

FACULDADE DE ENGENHARIA DA UNIVERSIDADE DO PORTO

Bridging the gap between the Research Center and the Market – A Fraunhofer's Nutrition Technology Case Study

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Master's Degree in Innovation and Technological Entrepreneurship

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Resumo

Atualmente, um dos fatores determinantes para o desenvolvimento económico é o conhecimento, o qual depende de um elevado investimento em educação, investigação e desenvolvimento (I&D).

Os Centros de Investigação Aplicada procuram a solução de problemas práticos, trazendo uma contribuição tangível para a sociedade. Para entender os benefícios do conhecimento e obter retornos desses investimentos, as inovações ou invenções resultantes devem ser comercializadas. A transferência de tecnologia só é bem-sucedida se houver procura por consumidores interessados pelas inovações tecnológicas desenvolvidas.

O principal objetivo deste trabalho foi a elaboração de um caso de estudo baseado no processo TPM (Tecnologia - Produto - Mercado) para a Tecnologia de Nutrição do Fraunhofer AICOS. Foi realizada uma pesquisa de PI, identificação das Características Únicas e Capacidades da Tecnologia, Análise da Concorrência, Ideação e Priorização de possíveis novas aplicações.

A aplicação do processo TPM resultou e permitiu a criação de um conjunto de potenciais novos produtos baseados na Nutrition Technology da Fraunhofer. Para isso, foram essenciais as informações e contribuições fornecidas em duas reuniões com professores da FCNAUP.

Um conjunto de Business Model Canvas e Value Propositions Canvas foi o resultado deste caso de estudo.

Concluiu-se que a Nutrition Technology tem um grande potencial de gerar uma vasta gama de potenciais novos produtos e explorar vários mercados diferentes

Como a sustentabilidade é uma questão relevante para o autor e para a sociedade atual, foi ainda desenvolvida um Triple Layered Business Model Canvas para este produto.

Abstract

One of the crucial drivers for economic development nowadays is knowledge, and it comprises high investment in education and training, research and development (R&D).

Applied Research Centers deals with solving practical problems, bringing a tangible contribution to the society. To understand the benefits of knowledge and to obtain returns from these investments, the resulting innovations or inventions must be sold, or commercialized. Transfer of technology is successful only if there is demand by specific paying customers for the technological innovation available.

The main goal of this work was the creation of a case study based on the TPM (Technology-Product – Market) to the Nutrition Technology of Fraunhofer AICOS (Assistive Information and Communication Solutions). To do this an IP search was conducted, identification of the Technology Uniqueness and Capabilities, a Competition Analysis, Ideation and Prioritization of new possible applications of the Nutrition Technology.

The application of the TPM process resulted and allowed the generation of a set of potential new products based on the Nutrition Technology. To achieve this, the information and contribution provided in two meetings with FCNAUP teachers was essential.

A set of Business Model Canvas and Value Propositions Canvas were created in result of this case study.

It was concluded that the Nutrition Technology Product has the potential to generate a vast array of potential new products and explore several different markets.

As sustainability is a relevant issue for the author and today's society, in addition a Triple Layered Business Model Canvas for one the products were also proposed.

Acknowledgments

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To my sister, Joana, that supports and helps me all the moments I need.

To my parents, for the ones that I do not have words to express myself.

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Index of Abbreviations and Acronyms

	AICOS – Assistive Information and Communication Solutions
2	BMC – Business Model Canvas
	BMI – Business Model Innovation
4	CoT – Commercialization of Technology
	FCNAUP – Faculdade de Nutrição da Universidade do Porto
6	IP – Intellectual Property Search
	MIETE – Masters in Innovation and Technological Entrepreneurship
8	R&D – Research and Development
	SBM – Sustainable Business Model
10	TEC – Technology Entrepreneurship and Commercialization Program
	TLBMC – Triple Layered Business Model Canvas
12	UP – University of Porto
	VPC -Value Proposition Canva
14	WIPO – World Intellectual Property Organization
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Chapter 1 - Introduction

2 1.1 Contextualization

Technology commercialization has drawn the attention of researchers for decades. Currently, however, this attention rarely diverges from assumptions that a specific technology is of immediate interest to a firm or research-based centers and that licensing and strategic alliances are the preferred modes of commercialization. This is somewhat paradoxical because the rapid accumulation of unused technologies implies that firms often must deal with technologies that do not fit their current knowledge base and/or business model and thus may not add value directly. While the “lean and mean” business logic would imply that such “misfit” technologies should better be discarded, there are strong reasons to believe that they deserve additional scholarly attention. Acting to realize the potential of such misfit technologies can clearly be valuable (Anokhin et al., 2011).

