private sector and civil society; (3) consider as essential actors the food industry and civil society, schools and community; fourthly (4) monitoring all the activities promoting healthier habits in order to understand what works and what has to be improved or changed (Comission of the European Communities;, 2007).

Food labels in EU are particularly relevant in order to allow the free circulation of products and therefore it was necessary to adopt common guides regarding mandatory requirements for safety and quality, origin of ingredients, expiration dates, food names and composition, ingredients, etc (Cheftel, 2005).

INFORMAÇÃO NUTRICIONAL MÉDIA	POR 100g DE PRODUTO EM PÓ	POR DOSE (100ml)*	%VDR**	VDR**
VALOR ENERGÉTICO	1688kJ 397kcal	288kJ 68kcal	3,4	2000kcal
PROTEÍNAS	11g	1,9g	3,7	50g
HIDRATOS DE CARBONO DOS QUAIS: AÇÚCARES	88g 88g	15g 15g	5,5 16,6	270g 90g
LÍPIDOS DOS QUAIS: SATURADOS	0,1g 0g	0,02g 0g	0,02 0	70g 20g
FIBRAS ALIMENTARES	0,1g	0,02g	0,1	25g
SÓDIO (SAL)	0,2g (0,5g)	0,03g (0,09g)	1,4	2,4g (6g)

MINERAIS E VITAMINAS	POR 100g DE PRODUTO EM PÓ	%DDR***
VITAMINA C	116mg	145%

*De produto confeccionado de acordo com o Modo de Preparação indicado.

Figure 2.12– Example of a European Nutrition Label, 2012[17]

In the EU the establishment of a legislation consisting of "Regulations (which are directly applicable to all Member States) and Directives (which require transposition and implementation into national legislations, thus imposing delays and possible inconsistencies in interpretation, application and/or enforcement)" (Cheftel, 2005, p. 532), took effect as of 1st of January of 1993 (The Council of the European Communities;, 1990) and initially stated, among other things, that when packaged food advertised nutrition claims such as "low fat, "high fibre" or health claims such as "reducing blood cholesterol", had to include a nutrition label in order to inform the consumer the serving size, and the servings per package or container. According to the claim, the percentage of daily values of either a group of four nutrients (energy, protein, carbohydrate, and fat) or the group of eight (the previous four plus sugar, saturated fat, fibber, and sodium) had to be stated (Bonsmann & Wills, 2012). Though the fact that the nutrition information wasn't compulsory lead to several years of negotiations for a new food regulation that would make nutrition labelling mandatory for all packaged food. This came to happen in 2011 with the release of Regulation (EU) No 1169/2011 of the European Parliament and of the Council of 25 of October 2011, setting that food manufacturers must provide information on energy value and on the amounts of fat, saturates, carbohydrate, sugars, protein and salt, expressed per 100g or per 100ml of product. Food producers who already include nutrition labels in their products have until December 2014 to re-implement it according to the new

[17] Retrieved from: http://1.bp.blogspot.com/-kVZ5p4dELRQ/T232Ww52-fI/AAAAAAAACSo/hZeXa1xYfMA/s1600/gelatina.jpg [accessed in: 20-03-2013]

rules, those who have yet to introduce the labels are given 2 extra years to introduce it (European Union;, 2011).

The nutrition labelling, through the provision of information, is seen as a way to support healthy decision making related with food and drinks (Comission of the European Communities;, 2007) and to provide incentive for food manufacturers to use healthier nutrients in packaged food. The Global Strategy on Diet, Physical Activity and Health by World Health Organization (WHO) recognizes that "consumers require accurate, standardized and comprehensible information on the content of food items in order to make healthy choices" (World Health Organization;, 2004, p. 7). Similarly, for the Organization for Economic Co-operation and Development (OECD) "nutritional labelling is a main tool for preventing increasing rates of obesity and unhealthy diets in OECD countries" (Organisation for Economic Co-Operation and Development;, 2008, p. 10).

In the United States of America (US), it was in 1972 that the Food and Drugs Administration (FDA) proposed a set of regulations to provide nutritional information on packaged food to be voluntarily applied except when in presence of nutrition claims, where its application was mandatory (Wartella, Lichtenstein, & Boon, 2010).

Right after 1973, American consumers started demanding more detailed nutrition information especially on processed and packaged food, coinciding with the spread of scientific knowledge about the relation between diet and health. Nevertheless, it wasn't until 1990 that a revision of the food label was started, which would later be presented by the FDA in the same year. The publication consisted of the proposed rules for the mandatory nutrition labelling for almost all packaged food. The result was the most significant food labelling legislation in 50 years (Wartella, Lichtenstein, & Boon, 2010).

Figure 2.13– Example of an American Nutrition Facts table, 2012[18]

[18] Retrieved from: http://www.boomboomenergy.com/blog/wp-content/uploads/2011/03/nutrition_facts_electrifire2.gif [accessed in: 20-03-2013])

The Nutrition Labeling and Education Act (NLEA) (Food and Drug Administration;, 1990), compiles all the rules and specifications that most of the American food packages must fulfil. Mandatory information that must be included in a nutrition label is the presence and amounts of certain nutrients (fat, total fat, saturated fat, cholesterol, sodium, total carbohydrate, dietary fibber, sugars, protein, vitamins A and C, calcium, and iron – in 2003 FDA also included *trans* fat to the list), and the amount of calories. The quantities of both have to be specified in serving sizes, or the size in which the amount of product is usually consumed (for example, teaspoons – tsp – is the baking soda serving size because it is a common household measure) in the form of a Nutrition Facts table. However for consumers to understand food consumption in the context of their total daily diet and compare nutritional values across products, NLEA established that the Nutrition Facts panel information has to be in relation to a daily reference value (DRV), set as percentage, for each nutrient (Food and Drug Administration;, 1990).

Similar regulations were outlined and implemented in several other countries like Australia and New Zealand, Canada, Hong Kong, etc. For this dissertation the focus is mainly the EU and US, where the amount of studies centred in these regions is superior and with direct relation to the context in which its being developed.

As previously referred, nutrition labelling allows consumers to select food according to their needs and, hopefully, towards healthier diets, where the excess of energy intake over energy expenditure can be more easily controlled.

A global study taken by The Nielsen Company about Healthy Eating trends Around the World (2012) shows that 53% of consumers over the world are overweight, and that in Europe the value is 5% over the global average with a 58% rate of incidence. Half of the respondents are trying to lose weight, and 78% of these perceive diet changes as the most effective way to lose extra weight, followed by physical exercise.

Another research taken by FLABEL (Food Labelling to Advance Better Education for Life), "a pan-European project which has explored the impact of food labelling among consumers in Europe" (Food Labelling to Advance Better Education for Life, 2012), confirms that in Europe, 85% of the evaluated products do have nutrition information. But do consumers understand or make any use of it? According to Nielsen's study, only 7% of the global average do not understand at all the nutrition labels on food packaging, 52% understand it in part, and 41% understand most of it. Portuguese consumers have the highest knowledge on nutrition labels in Europe, with 60% of consumers claiming to largely understand them (The Nielsen Company;, 2012).

What is then the real impact that food labelling has among Europeans, their dietary choices, consumer habits and food-related issues? The FLABEL consortium focused mostly on giving an answer to this question, but instead of getting a direct response, the conclusions showed that food choice based on nutrition labels depends mostly on consumers' attention and their understanding of it, emphasizing as main obstacles the lack of motivation and attention: "consumers need to be motivated to engage with nutrition information – for instance, by having a health goal - in order to pay greater attention to labels" (Food Labelling to Advance Better Education for Life, 2012). If a

consumer, at the point of purchase (POP), is driven by health concerns, he is more likely to pay attention to nutrition labels. On the other hand, if consumers solely follow their preferences, little or no attention is given to nutrition labels.

An in-store observation with shoppers from the United Kingdom (UK), Sweden, France, Germany, Poland and Hungary, aiming to investigate the use of nutrition information on food labels showed that 16,8% of shoppers said they look for nutrition information, especially the consumers originally from the UK. UK consumers were early adopters of nutrition labelling, and due to this prolonged adaptation, they emphasize the importance of exposing the public to debates around nutrition labelling so that it may affect people's thinking and behaviour. (Grunert, Fernández-Celemín, Wills, Bonsmann, & Nureeva, 2010). In the same study, when the shopper was asked to declare the main reason for choosing a certain product, taste (52%) came in first place followed by 'this is what my family wants' (13.4%), price/special offer (10.7%) and health/nutrition (8%). If 16,8% of shoppers said they look at nutrition labels, it is not clear whether they used it or not on food choice, as only 8% of respondents said to be health/nutrition driven when shopping for food. Once again, it is not people's capacity to understand nutritional information but the lack of motivation to use it when it comes to choosing healthier food, giving strength to the theory that is through public education that it is possible to raise awareness and therefore have actual impact on the beliefs and motives related to food consumption (Hieke & Willis, 2012).

Nevertheless, if people do have the means to make informed choices on pre-packaged food, the same doesn't happen when it comes to food selection in restaurants.

Obesity rates have increased and so has the "away-from-home" food consumption, causing a debate around the nutritious quality of food prepared in restaurants and consumers' knowledge about its influence on weight maintenance and weight-loss attempts, having fast-food restaurants being pointed out as the main responsible in contributing to obesity high levels (Burton, Howlett, & Tangari, Food for Thought: How Will the Nutrition Labeling of Quick Service Restaurant Menu Items Influence Consumers' Product Evaluations, Purchase Intentions, and Choices?, 2009).

In the European Union the new regulation on the provision of food information to consumers (European Union;, 2011), covers all "foods delivered by mass caterers". Nevertheless, the compulsory information for mass caterers is a declaration on the presence of ingredients responsible for allergic reactions (EUFIC - European Food Information Council;, 2012). That is applicable unless Member States adopt national measures in order to provide the information on the no.1 Article 9 (i.e. nutrition declaration) (European Union;, 2011).

The UK has been prominent in raising public discussion around nutrition labelling resulting, for example, in the Public Health Responsibility Deal (Department of Health;, 2012) that, among others, includes a pledge for out-of-home calorie labelling asking "catering businesses, who sell food in out of home settings, to provide calorie information for customers on menus or menu boards, to help people make healthier choices" (Department of Health;, 2012).

In the USA, despite being advised by NLEA that "restaurant foods must comply with the various established definitions and many requirements for nutrient content claims"

(Food and Drug Administration;, 1990), FDA did not require full nutrition labelling for restaurant foods, nor did require that nutrition information should be presented in the Nutrition Facts format. However, some State and local jurisdictions have enacted regulations requiring "calorie declaration for food offered for sale at restaurants and other establishments" (Food and Drug Administration;, 2011), but with very diverse requirements between them. Patient Protection and Affordable Care Act of 2010 ("Affordable Care Act"), which was signed into law on March 23, 2010, establishes requirements for nutrition labelling of standard menu items for chain restaurants, similar retail food establishments, and chain vending machine operators (Food and Drug Administration;, 2010). But cannot constitute legal requirements since some provisions depend on FDA to issue rules before they can be required. In conclusion, the mandatory information to be provided by chain retail food establishments is the number of calories in each standard menu item on menus and menu boards, written nutrition information upon request, and a clear statement on menu boards about this information availability (Food and Drug Administration;, 2010).

Figure 2.14 - Menu board displaying information about energy (in calories)[19]

Nielsen's study (2012) shows that diners around the world see calorie disclosure on restaurant menus as important data to support their decision, though the significance given to this information is higher for fast-food restaurants (49%) and less for privately-owned restaurants (31%). Nevertheless, researches prove that there is a gap between what consumers say they do and what they actually do (Hieke & Willis, 2012).

Focused on the demand for nutrition information in full-service restaurants, Josiam and Foster (Nutritional information on restaurant menus: Who cares and why restauranteurs should bother, 2009) research's conclusions illustrate that if nutritional information had to be available, a "substantial segment" of consumers would use it and probably would dine out more often, especially people who typically eat healthier food at home. The older and wealthier consumers with higher levels of education are the most concerned about nutritional information disclosure in restaurants. Another interesting conclusion is related with obligation: those who resort to restaurants as a

[19] Retrieved from: http://www.mlive.com/news/usworld/index.ssf/2011/04/fda_proposes_calorie_counts_on.html [accessed in: 25-03-2013]

necessity, are more likely to use nutrition information, in opposition to people who go to restaurants as a pleasure, who are less likely to use it. The authors envision these conclusions as a marketing opportunity, a competitive advantage for restaurants capable to implement the nutrition information into their menus according to their business goals, and their targets.

Regarding now a research on the impact nutrition labels have on people when buying food in quick-service restaurants, most consumers tend to underestimate calorie, fat and salt consumption (Burton, Howlett, & Tangari, 2009). One important conclusion is related to what it is called "deviation from consumer expectations". That is, "the percentage of consumers choosing the less healthful menu items decreased when actual calories were disclosed and exceeded expected levels, and the percentage of consumers choosing the more healthful items increased when actual calories were disclosed and levels were less than expected" (Burton, Howlett, & Tangari, 2009, p. 270). The "positive disconfirmation", when consumers realize that they overestimate the actual calorie level, can increase sales for that menu item. On the contrary, "negative disconfirmation" or when the actual calorie level exceeds the expected, results on sales decrease. By making nutritional information available, restaurants can take a major part in changing consumer's habits either by reducing serving sizes or by improving the nutritional profile of their food. The "positive disconfirmation" factor can be here the common motivation for restaurants and consumers: the first might increase sales, and the second can eat healthier food away-from-home, resulting in a win-win situation.

Transversal to several studies about whether nutrition labels influence consumers diets, is the deduction that consumers' behaviour is a complex topic and their food choices are mostly driven by knowledge, motivation and education (Hieke & Taylor, 2012) Nutritional information disclosure is just one aspect when talking about diminishing the obesity rates and chronic diseases. The lack of motivation to use that information when choosing food has to be countered with education campaigns and public debates, as it shows to be efficient when it comes to the relation between recognition and knowledge, well demonstrated by the UK case.

This research aims to take a step further regarding food labelling in EU restaurants' menus by offering, along with the mandatory information regarding the allergens disclosure, a nutrition label that is visually appealing, provides a clear and reliable information on the most important nutrients and energy values and, most of all, that can influence consumers to decide on healthier food.

The novelty regarding the application of nutrition labelling on restaurant menus, and consequent lack of studies about the efficiency of the graphic forms assumed to convey this information, lead this research to rely on readings about the different front-of-pack (FOP) labels used for pre-packaged food. This option is based mainly in the similarity on label size and amount of information present in packaged food and what is reasonable to expect to show on a restaurant menu. As it is a methodological decision, it will be taken in deeper analysis in the Methodology chapter.

In order to help consumers understand and make real use of nutritional information there have been developed, on a voluntary basis, several front-of-pack graphic

solutions. Bringing the essential information to the front-of-pack would help the consumer in selecting healthier food at the point of purchase, and the combination of both front-of-pack and back-of-pack information leads consumers to better understand nutritional information and increase the its credibility (Kleef, Trijp, Paeps, & Fernández-Celemín, 2007). These labels can either assume the form of a simple health logo or, by disclosing detailed information about nutrient and calorie values result in a more complex format.