A research center enables interaction between faculty, scholars, students, and industry to enhance research opportunities, academic excellence, real-world problem solving, and knowledge creation and dissemination, with the purpose of bringing value and solutions to the society.

16 Motivations

The researcher, David Trindade is graduated in Archaeology and History by the Faculdade de Letras da Universidade de Coimbra and wishing to develop his entrepreneurial skills decided to enrol in the Master in Innovation and Technological Entrepreneurship. Being an Archaeologist David, decided that being is previously academic years focus on the past, it will be interesting to now focus on the future. Having the opportunity to accomplish his Master's Dissertation in Business Environment at Fraunhofer AICOS, he hopes that this study will result not only in the application of the knowledge that he acquired during the master's course but also the experience in methodologies and problem analysis under a specific business context (Fraunhofer AICOS) that he can later transfer to another environment. He therefore considers that this is an interesting and motivating challenge from a professional and personal point of view, hoping to solve it with this thesis, but also acquired critical analytical knowledge to solve similar problems in the future.

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1.2 Objectives

The main goal is the study the creation of a case study based on the TPM (Technology - Product – Market) process to the Nutrition Technology of Fraunhofer AICOS, and generate a set of potential new products based on the Nutrition Technology, creating for three of them a Value Proposition Canvas (VPC) and for two of them a Business Model Canvas (BMC). As sustainability is a relevant issue for the author and today’s society, in addition a Triple Layered Business Model Canvas for one the products is also intended).

1.3 Structure of dissertation

This dissertation in organized in five chapters and four annexes, as follow

- **Chapter 1** – Presents the contextualization of the topic, the motivations of the researcher, the objectives of this work and the structure of the dissertation;
- **Chapter 2** - Presents an overview of the literature concerning the relevant subjects for this dissertation, namely Business Models, Business Models Canvas, Triple Layered Business Model Canvas, Value Propositions, Value Propositions Canvas and Technology Commercialization;
- **Chapter 3** – Includes Case Study, namely the Application of TPM in the Nutrition Technology and the Triple Layer Business
- **Chapter 4** - Presents the Critical Analysis of the Case Study
- **Chapter 5** – Addresses the conclusions from this work

Appendix

Annex I - Synthesis of Scopus research

Annex II - Technology – Product - Market - Fit tables

Annex III - Results of the IP Search on the Nutrition Technology

Annex IV – Prioritization matrix

Chapter 2 – Literature Review

2.1 Introduction to Literature Review

In a first phase in the research methods class, part of the MIETE master, the research for this topic was done in Scopus using multiple combinations of Keywords. The combination, that makes most sense was “(Technology AND Commercialization OR Pull/Push) AND Methodologies” with the filter set to the last 10 years. In a second phase, for a better understanding of the tools used in this dissertation the search was made to include “Business Models”, “Business Models Canvas” “Value Proposition Canvas” and “TPM”.

The synthesis table of this research with the more relevant papers is present on Annex I

2.2 TPM process

The technology is recognized as fundamental for the maintenance and development of the contemporary societies. However, it has not been easy to transfer the knowledge and innovation to the entrepreneurs. The gap between creation of knowledge, innovation and technology, mostly in Universities, and its valorisation and commercialization are questions addressed by several authors (Shibata et al., 2010; Anokhin et al., 2011; Andriessen, 2005; Aarikka-Stenroos and Sandberg, 2011; Aarikka-Stenroos and Lehtimaki, 2014; Baycan and Stough, 2013; Aarikka et al., 2014; Dehghani, 2015).

At North Carolina State University, from 1995 to 1999, was originally established the Technology Entrepreneurship and Commercialization program (TEC). Subsequently, TEC has been polished and improved through trial-and error learning in classrooms at several universities in various countries of United States, Slovenia, United Kingdom, South Korea, South Africa and Portugal. The objective of this program was to “*bridge the gap between the creation of technologies and the commercialization of these technologies and addresses the factors that cause technology and innovation to languish in the Valley of Death (Figure 2.1), a critical problem in technology commercialization*” (Barr et al., 2014). The Valley of Death is referred as the institutional, financial and skill gap in the commercialization technology (COT). Several reasons can explain the region of Valley of Death. Researchers and technical faculty staff (left side) usually do not comprehend the concerns of commercialization staff (right side) and the inversely is also true. “*The cultural gap between these groups manifests itself in the results prized by one*

side and devalued by the other” (Markham, 2002). Likewise, the two groups frequently have diverse goals and reward structures. Researchers find value in the invention and discovery processes and the development of knowledge, while commercialization and business-people want a product or a service to sell and frequently consider the value of discovery as theoretical and pointless. *“Both technical and commercialization people need help translating research findings into superior product offerings”* (Markham, 2002).