FLABEL consortium (2012) distinguished three types of labels based in the concepts of directiveness, or how explicit is the provided guidance (to eat /not to eat), and information content, to distinguish the degree of information given to the consumer.

The directive labels correspond to those not including any nutritional information, as for example, the health logos. Health logos characterize food's healthfulness: if a product has nutritional quality, according to the legally established reference intakes, it is assigned with a health logo. No nutritional quality corresponds to the absence of a health logo.

An example of this kind is the keyhole symbol. Created in 1989 by the Swedish National Food Agency, after adopted by Denmark and Norway, the keyhole symbol indentifies the healthiest options in each food category.

Figure 2.15 - Keyhole Symbol FOP label, by the Swedish National Food Agency, 1989[20]

Semi-directive labels contain nutrition-based information, therefore have higher information content, but it also provides some directiveness by guiding consumers through colour, for example.

These more complex FOP labels can include additional information like nutrient and calorie quantity per 100g/100ml and a percentage on the guideline daily amounts (GDAs), which are reference values to how many calories and nutrients people can consume each day for a healthy, balanced diet (Food and Drink Federation;, 2012).

The traffic light system developed by Food Standards Agency (FSA) in the UK is probably the most familiar of its kind among the European and perhaps Portuguese consumers, as it can be found in every Continente's food product, the biggest retail company in Portugal.

[20] Retrieved from: http://www.noeglehullet.dk/services/English/forside.htm [accessed in: 25-03-2013]

Based on the colours green, amber and red, the label shows if the food has respectively low, medium or high, amounts of fat, saturated fat, sugars and salt (range determined by the European Regulation (EC) No 1924/2006 (European Union;, 2006)), and GDA information in order to achieve balance across products (Food Standards Agency;, 2007).

Figure 2.16 – Traffic Light System FOP label, by Food Standards Agency and adapted for Continente[21]

At last, non-directive labels, are those containing high levels of nutritional information although not providing any judgment about product's nutritional quality as the previous types.

The GDAs are an example of labels containing a great amount of nutritional information without providing any guidance to the consumer, whom has to rely on his nutritional knowledge to make healthier food choices.

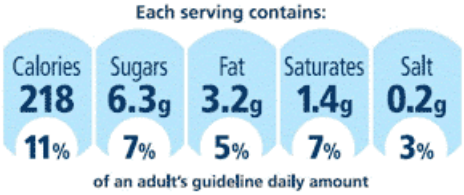

Figure 2.17– Guideline Daily Amount FOP label[22]

[21] Retrieved from: http://movimentohipersaudavel.continente.pt/pdf/Ebook_semaforoNutricional.pdf [accessed in: 25-03-2013]

[22] Retrieved from: http://www.bupa.co.uk/individuals/health-information/health-news-index/2012/26102012-does-food-labelling-help-you-make-healthier-choices [accessed in: 25-03-2013]

The labels' performance will be taken into deeper analysis further on this investigation to justify the options made to design the new nutrition label for restaurant menus, the main objective of this research.

Labelling laws expect to empower consumers when it comes to their food choice. However, and as it has been stated before, people are most likely to use labels and be motivated for healthy eating, if there is a constant promotion and education towards healthier food and lifestyle. Consistency, or the familiarity effect, is pointed out as the best way to raise awareness: labels to which people are familiar are likely to increase attention and therefore facilitate its use (Food Labelling to Advance Better Education for Life, 2012). A study by Bonsmann & Wills (Economy and Environment (A Drewnowski, Section Editor) Nutrition Labeling to Prevent Obesity: Reviewing the Evidence from Europe, 2012) supports this approach suggesting that no matter what is the FOP system, it is consistency on its visual presentation and placement that may increase familiarity and therefore enhance nutrition labels' use, particularly when sustained by promotional and education campaigns.

The study and analysis of different formats of existing nutrition labels, their design and its relation with effectiveness, measured by consumers' real use and understanding of it, will provide important information on consumer's receptiveness on the label.

Infographics are usually perceived as official reliable information, but in an age where graphic design can be found anywhere since it is blended with the "visual culture of everyday life" (Barnard, 2008, p. 9), the graphic representation of nutritional information needs to be visually appealing. Although, at the same time, detached from advertising in order to be noticed, trusted and therefore used.

2.4 Technology trends within the nutrition area

The spread and massification of personal gadgets with constant access to Internet, like smartphones and tablets, forced the evolution of a new industry related with mobile applications (apps).

In the nutrition field there have been created several applications: from apps that help in the weight-loss process to others that support consumer's food choice according to their particular health condition. These applications proliferate particularly in the US where the National Nutrient Database for Standard Reference includes pre-packaged food from the different US supermarkets. The completeness of this database allowed, for example, the creation of applications where through a barcode scan, the consumer can immediately access the nutritional profile of the food he is intending to buy.

Fooducate (2010), for example, is an application that through a barcode scan, grades each product in its healthfulness, liking and number of calories per serving (figure 2.18).

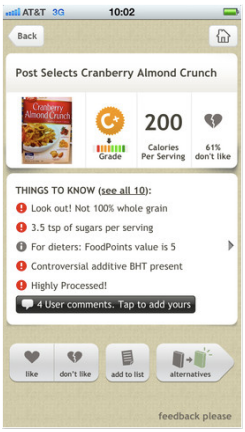

Figure 2.18 – Fooducate *app* screenshot[23]

It also includes a "Health Tracker" which provides a personal rate on healthfulness measured on the food intake and exercise made.

Another similar application, that also uses barcode scan, is ShopWell (2010-2013). By setting a profile where are disclosed personal objectives (lose, maintain or gain weight), health related issues (anaemia, heart diseases, diabetes, etc) and finally food intolerances and allergies, the application has the ability to suggest the best food match to shop according to that profile (fig. 19/20).

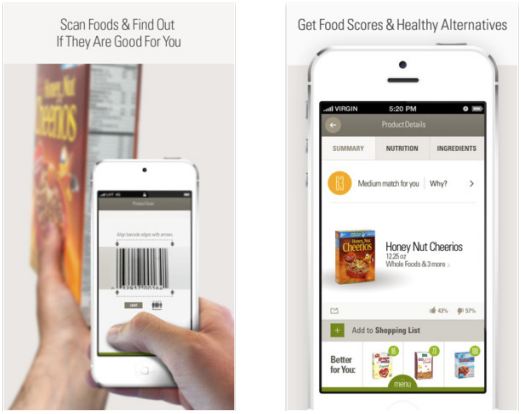

Figure 2.19 – ShopWell *app* running and screenshot[24]

Another and different approach is the one from The Eatery (2011) by Massive Health. More than counting calories, the Eatery defends that the record of every meal, through pictures, make people aware of their eating habits and therefore make them lose more weight. The posted photos are rated both by the users and their network as well. After

[23] Retrieved from: https://itunes.apple.com/us/app/fooducate/id398436747?mt=8 [accessed in: 12-03-2013]

[24] Retrieved from: https://itunes.apple.com/app/shopwell/id393422300 [accessed in: 12-03-2013]

a week, it is possible to get a graphic about how healthy was the food during that period.

Like these ones, there are a lot more to be found on the application's stores. But the lack of a database as complete as the American one does not allow European apps to be as complete as the developed for the US market.

3 Methodology

After perceiving that obesity is also a consequence from the increasing habit of eating out in restaurants, the methodological strategy outlined with the aim of designing a nutrition label for restaurant menus, was: to gather the most relevant literature, studies and information in the areas of communication, information design and nutrition labelling in order to get a general overview and then proceed to the actual label design supported on the critical analysis of the collected data. The test of the developed nutrition label within the market /users is out of scope of this dissertation, nevertheless some directions are given in this area for future work.

The bibliography is result of a critical analysis from: (1) the source, if it is reliable and if it is published in credited publications, (2) the year of publication, as fast evolving areas with a relevantly high amount of literature it was possible to choose from the most recent, and (3) the content, that is, its relevance to the subject of designing a nutrition label to restaurant menus.

Specifically for case studies, to the previously referred selection criteria it was also added the country in which it was taken.

The general outcome is a collection of books, articles and case studies within the areas of communication theory; graphic design; infographics; food related diseases; nutrition label history and regulations; importance of nutritional information disclosure in restaurants; and FOP labels formats and related efficiency. The bibliography is diverse and presents different approaches from the subject in analyse.

3.1 Approach to literature review

The initial literature review focused on the nutrition side and it was assembled together with a nutritionist from Movelife - project with which part of this dissertation is being developed in collaboration. This previous knowledge allowed the identification of the main literature and studies in the nutrition field and as well, to access their bibliography to get other scientific articles and further case studies readings.

Researches from the European Information Council (EUFIC), European Union, Organisation for Economic Co-Operation and Development (OECD), World Health Organization and the U.S. Food and Drug Administration (FDA), allowed understanding the main strategies endorsed to prevent obesity. What is consensual between them is that a better-informed consumer is able to do healthier choices when buying drinks or food. Therefore, the next phase of research and selection was over scientific articles about nutrition labelling efficiency on promoting healthier eating habits, the possible contents and formats of a label and as well how nutritional information disclosure in restaurant menus can play an active role in promoting healthier eating habits.

Despite being a difficult task, the reading of some regulations both from EU and the American FDA has provided the necessary legal framework to develop the nutrition label.

Also, it is important to emphasize the effort towards the dissection and full understanding of the new EU Regulation (2011) on the provision of food information to consumers and most of all its scope, in order to identify the specific parameters applicable to restaurants.

After the first general readings that included nutrition label's history, the main inference is that the most recent developments in the nutritional information disclosure are related with FOP labels in pre-packed food. The reading from nutrition label's history allowed to comprehend that disclosure of nutritional information began when pre-packed food started to reach the masses, and that is probably why it is an area where it is possible to collect diverse researches and studies.

Regarding the restaurants, the conclusion is not that clear. Both in Europe and US, despite the fact there is a public recognition of the importance of nutritional information disclosure in restaurants the taken measures have still little impact. There is literature about the theme but not so many studies co-relating the provision of nutritional information with changes on consumer's dietary habits.

While not having a solid set of case studies about specific successful formats and contents of nutrition labels in restaurant's menus, within the scope of this dissertation the studies related with FOP labels are considered the main reference for designing a nutrition label.

Having defined FOP labels as main references and taking a deeper look into their graphic appearance and information content, it was clear that research was needed on communication theory and more specifically on semiotics, as the science of signs and meanings. It was important to understand how codes, or the arrangement of signs, can convey knowledge. Semiotics is a vast area of study but for the purpose of this dissertation it was only needed as a framing general overview and then a more detailed research on signifying codes. Therefore, one author was selected that had compiled a general overview into communication studies.

After reading about information visualization characteristics in specialized websites and in a master dissertation, it is considered that infographics is the type of visual language usually adopted by FOP labels to transmit nutritional information. Consequently it was necessary to understand when and how information and data started to be converted into graphics in order to be easily readable and used by a wider public, that is, the infographics history. Along the way, the focus on Otto Neurath and the ISOTYPE system seemed too fundamental to present just a light overview about it. Considering that the nutrition label has as its main objective to change the consumer's bad eating habits by informing them, there was a clear option on providing a deeper understanding over Neurath's visual language as it has a major link with education.

Despite the methodological order presented here, when outlining the state of the art content's, it was more coherent to first introduce the reader the communication and design aspects and then the nutrition labelling information. Not only because the research about semiotics and infographics serves as a frame to FOP labels, but also because the nutrition's state of the art makes a better introduction to the actual design of the nutrition label.

3.2 Case studies' selection

Because it is directly related with consumer's behaviour research, a subject rather complex to study, there is still no clear evidence nor agreement on whether the provision of nutritional information can change people's dietary habits. Despite looking dissuading, this is the main conclusion that can be taken from the case studies' reading.

For the case studies' selection the followed methodology was the same as for the literature review with its choice related to the source, the year of publication and content. Nevertheless, a particular feature was added to the previous ones: the country of origin. Preference was given to European countries and the US not only because both share similar westernized cultures, but also because they are both prolific in case studies' development in the nutrition field of study.

The selected studies in its majority come from journals directly related with consumers such as The Journal of Consumer's Affairs, the Journal of Consumer Research and the Journal of Retailing. The reviewed studies are both experiments taken in the field and in controlled settings experiments. The field experiments are performed in natural settings, and while it is not possible to have full control of the environment, the results can be more reliable as consumers' choices are consequence from the real time, cost and inherent pressures and it is possible to assemble a more realistic sample (Wartella, Lichtenstein, & Boon, 2010). In non-field experiments all the external factors are controllable in order to get more focused results and to get examined different labels, but regarding the conclusions about consumer's behaviour mightn't be as easy to get as in the first.

Along the search in scientific databases, there was a clear contrast between the higher amount of available information about front-of-pack labels, and the relatively low number on nutritional information disclosure in restaurants. While at first it was possible to perceive an evolution from the theoretical hypothesis to the development of tests in order to get constructive conclusions, for the second, it feels like research is still trying to reach this same path.

That is one of the reasons which FOP labels and the studies regarding them are taken as the main references for the design of a nutrition label for restaurant menus. The other major reason is the type, amount and format in which the information is usually organized. Not only it might be similar the kind of information presented to the consumer but its layout as well because of the similar lack of space.

The appearance of FOP labels result from a collective effort from food manufacturers, retailers, health organizations, and others to promote healthful eating, particularly using symbols and nutrition rating systems that summarize the most important aspects and features of food products to help consumers make healthier food choices at the point of purchase (Wartella, Lichtenstein, & Boon, 2010). The FOP labels, as pointed by the authors Hieke and Taylor (2012), may be an effective way to create awareness to the nutrition facts label, as it is a synthesized and more appealing form of it. Also, as showed by Wartella et al. (2010, p. 53), in 2010 FDA set a global goal for FOP nutrition labels:

"The goal of an FOP nutrition label is to increase the proportion of consumers who readily notice, understand, and use the available information to make more nutritious choices for themselves and their families, and thereby prevent or reduce obesity and other diet-related chronic disease."

And as well set other potential purposes like providing consumers with an effective and convenient tool to get precise information about nutritional quality of food, helping with consumer's education and facilitate healthier food choices and encouraging industry to improve the nutritional profile of products.

But the purposes for which FOP label systems have been developed are varied as: provide information on calorie content, serving size or targeted nutrition, whether a product is high or low in specific nutrients, give information on overall nutritional value of a product, allow comparison of nutritional values within or across food categories, provide information about contribution of recommended food groups and guidance on products appropriate for marketing to children and finally, to encourage product reformulation (Wartella, Lichtenstein, & Boon, 2010).

The first study to be read exclusively on the subject of FOP labels was the outcome from the EU-funded research project FLABEL that was able to provide a deeper insight into the theme. Next, it was analysed studies testing the effectiveness of the different FOP labels. In this area, nor only are considered FOP labels specifically from Europe, as in the study from Feunekesa et al. (2008) and Grunert at al. (2010) but it considers the cases from the US as well, as in Wartella et al. examination on FOP rating systems and symbols (2010) from the US and abroad and the consequent research into guiding principles to develop FOP labels (2011).

In conclusion, it is by its capability to influence consumer at the point of purchase and its variety of possible content and format, that FOP label systems are used in this dissertation as source of research to design the nutrition label to be presented on restaurant menus.

3.3 Methodology for designing the nutrition label

In order to select the appropriate methodology to develop the nutrition label, it was necessary to understand the strengths and limitations of the methodologies used in other researches.

In a Critical Review of the Nutrition Labelling (2012), Hieke and Taylor provide us with an analysis of label features - such has label format and label wording -, and about consumer characteristics - like sociodemographic factors. To accomplish this objective the followed methodology was to compare and combine previous research findings, starting with a keyword search in databases in order to collect the most relevant articles, followed by a search on journals focused on consumer's behaviour, resulting on a total of 47 studies.

The option to show here in more detail the results from this review lies in the fact that it includes a great amount of the studies used in this dissertation.

In order to get optimized conclusions, Hieke and Taylor (2012), consider that format and design of nutrition labels are related with (1) the exact content of the label -

consumer's preferences, comprehension of information and influence on product ratings and purchase intentions; (2) information complexity; (3) the amount of information related with the product in the package.

Over the table 1 in the appendix it is possible to understand and compare the scope of the research methods used for the 47 studies which, as previously referred, are divided by the categories of label format / design and consumer characteristics.

The preponderance of used methodologies in the reviewed studies are experiments conducted in controlled settings or result from surveys either online or by mail.

The authors present three general methodological critiques: (1) narrow research focus, as most of the reviewed studies consider only one or two claims and formats, (2) type of used samples, since there is an excessive use of undergraduate students representing the general population the results may be distorted and (3) the measurements used for comparability of nutrition knowledge and usage are vague, which makes difficult to understand what and how is being measured.

Within the scope of this research, the design and methodological decisions related to the nutrition label are based in a critical review of case studies and not on a case study that was developed exclusively for the dissertation. This option is justified by the generous amounts of available case studies published in credible publications, or developed by or in partnership with acclaimed organizations. It is a fact that they have facilitated access to decisive data and a capacity to assemble the studies that and individual, with temporal restrictions, couldn't possible have.

Nevertheless and as conclusion, there is the list of deductions from Hieke and Taylor (2012) suggesting the important methodological directions to be followed when creating case studies and that will be considered in future work:

- Research on the consumer's behaviour to understand whether their everyday food choices are improved due to nutrition labels;
- Resorting on test markets both at home and in store in order to identify and compare the usage of different label formats, to understand the process of information search, and finally, to analyse consumer's choices;
- Interview studies to perceive how consumers use labels and what they think about them, providing as well information about the cognitive processes that consumers go through when searching, reading and using nutritional information, and whether it has any impact in consumption decision;
- Experimental research on laboratory environment, as it helps to control unwanted side effects.

During the literature review and case studies selection there was a special care to critically analyse the ideas and conclusions from the other researchers and to preview their relevance to the design of a nutrition label for restaurant menus. It is expected from this final collection that it works both as a safety net and as a trampoline.

4 A model for a restaurant's menu nutritional labelling system including nutritional criteria to select and evaluate nutrients

From the literature review and case study's methodological analysis to the actual design of the nutrition label there was a hiatus. To set the collected ideas in order to think of what might be the best solution regarding the implementation of nutrition labels in restaurant menus was a process that required some detachment and most of all opinions from the different areas involved. It is important to underline that the design of the label was surrounded by different constraints. From the rigour of the EU Regulation, to the nutritional accuracy and the possible programming limitations of the software, it was necessary to find the perfect balance between all parts and as well flexibility to manage them all. Altogether, allied with time pressures related with the market entrance, makes the MoveLife's software and nutrition label the perfect example of a project within the field of Creative Industries Management.

The development of the nutrition label presented here is a result from literature review and case studies' analysis, European regulations and a leap of faith, as it wasn't possible to find much information regarding nutritional disclosure within restaurant's context.

4.1 Objectives for disclosing nutritional information

As previously stated, FOP systems are used in this dissertation as the main references in terms of possible formats, contents and layouts in the disclosure of nutritional information in restaurants to consumers. FOP labels are intended to be easy to understand and to use. But there are some formats that consumers prefer above others. Around 2009 it was already possible to find many different FOP systems but each based on distinct criteria. This diversity is in the origin of some confusion since the provided information is not consistent across products. (Wartella, Lichtenstein, & Boon, 2010). The same authors concluded that given the existing disparity that occurred on FOP labels, it was important to use a standardized and easy-to-read format that focused on nutrients or food components that was most strongly associated with the diet-related health risks (Wartella, Lichtenstein, & Boon, 2010). The major ambition of this dissertation is to create a nutrition label that will be available in as many restaurants as possible so that consumers may feel familiarized with it. Consequently, by having the frequent use of a common, familiar nutrition label, consumers will be able to make healthier food options. Apart from nutritional information, the label will also include mandatory information listing any substances or products that may potentially cause any allergies or intolerances. The label is going to be a product of MoveLife's software. All criteria presented in this dissertation will serve as the scientific base for the software to automatically model the label associated to each dish. That means that the software, from the ingredients of a restaurant's recipes, is able to transform the nutritional values of a food into a nutrition label to be applied in the menu. By using the software, *Chefs* can perceive the overall healthfulness of their foods and consequently encourage the improvement

of food's nutritional profile. In the Appendix A it is possible to have an overview on the software's overall look.

In the research developed by Wartella et al. (2011), there is a list of directives for FOP labels in order to achieve success. Adapting it to restaurant context has resulted in the next three statements:

- The label should be able to encourage consumers to make healthier choices;
- The label should encourage restaurants to provide healthier food and to reformulate current recipes;
- The label should encourage restaurant owners to highlight these options in their menus, for example using them as specials.

4.2 Critical success factors for disclosing nutritional information and different formats of nutrition labels

As concluded in different studies, consumers tend to prefer less complex labels.

Although there is no evidence on whether or not FOP labelling is the best solution in aiding consumers to choose healthier food options, there are some clues that show that FOP labels that are simple and easy to understand can be more successful in supporting healthier food choices (Wartella E. A., Lichtenstein, Yaktine, & Nathan, 2011).

According to Hieke and Taylor (2012) when studies are conducted in laboratories consumers are likely to prefer more detailed nutritional information. But when the study is taken into the actual shopping environment, consumers prefer more simplified, easy-to-use labels. This is mainly because in real environments the consumer has more distractions associated to the process of shopping, like costs and time pressure.

Considering that buying food in restaurants has similar pressure decisions associated with the food choice, the option for a less complex label regarding information content may be easier for consumers to use and to influence their choices.

Wartella et al. (2011), also defined the main features of a FOP label in order to be effective. To design the nutrition label for restaurants those features will be taken into account as well. The label must be:

- Simple and standard: it shouldn't require specific or sophisticated nutrition knowledge
- Interpretive: the nutritional information should be provided as guidance, like a summary symbol, more than as specific and detailed facts;
- Ordinal: the previously referred guidance should be given in a scaled or ranked approach;
- Versatile: it should appear in all elements in the menu to allow comparisons;

- Transparent: the nutritional criteria in which it is based should be publicly available;
- Branded: the label should be identifiable with an easy to remember name or symbols, and supported by communication programs frequently refreshed.

If in the FLABEL consortium (2012) labels were divided by directive, semi-directive and non-directive, in Wartella's et al. (2010) research, FOP labels are divided by **food group information systems**, **summary indicator systems** and **nutrient-specific systems**. Food group information systems are those that distinguish food based on the presence of a particular food group or of ingredients considered to be important (as whole grains). Summary indicator systems, similarly to the directive labels classification, provide summary nutritional information with a symbol or a score and no specific nutrient content information is given. Nutrient-specific systems include both semi-directive and non-directive labels, as it refers to systems that display the amount per serving of selected nutrients. They can also be classified with traffic light colours to indicate that a product contains "high" (red), "medium" (amber) or "low" (green) amounts of a nutrient (Wartella, Lichtenstein, & Boon, 2010). The red colour indicates the *less healthy choice*, the amber the *ok choice* and the green the *healthier choice.*

A study testing the effectiveness of different nutrition labelling formats on front-of-pack in four European countries (Feunekesa, Gortemakera, Willemsa, Liona, & Kommerb, 2008), showed that participants liked the traffic light system the most. But regarding comprehension, it was a point-based system that scored the most. Liking is related with the concept of familiarity (Food Labelling to Advance Better Education for Life, 2012), and the traffic light system has been widely exposed. On the other side, a point-based system allows a faster and more intuitive choice, being more suitable for vulnerable groups (such as older consumers or consumers with lower levels of education and income) that might have some difficulty interpreting nutrition labels. (Feunekesa, Gortemakera, Willemsa, Liona, & Kommerb, 2008).

FLABEL consortium (2012) concluded that the ideal baseline label format provides information on energy and key nutrients (in calories and grams) and is enhanced with a health logo. Although recognizing that focusing solely on risk nutrients does not appear to be sufficient in identifying the healthfulness of certain foods (European Food Information Council, 2012).

While not increasing attention, using GDAs, colour coding and the provision of text *low, medium, high*, associated with the amount of each nutrient, will have an impact on attractiveness and consumer liking. Consequently it may influence consumers to choose healthier food (European Food Information Council, 2012).

Therefore, the label for restaurant menus should consider including both a summary indicator system (or point-based system) and a nutrient-specific system. As referred by Wartella et al. (2010) the first is an easy way for consumers to select foods with higher nutritional quality without having to decode nutrition information, resulting in a simple guidance. The second is a system that provides more complex and detailed information of the nutrient content of a food and its contribution to the daily diet

usually a percentage of Daily Value[25] (%DV) or Guideline Daily Amount[26] (%GDA). This information, as said before, can be associated with traffic light colours. The specificity of the nutrient-specific system allows and facilitates comparison across food categories. The Committee on Examination of Front-of-Package Nutrition Rating Systems and Symbols (Wartella, Lichtenstein, & Boon, 2010) determined for each system its strengths and limitations. The strengths of summary indicator systems are related with the development of specific criteria to food groups and their relative contribution to overall diet; and with the conception of threshold or algorithm based systems that include nutrients considered to be important to public health and as well the nutrient density. To determine the overall nutritional value, it is usual to consider the nutrients which intake should be limited and the nutrients which intake is encouraged. The system's limitations from the consumer's perspective, is related to the lack of information at the point-of purchase about the nutrients that contributed to food's evaluation (Wartella, Lichtenstein, & Boon, 2010).

For nutrient-specific information systems its strengths are related with using one criterion across all food categories, which allows direct comparisons. Most of these systems emphasize as well the nutrients that are particularly relevant to public health problems. Expressing those nutrients in a percentage of Daily Values and categorizing their contribution as "low", "medium" and "high", helps consumers to visualize food's nutritional contribution to their daily diet.

The limitations of this system are related to label clutter, as excessive information can interfere with consumers' capacity in using the information effectively. Another limitation is connected with criteria restrictiveness, as it might exclude foods that are important for a healthy diet (Wartella, Lichtenstein, & Boon, 2010).

4.3 Selecting the nutritional information

What nutrition information to include and what to exclude is a decision that must be sustained in credible and consensual facts. In order to do so, it is important to recall that the object of this research is to create through static infographics, a nutrition label widely understandable by the general population. The label, which is automatically generated by MoveLife's software, can then be added specifically to the menus of mass caterers in order to fight the increasing rates of overweight, obesity and related chronic diseases.

According to WHO Global status report on noncommunicable diseases (2010) these "are the biggest killers today" (World Health Organization;, 2010). Noncommunicable diseases, as said before, include overweight and obesity, which in their turn are responsible for the increasing risk of heart disease, strokes and diabetes.

[25] DVs are reference values to report nutrients in a label. These values were set by Food and Drugs Administration for the US population, and differ from the reference values adopted in the EU.

[26] GDAs are a guide to how many calories and nutrients people can consume each day for a healthy, balanced diet. GDAs are recommended by EU which set a regulation introducing EU Reference Intake values for energy, total fat, saturates, carbohydrates, sugars, protein and salt.

In 2008 around 55% of the European population was overweight from which 22% were obese (World Health Organization;, 2010). Unhealthy diets are one of the major factors that contribute to these high rates. Considering that the main target is the overweight or obese population, it is important to determine which critical nutrients contribute the most to these conditions.

As supported by Wartella et al. (2010), disclosing all nutrients may not be useful, not only because some nutrients are more diet specific (as for athletes), but also because its clutter might suppress the information disclosure on nutrients that are more important for the general population. Within the scope of this dissertation the term general population is related to the European population, therefore it is important to identify the nutrients that contribute the most to overweight, obesity and related chronic diseases in the European context.

According to the WHO data (2010) the consumption of high amounts of high-energy foods, like processed foods that are high in fats and sugars, instigates obesity. The overconsumption of salt is responsible for cardiovascular diseases and raised blood pressure. Saturated fat and trans-fat increase the risk of coronary heart disease and type II diabetes. Therefore, next to energy values, it is important to consider including these nutrients in the nutrition label.

Along with the nutritional information, the EU Regulation 1169/2011 on the provision of food information to consumers (2011) considers it important to notify consumers of the presence of certain ingredients or substances that can cause allergies or intolerances and in some cases cause a danger to the health of people affected by it. In order to improve this communication, the Commission prepared a list that enumerates the substances or products causing allergies or intolerances that need to be declared. This information must be preceded by the word “contains” and it consists of the following substances and products: cereals containing gluten, crustaceans, eggs, fish, peanuts, soybeans, milk (including lactose), nuts, celery, mustard, sesame seeds, sulphur dioxide and sulphites, lupine and molluscs (A more detailed list can be found in Appendix B).

The nutrition label for restaurants should therefore embrace in an organized and attractive way three different types of information: (1) a summary indicator or a point based system scoring the nutritional density of food; (2) a nutrient-specific system focusing on nutrients that are most strongly related with diet-related health risks affecting the general European population; (3) the substances or products that may cause allergies or intolerances.

4.4 Nutritional Criteria and disclosure of substances causing allergies and intolerances

The nutritional criteria for the restaurant’s menu label was defined together with a MoveLife’s nutritionist, and based on the literature review, more specifically on the two phase research taken by Wartella et al. (2010) (2011) and FLABEL (European Food Information Council, 2012). These are both about what should be considered in

order to design a successful FOP symbol system. Most of these critical success factors can be transposed for use with restaurant menus labels.

As previously stated, it has been identified which information a menu's nutrition label should consider including, and which system should deliver that information. However, it is still necessary to set the nutritional criteria in which each system is going to be based.