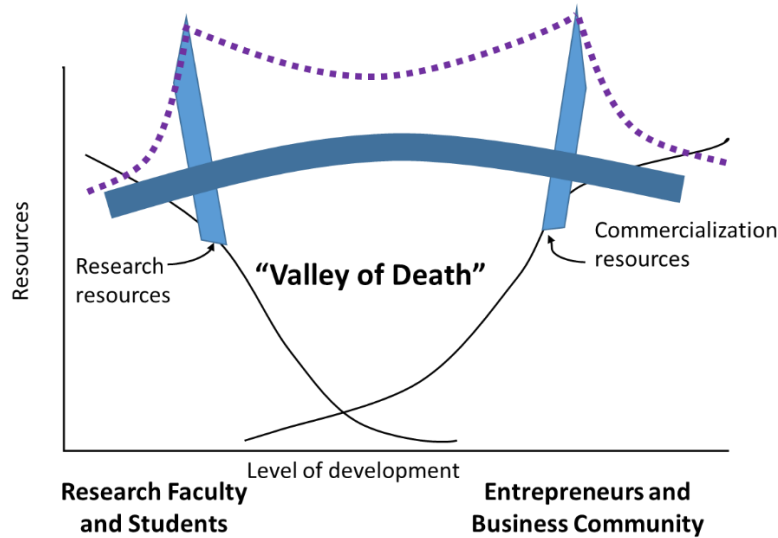


Figure 2.1 The valley of death bridging the gap between research and commercial application (adapted from Barr et al., 2009)

The use of actual technologies in a multi-disciplinary team setting, through content and practical specialists that backs the teams allows the students to be completely involved in the early stages of the COT process than *“does more traditional case-based education or the creation of business plans around an existing business concept”* (Barr et al., 2014). The additional prominence on these early stages through the identification and assessment of conceivable technology–product–market (TPM) linkages in a process-based inclusive model delivers significantly additional value creation to the early stages of COT. The T-P-M construct permits students to start with a technology but then move rapidly to understanding the critical role in commercialization of product and market drivers, thus successfully integrating technology push and market pull commercial logics (Barr et al., 2014).

Most of these leaders in technology learn to elaborate on TPM connections rather than rely on flashes of intuitive inspiration. They match a number of product ideas with a disciplined process of market segmentation for best commercial application of the technical capabilities. They establish the logical links between technical capabilities and enduring customer needs by

Chapter 2 – Literature Review

means of the product attributes, which unite technologies and markets. A Product Features Worksheet can be useful in establishing these links by listing: 1) capabilities of the new technology; 2) multiple customer needs addressed by these capabilities; and 3) the multiple product attributes or features that could be developed based on the technical capabilities and customer needs.

A university developed a course, in which the students apply a structured process model of creating business (selling products and services based on technology). This process, was named of “algorithm” is intended explicitly to “*embed sets of skills and behaviours that allow technology commercialization novices to operate as competent technology entrepreneurs or as technology product champions within existing firms*” (Barr et al., 2014). While seeming to be a technology-push process, the algorithm is planned to methodically explore linkages between a widespread assortment of market needs and the unique attributes and product features enabled by novel and emerging technologies.

The first step of this process is called the ideation phase. The aim of this phase is to create a set of prioritized product concepts with solid conjectured linkages between the characteristics and unique capabilities of the technologies and of the customer/market needs. Through these linkages, it is possible to reach initial product concepts. “*Ideas are generated, prioritized, slightly refined, and written into preliminary initial statements describing the product and the markets they might serve. Students first investigate the technology and discover how it works and what unique capabilities it may create or enable. The key construct introduced to generate and capture “lots of ideas” is “T-P-M,” referring to “Technology–Product–Market” linkages*” (Barr et al, 2014). The users of this process are then required to generate several product ideas that might be established for each technology and numerous markets for each of the products or services. A Product Features Worksheet can be useful in creating these links by first listing the capabilities of the new technology, next the several customer needs related to these capabilities; and finally, the numerous product characteristics or features that might be developed based on the technical capabilities and customer needs (Markham, 2002). In the second phase of this process, the teams create a set of criteria, the most important ones for making essential decisions, assign weights to each of the criteria, and finally to evaluate each opportunity for which T-P-M linkages have been developed, against these criteria, which originates a quantitative ranking. This ranking will become the primal tool for the selection of what opportunities will be chosen to carry forward. This second phase is finished by the construction of a commercialization/start-up strategy and the development of value propositions for the potential products.