Nutritional criteria for the summary indicator system

The main feature of a summary indicator system is allowing consumers to get an immediate perception of the food's healthfulness. As previously referred, conveying information in simple formats might be more effective. Therefore simple symbols may help consumers to infer more correctly the healthfulness of a food.

The attribution of stars is commonly related with classifications. Associated with it, it is possible to have restaurant ratings, hotel ratings, military ranks, etc. There is inclusively a FOP system using stars to classify food, the Guiding Stars (figure XX). For their wide acceptance and recognition within the public, stars are going to be used to represent the summary indicator system in the label for restaurant menus.

Figure 4.1 – Guiding Stars nutrition rating system[27]

The criterion of attribution or non-attribution of a star is, as suggested by Wartella et al. (2011) divided in two steps: (1) is the food eligible to earn stars? and (2) if it is eligible, than it is qualified with how many stars?

One of the limitations of summary indicator systems is that it might exclude food that is an important part of a healthy diet. On the contrary, it can give positive scoring to food that in the overall isn't healthy. For example, by attributing stars to a food that has low levels of two nutrients and a high level of another, it can mislead the consumer about the overall healthfulness. A food's global healthfulness is jeopardized if the amount of salt exceeds the recommended values. It is not possible to consider it healthy even if the other nutrients are within the lowest values. To overcome these limitations Wartella et al (2011) recommend excluding a food from earning points (in this context, stars) if one (or more) nutrient (saturated fat, salt and sugar) exceeds a specified limit (see Appendix C). What this translate to is that a food might be ineligible for getting any stars, if a similar situation occurs as demonstrated in the figure:

	LOW	MEDIUM	HIGH	STARS	TOTAL
SAT FAT				X	
SUGAR				(1)	X
SALT				(1)	

Figure 4.2 - Example of a food that is ineligible for getting stars.

[27] Retrieved from: http://guidingstars.com/ [accessed in 01-02-2012]

This example shows that even the sugar and salt qualified for earning a star, the saturated fat amount compromised the total eligibility, as it exceeded the specified amount.

If the food meets the eligibility criteria, than it can earn one or zero stars. To earn a star, the nutrient must be within the low boundaries. If the nutrient is in the medium range, then it doesn't earn a star. Some options are illustrated below:

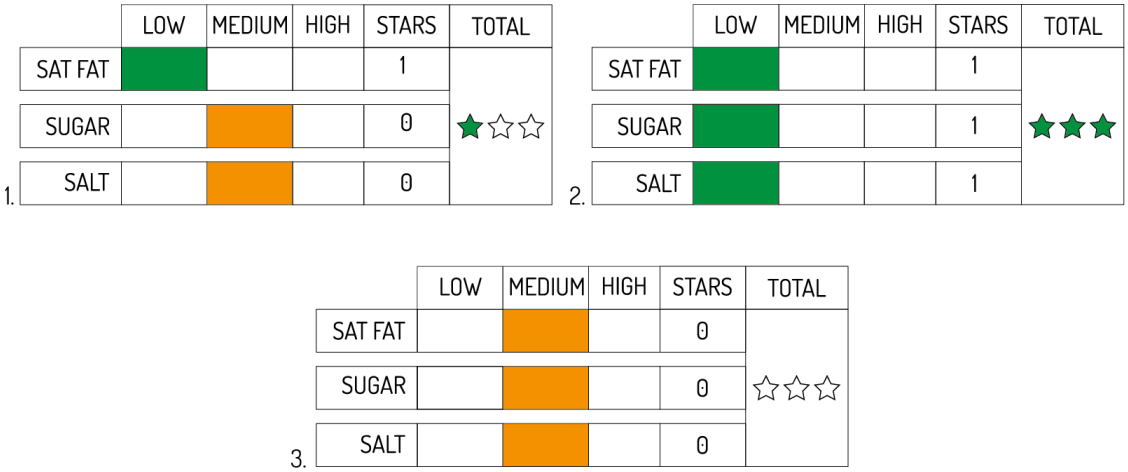

Figure 4.3 – Different options for star qualification or no qualification

In the first option (1), the food just qualified for one star referring to saturated fat, as the remaining sugar and salt were within the medium values. In the second option (2), the food earned three stars, as all three nutrients meet the *low* criteria. In the third (3) option, no stars were attributed as none of the nutrients met the qualifying criteria. Also, there isn't a degree of importance endorsed to each nutrient, as the three are in the origin of overweight, obesity and all the related diseases.

Similarly to Guiding Stars (Pinto, 2009) rating levels, foods with one star have good nutritional value (*ok choice)*, foods with two stars have better nutritional value *(healthy choice)*, and foods with three starts have the best nutritional value *(healthiest choice)*. Food with no starts attributed means *less healthy choice.*

The criteria for the *low (green), medium (amber)* and *high (red)* amounts of a certain nutrient are inherited from the nutrient-specific system, and in particular from the traffic light system, as it is going to be described next.

Nutritional criteria for the nutrient-specific system

Systems that are considered nutrient-specific, as said before, can include both semi-directive and non-directive labels, meaning that either the given nutritional information has associated to it a judgement (usually based on a traffic light colour system) or that simply provides information without any guidance. Based on the previous research, systems that offer some guidance and which are simple and easy to understand can encourage more effectively consumers to choose healthier food (Wartella E. A., Lichtenstein, Yaktine, & Nathan, 2011). Therefore the nutrient-specific system to include in the restaurant menu's label is similar to the traffic light signpost labelling developed by Food Standards Agency (FSA) in the UK. As pointed in the Front-of-pack Traffic light signpost labelling Technical Guidance (Food Standards Agency, 2007) this system incorporates four fundamental elements:

1- Independent information on fat, saturated fat, sugars and salt;

2- Red, amber or green colour coding which quickly allows obtaining information on the level (i.e. whether high, medium, or low) of the individual nutrients in the product;

3- Information on the amounts of nutrients present in a portion of the product; and

4- Colour attribution based on nutritional criteria.

In addition information in calories can be provided as well.

Regarding the second point, and combining it with data collected from the WHO (Global status report on noncommunicable diseases, 2010) and with the study taken by Wartella et al. (2010) the selected information to be disclosed is: total energy, saturated fat, sugars and salt. Both energy and nutrients' amounts are going to be disclosed in %GDAs and in grams (for the average adult and per the dish in its total), as it is the reference intake currently adopted by EU. In practical terms, this means that when the *Chef* is introducing the recipe into the MoveLife's software, he has to indicate the number of persons for whom the recipe is made. Automatically, the software divides the total amounts of the ingredients by the set servings. Say that a recipe is for 4 persons and that a value of 400g of chocolate is introduced. The label that will be present on the menu will indicate 100g of chocolate per dish, as it is the amount that will be served to the consumer.

The energy and nutrient selection is justified by the consistency of recommendations from previous researches about the influence that the overconsumption of these nutrients have in the increasing rates of some noncommunicable diseases. Consequently, saturated fat, sugars and salt are nutrients whose intake should be generally discouraged. On the other hand, the consumption of some carbohydrates (like fibre) and some fat is encouraged, and protein simply isn't a nutrient of public health concern (Wartella, Lichtenstein, & Boon, 2010).

The ratio between the excess of high-energy foods intake over energy expenditure, is one of the main causes of overweight and obesity. That is, most of the obese or

overweight population consumes more energy that what they are able to expend. Informing consumers about the amount of energy (disclosed in calories) present in a food might help consumers to choose healthier food.

The over-consumption of saturated fat increases the risk of coronary heart disease and type II diabetes. But not all fat intake is discouraged. Total fat also includes beneficial mono and polyunsaturated fats, whose consumption is part of a healthy diet (Wartella, Lichtenstein, & Boon, 2010). Many consumers have a negative view of fat in general and tend to avoid foods that show higher amounts of total fat. Nevertheless this is not always the best or healthier option (Wartella, Lichtenstein, & Boon, 2010). Showing just the saturated fat levels may provide a more balanced and desirable behaviour relative to fat.

In Wartella's et al. phase I report (2010) total sugars were excluded from integrating a FOP system because of the lack of consensus about the amount of sugars that can be consumed in a healthy diet. Instead, the committee considered including added sugars since the increase in its consumption is directly related with the increase in total calories. On the other hand, FSA Technical Guidance for Traffic Light system (2007) considers both the total and the added sugar in colour determination. Added sugar in itself might misinform consumers who may need to be concerned with total sugars, such as individuals with diabetes, or trying to control their weight (Wartella, Lichtenstein, & Boon, 2010). Differently from processed foods, added sugars aren't a common ingredient in restaurant recipes. Accordingly, the nutrition label will disclose the total sugars in accordance with the reference daily intake values established in the EU Regulation (EC) 1169/2011 (European Union;, 2011).

There is evidence that excessive salt intake is related with raised blood pressure, which is a major cause of mortality (World Health Organization;, 2010). Data from the WHO (2010) shows that: raised blood pressure is estimated to cause 7.5 million deaths worldwide, about 12.8% of the total of annual deaths; and that if salt consumption is reduced to the recommended level (no more than 6g/day for adult), around 2.5 million deaths could be prevented each year (World Health Organization;, 2010).

In conclusion, the nutritional information to disclose in the nutrient-specific system is: energy (in kcal), saturated fat, sugar and salt.

Criteria for colour attribution

As stated before, colour is essential in differentiation in many different areas. By its contrasts, information can be read and understood more clearly than in its absence. Although there is no major evidence whether colours influence the selection of healthier food, it slightly increased the correctness of the health inferences. (Food Labelling to Advance Better Education for Life, 2012).

The traffic light FOP system was developed by FSA in the UK. Since it's creation, it has been adopted by other European countries, including Portugal, making it widely acknowledged.

As referred in the semiotics context, the traffic light code (in the context of the Traffic Code) is included in the category of code of behaviour: it depends on the knowledge that the members of a community have from the rules by which the code is driven. At the very least, the traffic light code has meaning to those who have a license to drive and to pedestrians who walk across streets with these signalling devices. Therefore, its recognition and efficiency is probably related with the familiarity with the three colour's code.

The major advantage of designing a label for restaurants is based on the existence of a recommended spread of food intake throughout the day. This means that there is a convention on the percentage of GDAs attributed to each meal along the day (values for healthy adults based in Energy GDA = 2000 kcal, as stated by the EU Regulation (European Union;, 2011)). While the FSA's traffic light colour attribution regards the amounts of nutrients present in the recommended portion of the product, the proposed label is specifically addressed to the dish that is served to the consumer.

The green, amber and red (low, medium, high) limits are in accordance with the European Regulation (EC) No 1169/2011 on the provision of food information to consumers (European Union;, 2011) and the recommendations about the spread of food intake throughout the day. In Appendix C it is possible to find in detail the criteria in which the colour code is determined. For a more general comprehension, the colour attribution is as followed:

	LOW ≤15%	MEDIUM >15% AND ≤30%	HIGH >30%
SAT FAT	≤ 3g	> 3g AND ≤ 6g	> 6g
SUGAR	≤ 13,5g	> 13,5g AND ≤ 27g	> 27g
SALT	≤ 0,9g	> 0,9g AND ≤ 1,8g	> 1,8g

Figure 4.4 – Individual criteria for colour attribution

- Green colour is attributed if the nutrient amount per dish is equal or lower to 15% of the GDAs;
- Amber colour is given if the nutrient amount per dish is higher than 15% and equal or lower to 30% of the GDAs; and
- Red colour is attributed if the nutrient amount per dish is higher than 30% of the GDAs.

The colour attribution is related with the search of equilibrium. It is intended to help consumers to achieve balance in their meals and not to classify foods as good, average or bad. The 30% value refers to the recommended percentage of GDAs for a lunch or a dinner. For example, if someone is considering having a three-course meal (with a starter, a main course and a dessert), it is recommended to choose foods where the green prevails (or that has more stars) in order to, in its total, not exceed the

recommended 30%. In the case that the meal is composed solely by the main course, it is acceptable to choose foods within the green and amber boundaries. Foods with red nutrients aren't recommended because they compromise the overall healthfulness of the food and the desired dietary equilibrium.

In conclusion, the colour indication aim is helping consumers in balancing the contribution of each meal's element within the total meal.

To operate as guideline, for the adult general population the EU considers 2000kcal as the recommended daily intake (European Union;, 2011), and according to the 30% previously referred, a lunch or dinner energy intake shouldn't exceed the recommended 600kcal. However, the non-inclusion of energy in the traffic light system, is related with the fact that its GDA can be very variable according to the individual's physical activity. For example, someone with a sedentary life doesn't need the same amount o energy as someone who has an active life.

In conclusion, the traffic light system allows the consumer to understand that a healthier diet comprises more nutrients labelled as green, and less of the other two.

A system for organizing substances / products causing allergies and intolerances

A food allergy is a specific type of adverse reaction of the body's immune system to specific proteins in a food and can be life threatening (Food and Drugs Administration, 2013). People with food intolerances, unlike food allergies, generally need to eat a bigger portion of food to have symptoms of food intolerance. The source of the intolerance is likely to be in the gastrointestinal system and is normally originated by an inability to digest or absorb certain foods, or components of those foods (Food and Drugs Administration, 2013).

Because food allergies are in the domain of public health concern, the EU provided that the presence of certain ingredients or substances that can cause allergies and intolerances must be disclosed. It applies both to pre-packaged food and to foods "offered for sale to the final consumer or to mass caterers without prepackaging, or where foods are packed on the sales premises at the consumer's request or prepacked for direct sale" (European Union;, 2011, p. L 304/38). The only exception is in cases where the name of the food has a clear reference to the substance or product concerned (i.e. steak with *mustard* sauce).

As previously referred, the products or substances that may cause allergies or intolerances are: cereals containing gluten, crustaceans, eggs, fish, peanuts, soybeans, milk (including lactose), nuts, celery, mustard, sesame seeds, sulphur dioxide and sulphites, lupine and molluscs.

It is possible to consider that this information can be simply disclosed through text. But it is more challenging to think of a broadcast signifying code to represent it.

Taking into account the second option and in order to facilitate the process of designing the nutrition label, it was necessary to find a method to organize these products and substances in a logical and meaningful way. This organization, if applied consistently across all menu items, could potentially help consumers to identify almost at a glance the products and substances present in that particular food. While it wasn't easy at first to find a criteria to organize them, the website www.allergen.org (relative to allergen nomenclature) contributed positively to this challenge with the idea of grouping the allergens and substances causing intolerances by taxonomic group. That is, the systems of classification in which species are organized (Natural History Museum, 2013). Therefore, the classification and organization resulted in the following scheme:

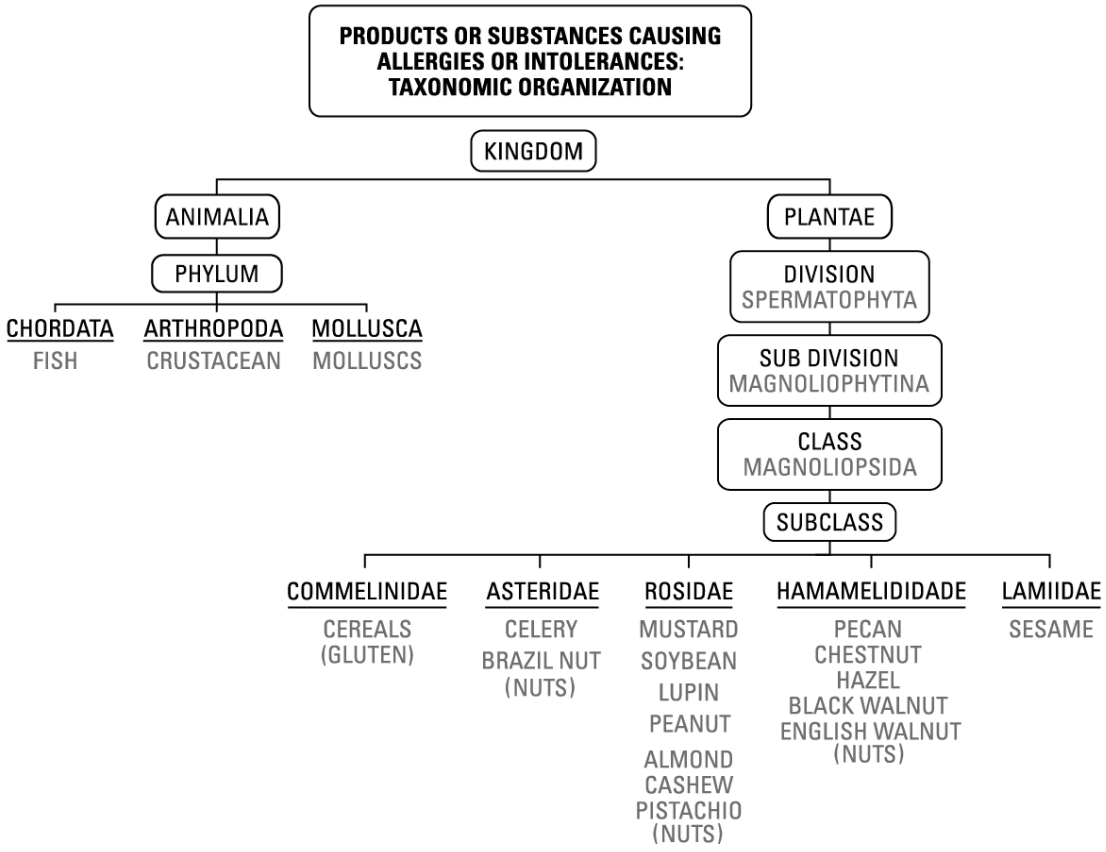

Figure 4.5 – Organization of products or substances causing allergies and intolerances by taxonomic group

Excluded from the taxonomic organization are eggs, milk, sulphur dioxide and sulphites. The first two can be grouped as animal products and therefore positioned next to the *animalia* kingdom, and the second considered individually.

Conclusions

Over the previous sub-chapter it was defined that restaurant menu's nutrition label should include:

- A summary indicator or a point (star) based system scoring the nutritional value of food;
- A nutrient-specific system, similar to the Traffic Light FOP label, disclosing information per dish on: (1) energy, and (2) saturated fat, sugars and salt in grams and the correspondent contribution in percentage to the GDAs (nutrients strongly related with diet-related health risks in European population); and
- Information about the substances or products that may cause allergies or intolerances.

4.5 A model of a restaurant's menu nutrition labelling system

Probably, the biggest challenge in this dissertation is how to provide useful information to consumers in an appealing way while having in consideration the difficulty that restaurants might have in inserting the labels on their menus.

Turning information more pleasing without losing efficiency and still having to communicate, is a challenge that the discipline of infographics faces on a daily basis. Otto Neurath, for example, felt like icons could be an effective way to convey information, since different classes and nationalities could understand it. He relied in the objectivity of vision rather than the interpretation mediated through culture.

At first sight, it seems that the use of ISOTYPE could have solved most of the linguistic problems that people have when travelling in different countries and cultures.

However, as held by Lupton (1986) a sign/ pictogram "functions by connecting with the culturally bound expectations of people using it" (Lupton, 1986, p. 51).

In the semiotics context, it may be plausible to consider that the ISOTYPE belongs to the arbitrary codes group. As said before, because they are symbolic and impersonal, these codes can be clearly understood by any culture's member. The difficulty lies in that people must decide to learn it. And probably, it is before making the decision of learning the code that might emerge all the different connotations.

One example from nowadays is the study taken by McDonalds (Hoffman, s.d.) in order to find out if the icons designed to represent the nutritional information on their packages worked efficiently all over the world. McDonalds' goal was to achieve a universal visual language, where it was possible to be understood worldwide. But it turned out to be a collection of symbols that, without judging its design features, wasn't able to evoke the same interpretation results across the world.

Therefore, it seems wise to recognize that an icon, without being learned or without relying in some sort of *anchorage,* as seen in the second chapter, can hardly have the exact same meaning across all cultures.

The design and content of the nutrition label for restaurant menus, will be primarily concerned with its efficiency in the European context. And even in Europe, there is a risk that the final result might suggest other interpretations and meanings. This test isn't within the scope of this dissertation, but it will be considered in the near future.

The label in itself has to work as a group but it has to be flexible enough to allow adding or taking information. For that reason, the label can assume the following configurations:

- **Standard Label**: includes the summary indicator, the energy amount, the nutrient-specific system and the substances or products causing allergies or intolerances;
- **Summary Label**: includes the summary indicator, the energy amount, and the substances or products causing allergies or intolerances;
- **Plain label**: includes the substances or products causing allergies or intolerances.

The use of the standard label is recommended since it provides more consistent and useful information to consumers, and specifically addresses the noncommunicable diseases with major impact in the population's health.

Visually, it is important that the label works as a whole. However, considering that it is possible to have three different combinations, it is important that the design is flexible enough to be re-arranged, almost like Lego pieces or the letters in an alphabet.

Both the star rating system and the traffic light system might look familiar for most consumers (the last one probably is more recognized than the first within the European context) nevertheless they are usually related with pre-packed food. Transposing these visuals plus the information about the substances causing allergies and intolerances to restaurant menus, requires the consideration of some adjustments:

- Restaurant menus have reduced space. As they generally work as lists, it is necessary to predict where the label can be introduced. Another solution to consider is to have a second menu attached to the main menu, providing all the nutritional and allergen / substances causing intolerances' information. Restaurant owners would probably be less sceptical about this second format;
- Menus are normally home-printed or getting printed in small print shops. Consequently, it is important to ensure that (1) the colours aren't too similar, or in a average quality printing they won't be distinguished, (2) labels have to work efficiently in black and white printing and (3) the label has to be clear and simple because details do get lost in small sized prints and will work as visual noise.

A visual representation of the summary rating system

The fact that stars are icons commonly associated with classifications was the main reason for its selection to represent the overall healthfulness of a food.

The eligibility criterion for a nutrient to qualify for a star depends on all nutrients being in the limits of green and amber colour attribution. Meaning that if a nutrient is red (high) and even if the other two are green (low) the food isn't eligible for getting a star. Graphically it results in the following image:

Figure 4.6 – Visual representation of a food that was ineligible for qualifying for stars.

If considered eligible, a food getting or not getting a star depends on whether a nutrient is within the boundaries of *low* values or not. The direct inference is if green colour is attributed to a nutrient it receives a star. On the other side, if the nutrient amounts are in the *medium* range, it doesn't earn a star. And this star absence is important to be noticed. As the relation between *earning a star* and *green* is direct, the earned stars will be green. To the nutrients that do not qualify to earn a star, the star's shape won't be filled with green, giving emphasis to its absence.

Figure 4.7 – Visual representation from the star-rating system

A visual representation of the nutrient-specific system

The FLABEL's study (European Food Information Council, 2012) showed that the GDA traffic light system scored highest in the various measures of liking. The positive result is related with previous exposure: people preferred the label they have seen before, or that it was used in their particular market (Food Labelling to Advance Better Education for Life, 2012). The GDA traffic light system is particularly abundant in the European market. Below it is possible to preview some of the different designs using the traffic light colour code to measure food's healthfulness:

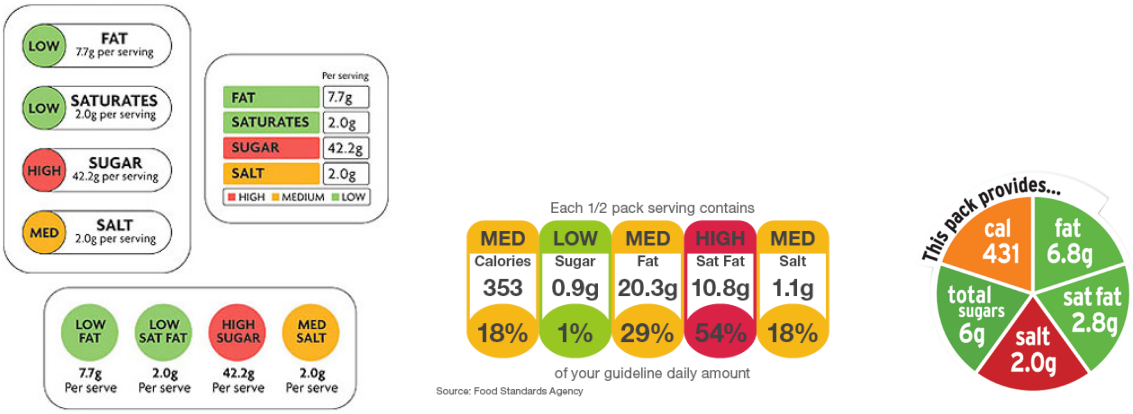

Figure 4.8 – Different approaches of FSA's traffic light system[28]

As it is possible to see, the format in which the traffic light system is shaped in can vary from manufacturer to manufacturer. What is consistent is the criterion in which they are based. The object of the label resulting from this research is different from the ones above: its aim is to inform consumers about the nutritional values of food in restaurants per individual dish. Consequently, and as stated before, it is mandatory to consider how the system will work in a menu format.

Wartella's et al. study (2011) defends the importance of integration between the nutrient-specific information and the summary information. In that way consumers are able to understand which nutrient contributed positively for getting a star and which did not. Therefore, it is necessary to predict within the nutrient specific label a space for inserting, or not, a star. The *green, amber* and *red* colours are in accordance with the FSA's Technical Guidance (Food Standards Agency;, 2007) for the traffic light labelling. In order to ensure a good colour contrast between colour and text, the chosen pantones are: Green- Pantone 143, CMYK specifications: C 53, M 0, Y 85, K 0; Amber: Pantone 143, CMYK specifications: C 0, M 40, Y 99, K 0; and Red: Pantone 1788, CMYK specifications: C 0, M 90, Y 75, K 0. (Food Standards Agency;, 2007)

[28] Retrieved from: www.food.gov.uk [accessed in: 25-04-2013]

Figure 4.9 – Colour specification for green, amber and red according to FSA

The first attempt in developing the nutrient specific indicator resulted as represented below[29]:

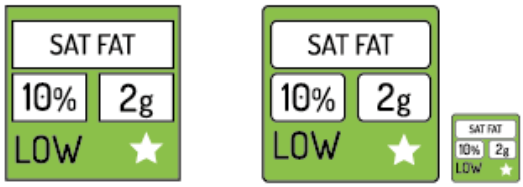

Figure 4.10 – Test 1 regarding the nutrient-specific individual indicators

The option for using a square is related with the flexibility the shape has in being combined. Like Lego blocks, squares can be pilled up or set side-by-side and still give the idea of group. The use of rounded corners creates a friendlier looking shape, as it is possible to compare in the image above.
By its good legibility and its coherence with MoveLife's software, the family font used is Dosis, designed by Impallari Type (http://www.impallari.com/) under the license SIL Open Font License, Version 1.1.[30]

The main problem of this first version is that, when scaled down, the lack of hierarchy in the information compromised its general visibility, especially in the case of the %GDAs and grams. Accordingly, it was necessary to emphasize either %GDAs or grams. The option was to highlight the %GDAs because it provides more intuitive information: it is not necessary to know the actual reference daily intake in grams to understand that a particular food contributed with 10% of the recommended daily amount for saturated fat. But placing grams as second level's information automatically raised the question where to insert the *low* information without cluttering the label. The assumption that most of people know that *green* stands for good, or healthy or, in the traffic context, to advance, sustained the decision to eliminate the word *low* (or *medium* and *high)* from the label. Apparently, excluding these words, could potentially compromise the label's efficiency in black and white

[29] The nutritional values of each nutrient and energy on the developed graphic tests are not accurate. Some values were radomly attributed.

[30] In order to stimulate worlwide development of collaborative font projects, the Open Font License (OFL) allows the licensed font to be used, studied, modified and redistributed freely as long as they are not sold by themselves. Font Squirrel. (2013). *SIL OFL Font License Dosis*. Retrieved in 25-05- 2012, from Font Squirrel: http://www.fontsquirrel.com/fonts/terminal-dosis

printing. By eliminating both the colour and *low* (medium or high) references, consumers could find it hard to infer food's healthfulness. However, because the star attribution is directly related with green colour, if a specific nutrient as associated to it a star, it means that it is within the green (low) boundaries.

As it is possible to see, the information is now more visible in even in small scales.

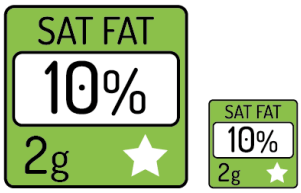

Figure 4.11 –Test 2 regarding regarding the nutrient-specific individual indicators

At this point, the group of the three nutrients look like this:

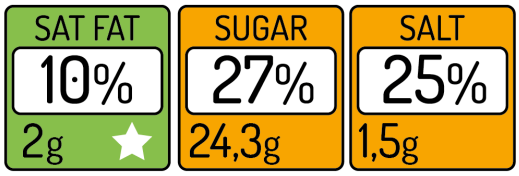

Figure 4.12 - Group of the three nutrients from test 2 in green and amber

It is important to emphasize that the absence of a star in the nutrients in amber colour is due to the summary-indicator system's criteria of qualification for a star. In this case, the summary indicator would be similar to the figure 4.7. For the same reason, if a dish doesn't meet the eligibility criteria, it can look like as follows and the correspondent summary indicator is similar to figure 4.6:

Figure 4.13 – Group of the three nutrients from test 2 in green and red.

In this case it is important to notice that even if saturated fat and sugar qualified for a star, the salt compromised the food's eligibility for earning stars. Visually, the stars in the green (low) nutrients are represented inside parentheses. Meaning that the nutrient would contribute with a star to the overall foods evaluation, if there wasn't a nutrient to exclude the food from earning stars.

Representing visually substances / products causing allergies and intolerances

For representing the products or substance causing allergies and intolerances there are two approaches to consider: (1) to disclose the information textually; and (2) to disclose the information within its visual representation.

For the first option, its strength is related with the low chances of inducing undesired meanings. The limitation is connected with using of a specific language, which may cause difficulty to foreign consumers.