In conclusion, TPM is a suitable and interactive tool for companies who want to identify their technology unique advantages, develop product concepts with them and reach possible

several markets. When these product concepts are defined, it's time to present them to potential lead customers of the markets addressed, to be tested and validated.

2.3 Business Models and Business Model Canvas

In recent years, the business model has been the focus from equally scholars and practitioners. Since 1995, there have been at least 1,177 articles published peer-reviewed academic journals in which the notion of a business model is lectured (Zott et al., 2011).

Although business models have been integral to trading and economic behaviour since pre-classical times (Teece, 2010), the definition and importance of the business model, starts to gain relevance in more recent years, with the advancing of technological development and the creation of electronic business. Business models have been closely connected with "e-business" since the advent of the Internet during the late 1990's (Nielsen and Lund, 2014). At that time the business model is no longer understood as only an operational plan for generating an appropriate information system but has evolved into a cohesive demonstration of the company organization, to contribute to the success of management in the decision-making process (Wirtz et al., 2015). In the next years, the perception of the business model evolves and begins to receive a much more general meaning in literature than the times that surrounded the e – business rhetoric. Although still being relatively vague, Magretta (2002) already defines business models as not only how a company makes money, but also answered essential questions such as: "who is the customer? and "what does the customer value?". Precisely this aspect of value seen from the point of the customer made a big impact on the existing thinking (Nielsen and Lund, 2014).

An elementary idea of the business model concept was that it must spell out the unique value proposition of the company and how such a value proposition should be put into effect. For the point of view of the customer, the "value creation" could be associated to solving a problem, improving performance, or reducing risk and costs, which might require specific value configurations including relationships to suppliers, access to technologies, insight in the users' needs etc. (Nielsen and Lund, 2014). So, a business model should articulate the logic and deliver evidence that establishes how a business generates and delivers value to customers. It likewise provides the architecture of revenues, costs, and profits associated with the business enterprise delivering that value (Teece, 2010) (Figure 2.2).