Regarding the second option, its strength is related with the ability that the code may have in becoming acknowledged across different cultures. The limitation is that it might evoke undesired interpretations and as consequence mislead the consumer.

Since the first hypothesis does not need a dedicated study, the following research is only about the second hypothesis.

From the fourteen products or substances causing allergies and intolerances there are a few that are more commonly illustrated, like gluten, peanuts and milk. As for the others, they are more often disclosed only as text.

Analysing the results obtained from MacDonald's research (Hoffman, s.d.) on their icons' efficiency across the world, it is possible to infer that iconic language, depending on the culture, can evoke different and undesirable meanings. Nevertheless, from its common use, the male and female icons used to indicate which washroom an individual should use the bathroom have the ability to suggest the same meaning in most cultures. Also it is possible to argue that nowadays there is a massive amount of icons, which might increase the difficulty in learning their individual meaning. For example in a computer or cell phone interface there are plenty of icons to learn, therefore they are usually attached with a textual description of their individual function (figure 4.15).

Figure 4.14 – Icon from Mac OS X Mountain Lion[31]

However, as said by Lupton (1986) "as with other cryptic messages, once the rationale behind a sign has been unlocked, it becomes memorable" (Lupton, 1986, p. 51).

[31] Screenshot of icon developed by Apple for Mac OS X Mountain Lion

If icons are the intuitive choice for representing the substances causing allergies and intolerances, when grouping the substances within their taxonomic group, the idea arose of using the visual reference of the periodic table of elements.

The periodic table of chemical elements was developed in 1869 by the Russian chemist Dmitri Mendeleev and displays in tabular form the chemical elements.

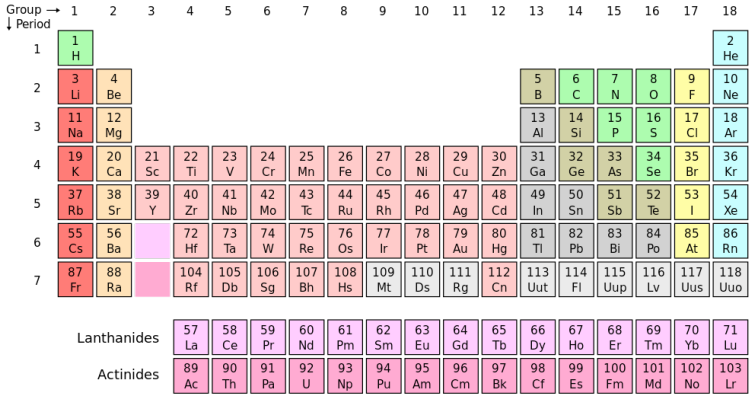

Figure 4.15 – Periodic Table of Elements (from Wikipedia)

This is a strong example of a code that to be understood must first be learned. The option of learning it, or the need of learning it, often comes associated with chemistry classes where this information is central in understanding the element's behaviour. At first sight the fact that the elements are named after their Latin names might seem an obstacle for those whose language isn't based in Latin roots. But, the periodic table of elements has achieved the status "of the most powerful icons in science (…). One sees periodic tables everywhere: in industrial labs, workshops, academic labs, and of course, lecture halls" (Scerri, 2007, p. 3).

As a result it seems that getting the advantage of the periodic table's widely recognized visuals and type of organization, can be an effective way to communicate the substances and products causing allergies and intolerances.

At the same time it is not wise to discard the icons, as they may have more acceptance with the consumer.

Since the testing of which type of system is more efficient and likable is out of the scope of this dissertation, both options (icons and periodic table based) plus simple textual disclosure will be considered in the label's development.

Representation of products / substances causing allergies and intolerances: icons

Developing icons to represent the products or substances causing allergies is a task that involves some issues. The major difficulty is to think of icons to represent substances that usually aren't recognized in their natural form (i.e. mustard and soybeans). Another concern is related with the attribution of a colour to each taxonomic group. Despite belonging to the same subclass, if the colour that is immediately associated with peanut is brown, it is not possible to say the same for lupin. Therefore different colours are considered for each *phylum* (relative to the

animalia kingdom) and for each subclass (relative do *plantae* kingdom). For animal products and sulphur dioxide and sulphites the colours are attributed individually.

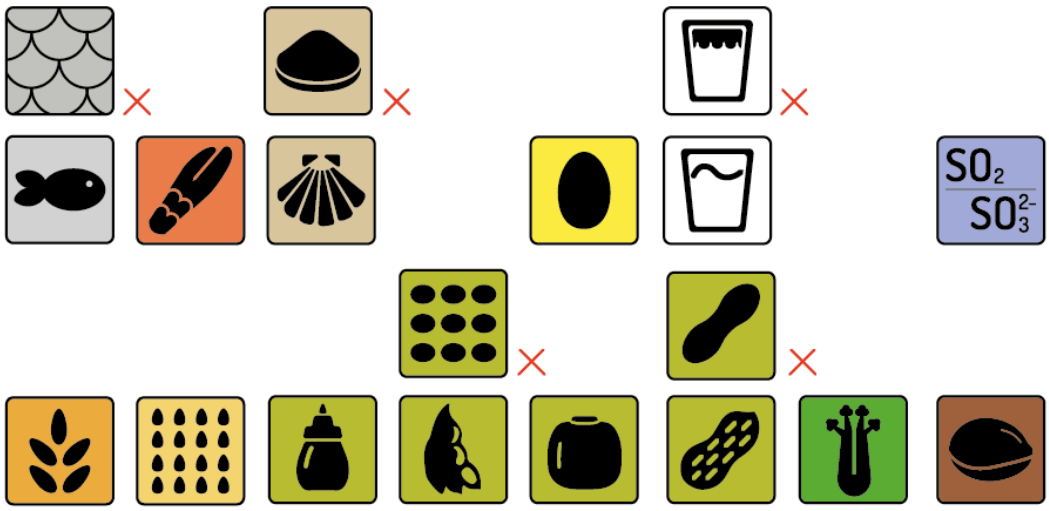

Figure 4.16 – Colour attribution and tests in the iconic representation of substances causing allergies or intolerances.

The image above shows the colour selection and part of the process of eliminating icons in favour of others. On the first row, from left to right the icons stand for: fish, crustacean, mollusc, egg, milk, dioxide sulphur and sulphites. On the second row: gluten, sesame seeds, mustard, soybeans, lupin, peanut, celery and nuts.

For the *animalia* kingdom the chromatic choices aim to represent literally the prevalent colour in each *phylum*. The animal product's colour is as well a literal approach. The dioxide sulphur gas and sulphites is lilac. The *plantae* kingdom has earth-related tones for each subclass.

As for the icons some were eliminated since they didn't share the same features with the others (i.e. the fish, milk and peanut signs). In this light, it can be argued as well that the dioxide sulphur and sulphites sign and mustard sign don't share the same characteristics. However the first is also the only icon that stands for something intangible as gas but which has an established representation of it. The second is one of the cases whose natural form is barely recognized, but its bottled version is widely known. As for the molluscs, scallop silhouette is more obvious and more recognizable than the clam shape.

It is predictable that some icons may cause more misinterpretations than others. Even after getting tested within the market and improved in the light of consumers' opinion, the icons will always have to be anchored with captions in order to avoid misinterpretations.

Representation of products / substances causing allergies and intolerances: symbols

Having the organization and the colour determined, for creating signs similar to the elements in the periodic table it is necessary to establish an abbreviation for each product or substances causing allergies. It is important to notice that these abbreviations are language specific. To make it coherent, for the most of cases it is going to be used the first two letters of each substance.

Exceptions open: (1) to sulphur dioxide and sulphites sign (that is getting its chemical designation); (2) to substances whose name is formed by two words, a letter is chosen from each word (i.e. sesame seeds = SS); and (3) substances whose name is immediately recognized if using three letters (i.e. egg or soy). As a result the abbreviation's list relative to the English language is:

- Fish: FI;
- Crustaceans: CR;
- Molluscs: MO;
- Eggs: EGG;
- Milk: MI;
- Sulphur dioxide and sulphites: SO_2 / SO_3^{2-}
- Gluten: GL;
- Sesame Seeds: SS;
- Mustard: MU;
- Soybeans: SOY;
- Lupine: LU;
- Peanut: PE;
- Celery: CE;
- Nuts: NUT;

In the appendix D it is possible to find the Portuguese version.

The graphic representation of this organization can be similar to the figure below:

Figure 4.17 – Possible graphic representation of the substances causing allergies and intolerances, based on the periodic table.

The strength of this interpretation is mostly related with the use of the alphabet. While the icons may be more conducive in evoking different meanings, the use of letters directly related with the substance's name in the mother language, might achieve better results in interpretation.

Conclusions

The strengths of both approaches are mostly related with the combination of icons or language with colour and positioning. For example, if the system was established both in the UK and in Portugal, that would mean that a non-Portuguese speaker, who is familiar with the system in English, would be able to infer the allergens that a food contained only by their colour and positioning within the group.

In the case of the label being printed in black and white, the system with icons can be more effective. In the abbreviation system this same person would have to rely solely on the sign's positioning.

In both visual systems, the information about the substances and products causing allergies and intolerances is given by the presence or absence of an icon. If a food has eggs, the icon of eggs appears visible. But if that same food doesn't have milk, the only thing visible related to milk is the empty space within the system's organization.

Both systems can be included in the semiotics' category of signifying codes. They are systems of signs with a number of units with shared features and they convey meaning. Whether they can achieve the category of broadcast codes, it depends on the consumers liking. The test on consumer's preferences, which as previously referred is out of the scope of this dissertation, is going to be decisive on what system to integrate in the restaurant menus.

After being learned it is expected that one system (icon-based) or the other (periodic table based), is going to be able to communicate without the aid of captions. The main question is what system will consumers prefer to use?

Composing the standard nutrition label

At this point it is defined already the overall graphic decisions related with each individual element that compose the standard label. Now it is time to group all elements and make it work as a whole. Summarizing (figure 4.19), the label for restaurant menus is formed by: the summary indicator, the amount of energy, the nutrient-specific traffic light colour system and the products or substances causing allergies and intolerances.

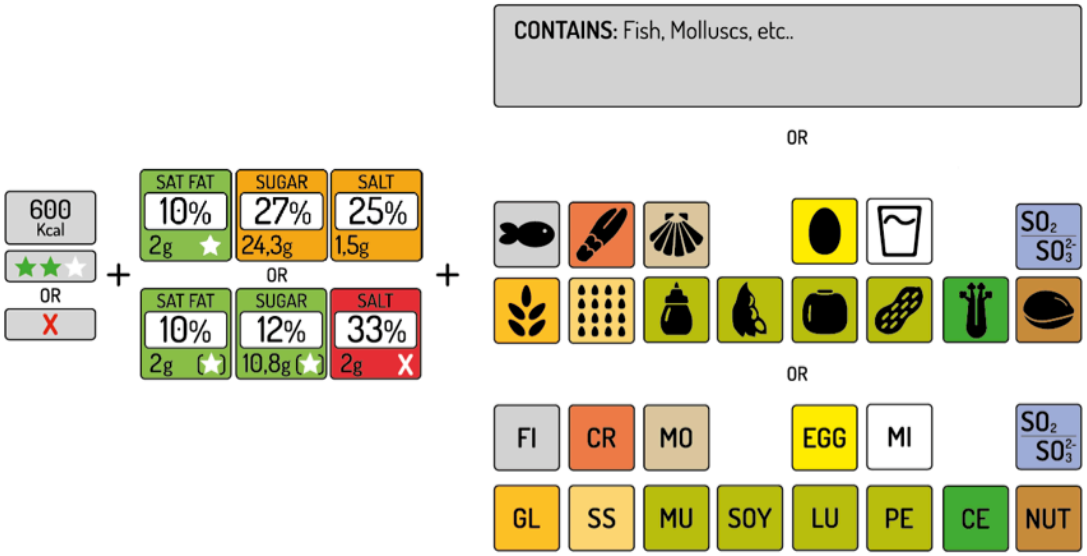

Figure 4.18 – The different elements possible conjugations

Assembling the different elements in a horizontal and a more vertical group resulted in the following configurations:

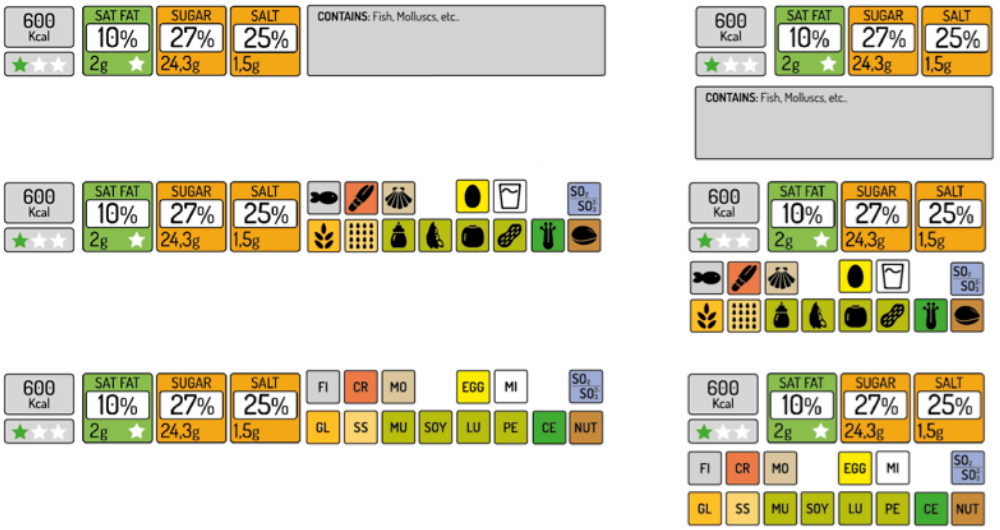

Figure 4.19 – First test on vertical and horizontal arrangements

The global assessment is that the black outline and the icon's black filling might be too imposing and edgy. In special the combination of black and yellow in the egg icon, can be regarded as a danger symbol.

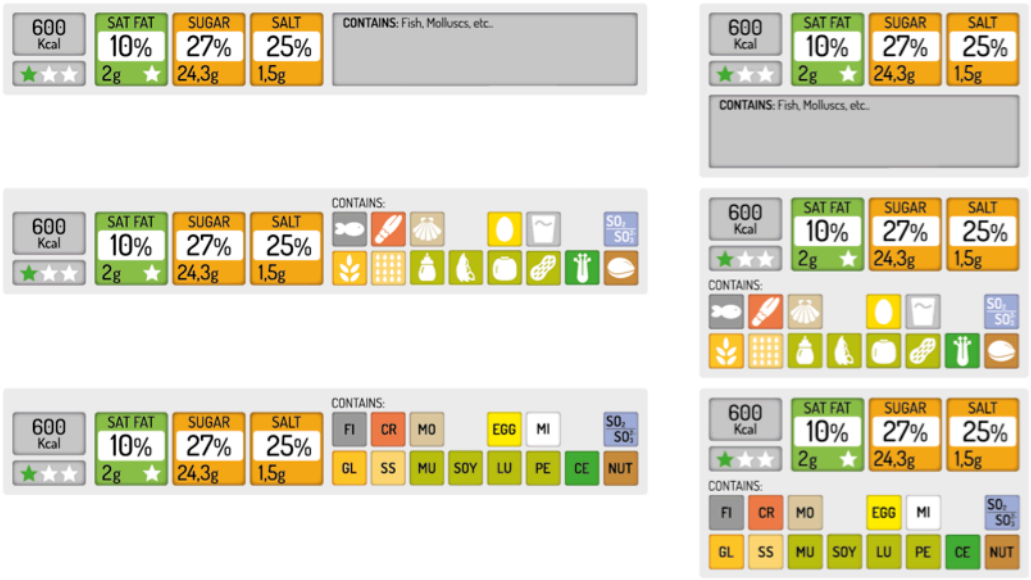

Figure 4.20 – Vertical and horizontal arrangements after general lightning of elements

In this figure is it possible to perceive an increase in the lightness of the label. All the outlines were taken, but at the same time a light grey background was added to help group the different elements. The colour's Pantone and CMYK composition, among other important design features, will be compiled in a guideline manual.

Now that the colour tones for the icons are set, it is important to show how the substances and products causing allergies and intolerances present in a recipe appear.

When the icon is visible it means that the food contains that substance. On the contrary, when the icon is invisible, it means that the food is free of that substance. It is important to notice that the space of the invisible substances (which the food doesn't contain) is kept in order to provide guidance for the remaining icons. In this figure the name of the dish was also added, positioned above the horizontal version of the label. Possibly, this is the best solution to join the dish's name with the nutritional and allergens information.

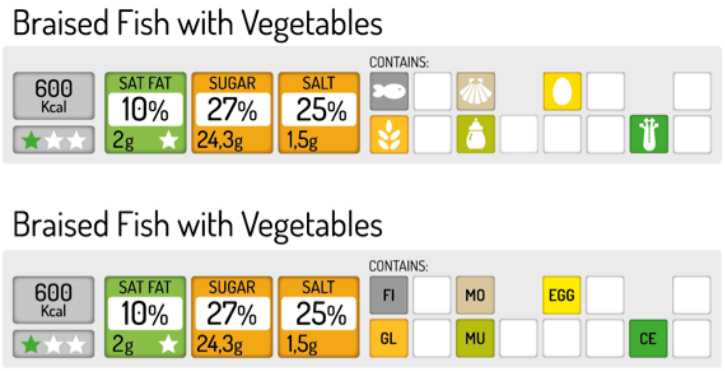

Figure 4.21 – Possible example of association with the dish's name

Next, there is an example of the label's behaviour in grey scale and another in black and white high contrast versions.

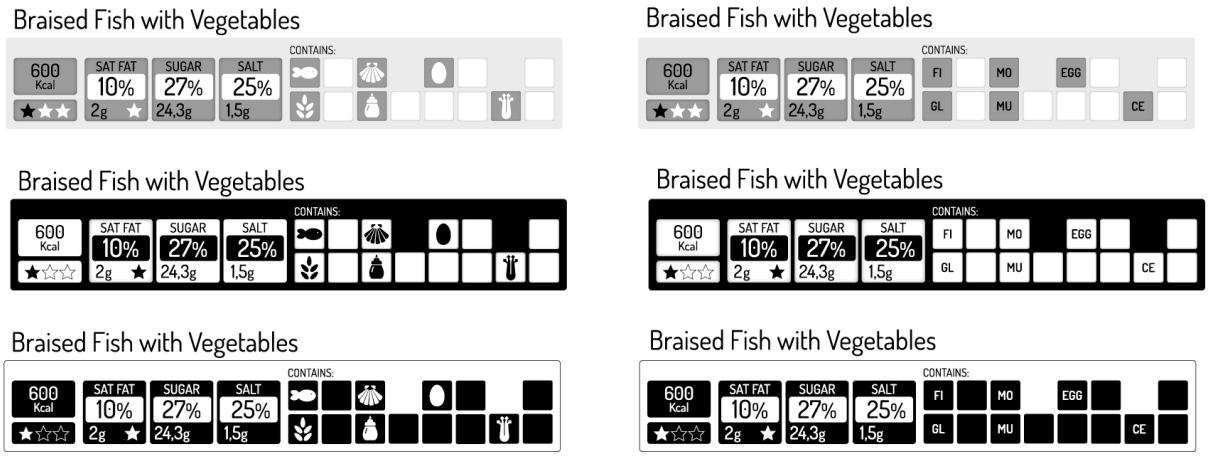

Figure 4.22 – Grey scale and high contrast versions

Despite not being the recommended labels, the next figures show the summary label (figure 4.24) and the plain label (figure 4.25):

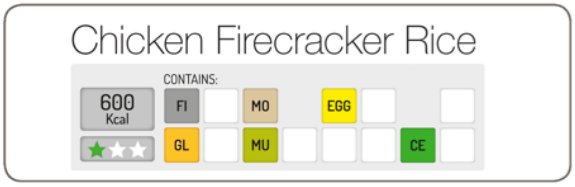

Figure 4.23 – Summary label

Figure 4.24 – Simple label

Since menus are the objects providing the major contact with the nutrition labels, in the next figure it is shown a possible configuration of a restaurant's menu, disclosing the nutritional information for each dish:

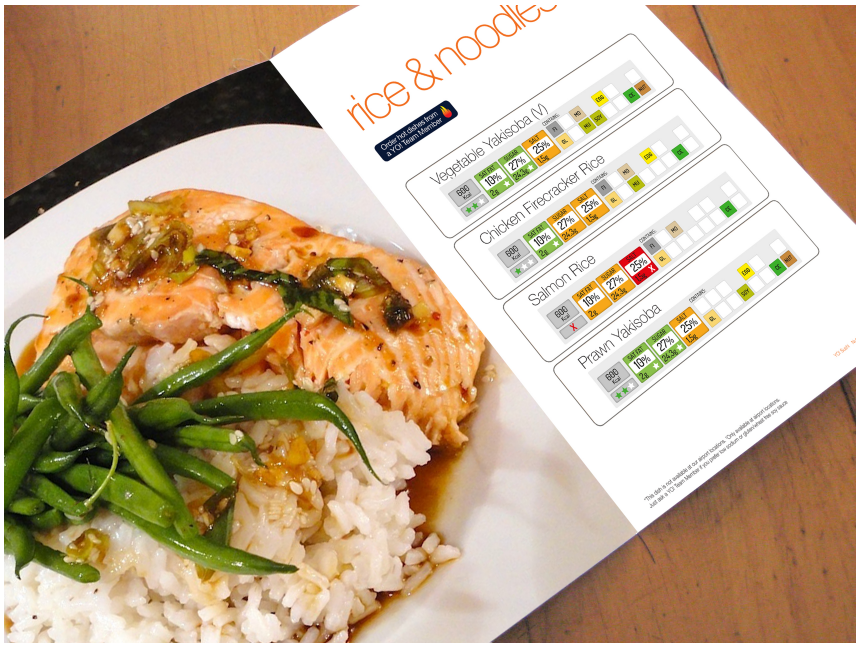

Figure 4.25 – Simulation of a menu using the developed labels

4.6 Conclusion

The process of designing a nutrition label for restaurant menus involved:

- (1) Developing nutrient criteria: selecting the nutrients and other components to incorporate, and the foundation for setting the criteria for each element;
- (2) Developing graphic representations for the different elements set in the previous point;

The set nutrient criteria are mostly based on previous researches' findings. The major update from the existing information about nutritional disclosure is its adaptation to the restaurant context. Along with the organization of substances causing allergies and intolerances by taxonomic group may increase the potential of success of the developed symbolic language.

The restaurant menu's label integrates the traffic light system with a star-based summary indicator, providing both nutrient-specific information and an overall

evaluation based on the *low (green), medium (amber)* and *high (red)* values of the individual nutrients in a dish. The star-based summary indicator helps consumers to understand the dish's overall healthfulness.

Regarding the prototype design, it was import to establish a coherent language in order to provide a sense of group. The consistency was based in the shape (rounded-corner square) and in the selected range of colours.

The next step, but out of the scope of this dissertation, is to test the prototype format within the market and consumers in order to improve its performance.

5 Conclusions from the developed research and future work

The reason for developing a system for disclosing nutritional information in restaurant's menus was at first related to a challenged extended from MoveLife. However, after conducting some quick research on the subject, it was possible to foresee the potential of the subject: integrating graphic design with science, health, consumer behaviour and technology. All these components seemed more than a common challenge.

Transmitting a message through graphic design outputs can be a complex task. Its success is directly related to the accuracy of the interpretations it evokes within a culture. Infographics, rely on visual representations of data to inform by telling a story. Otto Neurath's ISOTYPE was a pioneer in representing visual data that could contribute positively to a population's education. By creating a logical system of signs representing different elements from daily life, Neurath was able to transmit even the most intangible data.

Similarly, educating the population for healthier eating habits and chefs for improving the overall healthfulness of their recipes, the necessity arose to design a system which was able to inform consumers of the nutritional value of their food. The need for a nutrition label in restaurants is mostly connected to the increasing habit of eating out of home and the consequent increasing rates of overweight and obesity among the population.

Since overweight, obesity and the associated chronic conditions such as cardiovascular disease, hypertension, type II diabetes, stroke and certain types of cancer are noncommunicable diseases and they are a major concern to health organizations and governments, there was a collective effort to set regulations on the provision of nutritional information to consumers. The EU Regulation (EC) 1169/2011 amended previous regulations in order to improve the consumer's protection relatively to food nutritional disclosure. Affecting directly mass caterers is the requirement to make available information on the food's content on products or substances causing allergies or intolerances. Therefore it was also necessary to consider that, along with the nutritional content of a food, the nutrition label for restaurants had to include the information on the allergens or products causing intolerances.

FOP labels, or the systems designed to help consumers in making healthier options relative to packed foods, were considered the main references for the literature review and case studies' selection. This decision had to do with the lack of researches about what should be the ideal format to disclose nutritional information in the restaurant context. Besides, since the label is to be inserted in a menu, the similar lack of space both on a package and a menu made this option even more valid.

An effective nutrition label should be:

- Simple and standard: it shouldn't require specific or sophisticated nutrition knowledge

- Interpretive: the nutritional information should be provided as guidance, like a summary symbol, more than as specific and detailed facts;
- Ordinal: the previously referred guidance should be given in a scaled or ranked approach;
- Versatile: it should appear in all elements in the menu to allow comparisons;
- Transparent: the nutritional criteria in which it is based should be publicly available;
- Branded: the label should be identifiable with an easy to remember name or symbols, and supported by communication programs frequently refreshed.

There isn't yet sufficient evidence on whether the information provided by FOP labels encourage healthier food choices, and in particular if the individual isn't motivated to do so. This confirms that education towards healthier eating may increase the personal motivation to search for healthier food.

Another factor that might increase a label's efficiency is the disclosure of the nutrients that are most strongly related with the noncommunicable diseases previously referred. This not only avoids cluttering the label, which may decrease its effectiveness, but as well addresses the nutrients of largest concern. Therefore, the selected information to disclose in restaurants' menu labels is: energy (in calories), saturated fat, sugar and salt. The exclusion of total fat is related to the common misconception that all fat is bad, resulting in an avoidance of food that is an important part of a healthy diet. By excluding it from the label, it might prevent this behaviour.

The evidence reviewed showed that a nutrient specific system together with a summary rating system works more effectively. Consequently, to the individual information on each nutrient, a summary rating system was added. To both elements was also added the information on the substances causing allergies and intolerances (standard label).

However there is the option that the label is formed only by the summary rating system together with the energy amount and substances causing allergies and intolerances (summary label); or solely by the substances causing allergies and intolerances (plain label). Nevertheless, it is recommended the use of the standard label since it provides more detailed information on the food's nutritional profile.

Summarizing, the ideal label (standard label) for restaurant menus includes a summary rating system, a specific system on energy and the nutrients saturated fat, sugar and salt and the list of allergens and products causing intolerances.

Selecting the criteria in which each system was to be based required much literature review and the expertise from MoveLife's nutritionist.

It was set that the summary rating system was going to be translated into a star-type classification. The established eligibility criteria were based in the individual healthfulness of nutrients. If a nutrient exceeds a certain percentage from the recommended daily intake, it compromises the food eligibility for getting stars. But if

all nutrients are within the boundaries of low and medium criteria (value relative to the contribution to the recommended daily intake), then the food might qualify for stars. The attribution of a star depends exclusively on whether a nutrient is within the *low* limits or not.

Across different case study's reading, a consensus was reached that the traffic light labelling system, despite not increasing significantly the use of a label, it aids consumer's perception on the overall food health inference and increases attractiveness and liking.

Since the traffic light label developed by FSA is widely acknowledge in the European context, it seemed wise to adapt the system to the restaurant context. The same colours (green, amber and red) and respective meanings (low, medium, high) were kept. Nevertheless, while FSA's traffic light label considers the amount of nutrients per 100g, or per serving size, the developed label discloses the information on the dish that is served individually to consumers.

Calories were excluded from colour attribution since the recommended daily intake can be variable according to each individual needs.

Relative to the provision of information on the substances causing allergies and intolerances, two options were considered: disclosing the information textually or disclosing the information through a visual representation.

Given that the textual disclosure was literal, the focus fell over the visual representation.

The starting point was to organize by taxonomic group the allergens and substances causing intolerances. And based on it, two visual systems were designed: one based on icons and the other based on language allied with the visual reference of the periodic table of elements.

Both systems might be more effective than the literal textual disclosure, since each substance occupies a specific and consistent position in the system and has attributed to it the colour of the group to which belongs. Once the logic is learned, the system can be potentially understood across different countries.

The graphic decisions related to the elements individually and to the group in itself were set in accordance with MoveLife's software. The restaurant's menu label is a product generated automatically in the context of the software, therefore it was important to keep the consistency in the identity. Using rounded corner squares for each element, and a rounded type as well, allowed both a natural visual grouping and a friendlier appearance.

As future work, it is essential to test the label in the market considering the listing of methodological directions referred on the third chapter, in order to obtain accurate data. Based on this feedback and peer review it is necessary to proceed to the eventual adjustments. Once this process is concluded, it is important to consider designing a strong communication campaign to mark the label's entrance in the market.

Most of all, the campaign should be clear about the label's main objectives which have to be communicated in a positive tone. Negative messages can compromise the

success of the label. The label has to be regarded, both by restaurant owners and consumers, as a tool that can improve the overall experience of eating in a restaurant. Chefs can easily increase the healthfulness of their recipes and consumers can be positively surprised with the nutritional information about their favourite dish. What is intended is exactly the opposite of the tobacco campaign, which discloses in images or sentences the negative effects of smoking. Food has to bee seen has a pleasure, which can only get better when it improves the overall health.