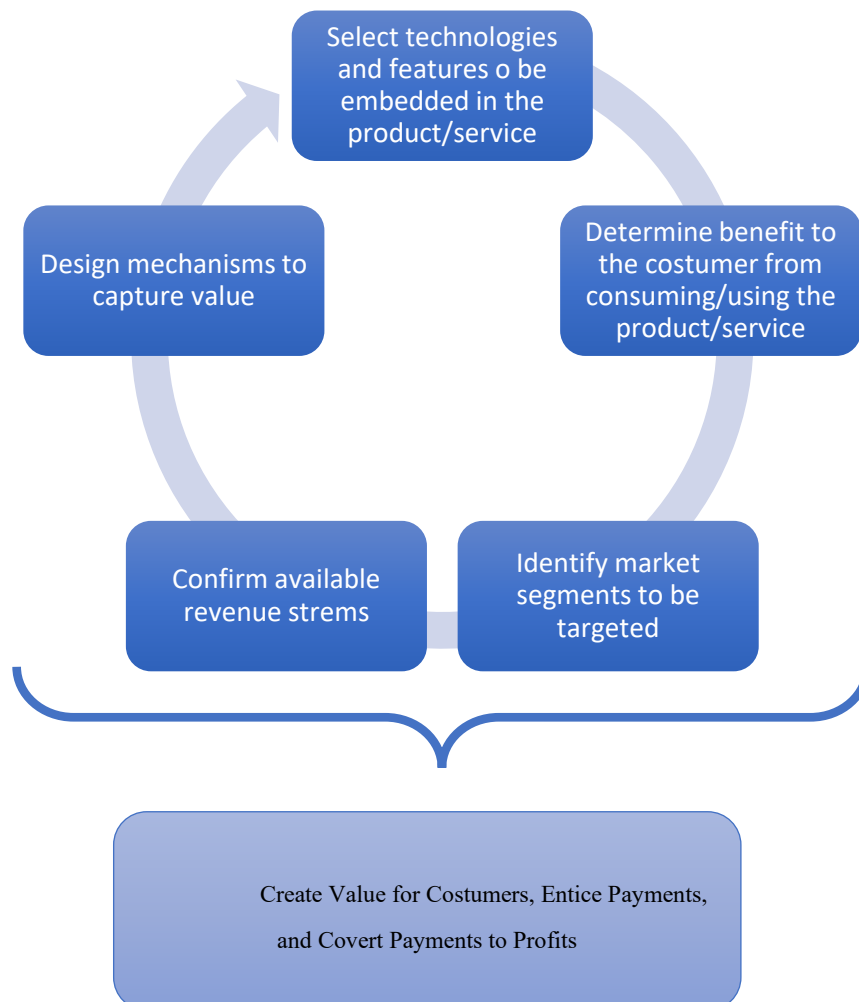


Figure 2.2 Elements of a business model (Teece, 2010)

Osterwalder (2004) starts to describe a business model as an abstract conceptual model representing a company's business and money earning logic and as a business layer between business strategy and processes. It distinguishes between three types of business models: the abstract model, a generic model of elements, components and relationships, second the operating business models, the implemented ones, and finally the scenario business models, which intend to represent a virtual and potential scenario.

In a later work, Osterwalder and Pigneur (2010), defines a Business Model as a description of the rationale of how and organization creates, delivers, and captures value (Osterwalder and Pigneur, 2010). In an effort to create a common framework that everybody can understand, manipulate, discuss and is intuitive, and at the same time not oversimplifying the complexities of how enterprises function, Osterwalder and Pigneur (2010) developed the Business Model Canvas. It consists of nine blocks - Customer Segments, Value Propositions, Channels, Customer Relationships, Revenue Streams, Key Resources, Key Activities, Key Partnerships and Cost Structure - that all together must show the reasoning behind on how a company aims to make

money. It's a blueprint for a strategy to be implemented through organizational structures, process and systems. The nine blocks will be discussed with more detail in the following text.

The initial point of the Business Model Canvas (BMC) presented in Figure 2.3, is the customer segment, which can be one or more, are the people that a company is trying to sell a product or a service. It's a group of customers that share common traits, being demographics (age, gender, professions, etc) or needs, behaviours, hobbies and motivations. The customer segment block is one of the most significant blocks of the BMC. The value propositions block defines the package of products and services that provides value to the customer and is the reason why customers choose one company in detriment of the competition. It aims to resolve a customer problem or satisfy a customer need. The channels building block defines how a company reaches and communicates to its customer segments for the delivery of their value proposition. The customer relationships block defines the kinds of relationships a firm establishes with the target customer segments. Relationships may go from personal to automated. Customer relationships might be driven by customer acquisition, customer retention and boosting sales (upselling). The revenue streams block represents the cash a company generates from each customer segment. The key resources block defines the most vital resources required to make the business model to function. The key activities block defines the most vital activities to make the business model work. The cost structure block makes explicit all the costs to make the business model work.

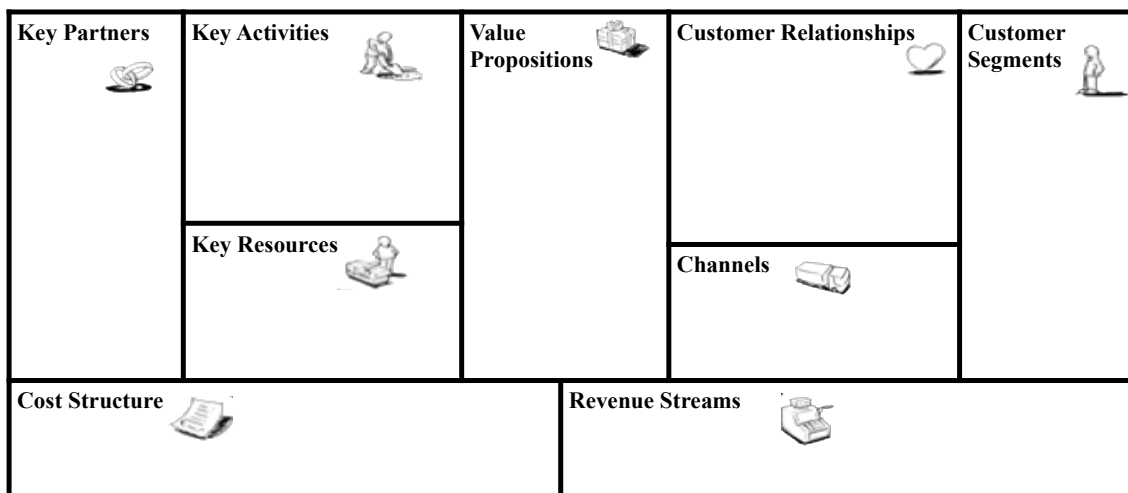


Figure 2.3 Business Model Canvas (adapted from Osterwalder and Pigneur,2010)