In the context of this dissertation it was assumed that the label was to be printed in the menus, since this is the object most restaurants use to show their food offer. Nevertheless, and considering that the nutrition label for restaurant's menus is generated in the MoveLife's software, it is import to consider the option of developing an application for smart phones, that through the reading of a QR code, consumers can access more detailed information on food's nutritional profile, and possibly integrate it on their individual %GDA.

In Appendix E it s possible to find the first steps on the development of a system representing calorie information in order to allow an easy, intuitive way, to create a balanced meal. The inclusion of this content as appendix was related to time constraints. However it might be important to give some steps further in that specific research.

It would be of interest to develop research on interactive infographics and to perceive how they could encourage healthier eating. Also to consider, could be its integration with current existing applications related to exercise, for example.

Consistency is related to the increase of awareness, therefore it is suggested an examination on the possibility of using one standardized nutrition label across restaurants and pre-packed food.

It could as well be relevant to consider ways of integrating the label in recipes' websites, so that even when cooking at home, it could be possible to know the nutrition value of the prepared food.

The process of designing a nutrition label for restaurant's menus implied an articulation between different areas such graphic design, nutrition, consumer behaviour and software programming. Being able to manage all the parts together is a skill related to the background provided by the first year of the master in Creative Industries Management. However, this process did not always run as smoothly as desired. Some chapters were more difficult to approach than others, since the main contents were totally apart from the core of the Creative Industries (i.e. the EU and US regulations).

At the end, it is rewarding to perceive that the Creative Industries can contribute to solving social problems: nutritional information doesn't have to be a grey unfriendly amount of data. It can be part of the role of Creative Industries to turn that data (or a similar one) into something attractive in order to effectively change people's behaviour towards a healthier lifestyle.

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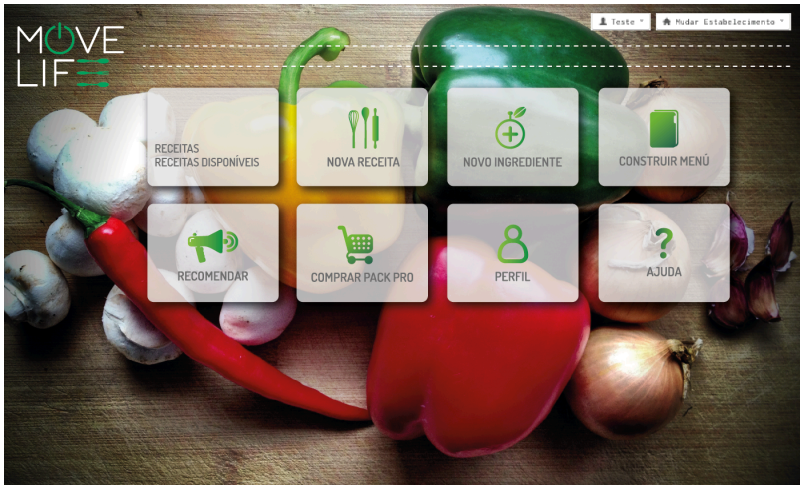
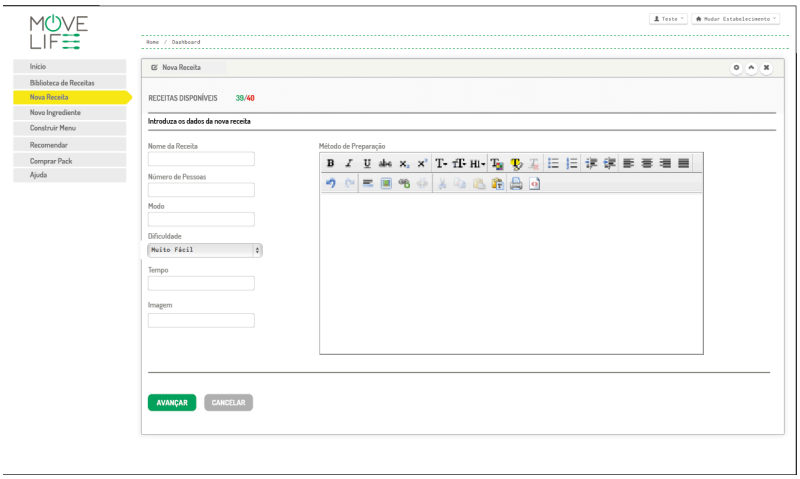
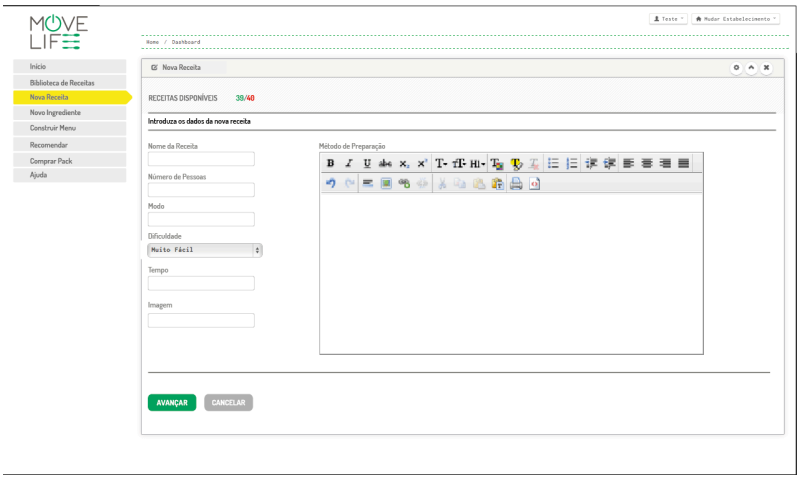
APPENDIX A

Screenshots of MoveLife's software *Beta* version







APPENDIX B

List on the products and substances causing allergies and intolerances provenient form the EU Regulation (EC) 1169/2011 on the provison of fodd information to consumers.

1. Cereals containing gluten, namely: wheat, rye, barley, oats, spelt, kamut or their hybridised strains, and products thereof, except:

    (a) wheat based glucose syrups including dextrose [31];

    (b) wheat based maltodextrins [31];

    (c) glucose syrups based on barley;

    (d) cereals used for making alcoholic distillates including ethyl alcohol of agricultural origin;

2. Crustaceans and products thereof;

3. Eggs and products thereof;

4. Fish and products thereof, except:

    (a) fish gelatine used as carrier for vitamin or carotenoid preparations;

    (b) fish gelatine or Isinglass used as fining agent in beer and wine;

5. Peanuts and products thereof;

6. Soybeans and products thereof, except:

    (a) fully refined soybean oil and fat[32];

    (b) natural mixed tocopherols (E306), natural D-alpha tocopherol, natural D-alpha tocopherol acetate, and natural

    D-alpha tocopherol succinate from soybean sources;

    (c) vegetable oils derived phytosterols and phytosterol esters from soybean sources;

    (d) plant stanol ester produced from vegetable oil sterols from soybean sources;

7. Milk and products thereof (including lactose), except:

    (a) whey used for making alcoholic distillates including ethyl alcohol of agricultural origin;

    (b) lactitol;

[32] And the products thereof, in so far as the process that they have undergone is not likely to increase the level of allergenicity assessed by the Authority for the relevant product from which they originated

8. Nuts, namely: almonds (Amygdalus communis L.), hazelnuts (Corylus avellana), walnuts (Juglans regia), cashews (Anacardium occidentale), pecan nuts (Carya illinoinensis (Wangenh.) K. Koch), Brazil nuts (Bertholletia excelsa), pistachio nuts (Pistacia vera), macadamia or Queensland nuts (Macadamia ternifolia), and products thereof, except for nuts used for making alcoholic distillates including ethyl alcohol of agricultural origin;

9. Celery and products thereof;

10. Mustard and products thereof;

11. Sesame seeds and products thereof;

12. Sulphur dioxide and sulphites at concentrations of more than 10 mg/kg or 10 mg/litre in terms of the total SO_2 which are to be calculated for products as proposed ready for consumption or as reconstituted according to the instructions of the manufacturers;

13. Lupin and products thereof;

14. Molluscs and products thereof.

APPENDIX C

Nutritional criteria

The recommended daily intake* determined by EU Regulationfor energy and selected nutrients is:

- 2000 kcal
- 20g saturated fat
- 90g sugar
- 6g salt

* Values for a healthy adult.

The insertion of the recipe in the software requires the number of servings. Therefore, by dividing the total ingredients by the determined number of servings, it is possible to calculate the nutritional profile of each dish.

Food and Drink Federation (Food and Drink Federation;, s.d.) in the UK, determined that in order to achieve a balanced diet the food intake along the day should as divided:

- Breakfast: 400 Calories (20% of GDA);
- **Lunch: 600 Calories (30% of GDA)**
- **Dinner: 600 Calories (30% of GDA)**
- Snacks: 400 Calories – (2x10% including any drinks)

In the Portuguese context the *Plataforma contra a obesidade* (platform against obesity) has a publication (Plataforma contra a obesidade, 2002) where it is made a similar distribution:

- Breakfast: 300 calories (15% of GDA)
- Morning snack: 100 calories (5% of GDA)
- **Lunch: 700 calories (35% of GDA)**
- Afternoon snack: 300 calories (15% of GDA)
- **Dinner: 600 calories (30% of GDA)**

Marked in bold are the meals, which are generally more related to restaurants. The two approaches recommend a different value for lunch. However, to keep consistency in both dinner and lunch, it is considered that 30% (600kcal) is the recommended intake for each of these meals.

	LOW ≤15%	MEDIUM >15% AND ≤30%	HIGH >30%
SAT FAT	≤ 3g	> 3g AND ≤ 6g	> 6g
SUGAR	≤ 13,5g	> 13,5g AND ≤ 27g	> 27g
SALT	≤ 0,9g	> 0,9g AND ≤ 1,8g	> 1,8g

All nutrients included in this system are those whose consumption is to be discouraged. Therefore the set boundaries are related with equilibrium within a meal:

≤15% (green colour):

- the intake of 15% or less of these nutrients provides the most balanced meal, since it represents half of the maximum recommended intake for a lunch or dinner;
- summary indicator information: if eligible, qualifies for a star

>15% to ≤30% (amber colour):

- the intake of more of 15% to 30% or less of these nutrients provides a reasonably balanced meal, but it requires a special attention over the nutrient(s) which is(are) reaching the maximum recommended intake for a lunch or dinner;
- summary indicator information: if eligible, amber colour doesn't qualify for a star

>30% (red colour):

- the intake of more of 30% of these nutrients is not recommended since it exceeds the recommended intake for a lunch or dinner;
- summary indicator information: compromises the food eligibility for earning stars

The colour attribution is related with the search of equilibrium. It is intended to help consumers to achieve balance in their meals and not to classify foods as good, average or bad.

The 30% value refers to the recommended percentage of GDAs for a lunch or a dinner. For example, if someone is considering having a three-course meal (with a starter, a main course and a dessert), it is recommended to choose foods where the green prevails (or with more stars) in order to, in its total, not exceed the recommended 30%.

In the case that the meal is composed solely by the main course, it is acceptable to choose foods within the green and amber boundaries (medium number of stars).

Foods with red nutrients aren't recommended because they compromise the overall healthfulness of the food and the desired dietary equilibrium (no stars and a cross instead).

In conclusion, the colour indication aim is helping consumers in balancing the contribution of each meal's element within the total meal.

APPENDIX D

Repesentation of the substances and products causing allergies and intolerances in portuguese.

APPENDIX E

The inclusion of this content as appendix is mainly related to the lack of time to develop a deeper research on the theme: representing calorie information in order to allow an easy, intuitive way, to create a balanced meal.

The overall idea for this system emerged with the writing of the dissertation's conclusion. While it seemed too important to simply discard it, the time constraints for developing the dissertation didn't allow both to develop the system with accuracy and to review all the previously developed content in order to include the system.

Accordingly, the content below can be considered as a good base for future work.

The major advantage of designing a label for restaurants is based on the existence of a recommended spread of food intake throughout the day. This means that there is a convention on the percentage of GDAs attributed to each meal along the day (values for healthy adults based in Energy GDA = 2000 kcal, as stated by the EU Regulation (European Union;, 2011)). Food and Drink Federation (Food and Drink Federation;, s.d.) in the UK, determined that in order to achieve a balanced diet the food intake along the day should as divided:

- Breakfast: 400 Calories (20% of GDA);
- **Lunch: 600 Calories (30% of GDA)**
- **Dinner: 600 Calories (30% of GDA)**
- Snacks: 400 Calories – (2x10% including any drinks)

In the Portuguese context the *Plataforma contra a obesidade* (platform against obesity) has a publication (Plataforma contra a obesiddade, 2002) where it is made a similar distribution:

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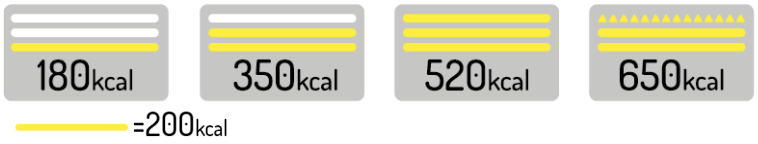
- Afternoon snack: 300 calories (15% of GDA)
- **Dinner: 600 calories (30% of GDA)**

Marked in bold are the meals, which are generally more related to restaurants. The two approaches recommend a different value for lunch. However, to keep consistency in both dinner and lunch, it is considered that 30% (600kcal) is the recommended intake for each of these meals.

Having the reference that 600kcal is the maximum recommended value for energy intake in a dinner or lunch it is possible to attribute to each food a total of three *energy bars,* considering that each bar stands for 200kcal:



Meaning that:

	≤200kcal	>200kcal AND ≤400kcal	>400kcal AND ≤600kcal	>600kcal
ENERGY BAR				

- If a food has 200kcal or less it is assigned one yellow bar;
- If a food has between 200kcal (excluding 200) and 400kcal (including 400) it is assigned two yellow bars;
- If a food has between 400kcal (excluding 400) and 600kcal (excluding 600kcal) it is assigned three yellow bars;
- At last, if a food has more than 600 kcal the last bar is replaced by an indicator representing that the food as exceeded the recommended 600kcal for meal.

The main advantage of this system is allowing the intuitive construction of a meal within the boundaries of the recommended %GDA for a lunch or dinner. For example if someone chooses a main course which has two energy bars, that same person can consider having a desert with one energy bar and still be within the ideal limits:

Roughly, even without any calculation it is guaranteed that the sum of two energy bars with one energy bar never exceeds the recommended %GDA for a lunch or dinner.

This system purpose isn't classifying the calorie content as good, medium or bad. The strength of the developed energy bar system is the ability to provide guidance so that consumers can tailor their meals according to their individual needs.

The *energy bar* system's limitations are related to the relation between the established limits and bar attribution. For example, if a main course contained 401kcal, three bars were attributed. Intuitively that would mean that for a balanced meal it wouldn't be possible to eat a desert. However there was still a margin of 199kcal to reach the recommended maximum amount of calories (600kcal).