2.4 Value Proposition and Value Proposition Canvas

All companies that produce goods or services aim to succeed with potential consumers. Sometimes the entrepreneurs are disappointed by the failure of a good idea. However, the success of the selling process should be well calculated in order to diminish considerably the failures. For this purpose, it is applied the concept of a value proposition, that is a study/proposal that aims to

create value to be delivered to the customers. According to Gierej (2017) there are some processes used to design a value proposition, namely Customer Development, the Lean Methodology and the concept of Business Model Canvas. This last one developed by Osterwalder and Pigneur (2010) is the most utilized nowadays. It considers the potential benefits that the consumers could have (the gains) as well as the possibility to relive its disadvantages (pains). However, to have success in the definition of a strong value proposition it is necessary to test and refining the value proposition. This process is named value proposition design. The great business companies recognize the importance of a good value proposition design to get success with their products. Osterwalder et al. (2014) described four steps to obtain the value proposition design, that are developing canvas, design, test and evolve. In the canvas it is analyzed the customer profile and the value map; in the design the prototyping solutions are used to verify the developed assumptions; in the test step experiments are conducted and the data analyzed; in the evolved step the product is introduced and the performance is analyzed and eventual modifications are introduced.

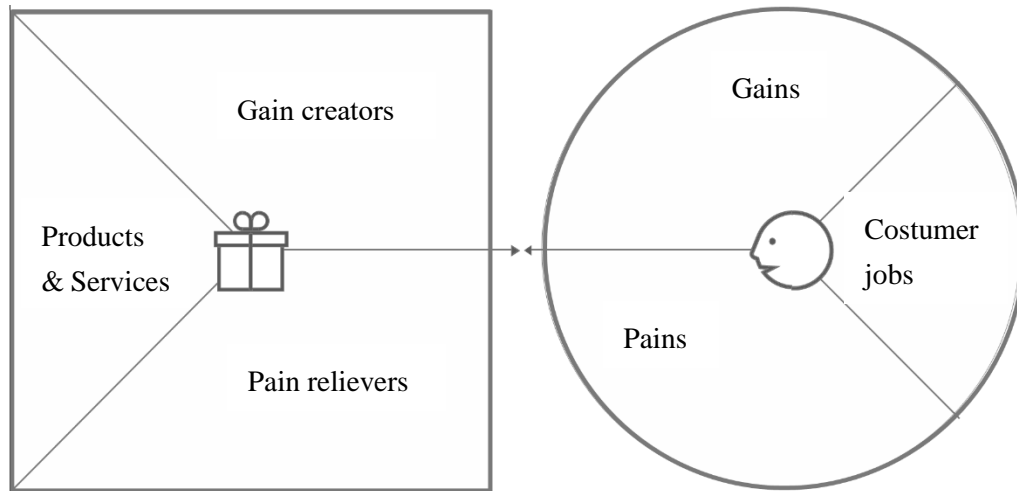
The Value Propositions Canvas

The first step of a value proposition design is clearly to know and understand the customers, what are their needs, what are the gains they get with the product /service offered and what are the existing pains. Also social and emotional feelings should be considered. To develop this step rationally and objectively is necessary to have discussion among the customers and the producers. This is a dynamic process where it is also possible to find out unexpected gains and unexpected pains to be relived. The beginning of the definition of a value proposition is the developing of the canvas, that defines the customer profile and the value map. The value proposition canvas provides the analysis of the market and customer expectations and determines the tasks that must be performed to match the expectations, enabling to understand the target customers. At the same time, the solutions to the desired gains and the steps necessary to obtain the aims are designed and tested.

This value proposition canvas supports the desire for data-driven decision-making.

The Value Proposition Canvas is represented in Figure 2.4.

The canvas is divided in two fields. The right side of canvas belongs to the customer profile where it is identified the customer jobs. Here it should be obtained a thorough understanding of the target group. The daily tasks of the customers should be recognized and analyzed. In this step it should be identified and understand the causality and the situational context in which someone might choose to hire or fire your value proposition.



2 **Figure 2.4 The Value Proposition Canvas (adapted from Osterwalder et al., 2014)**

4 The pains are another sector of customer profile. Here you expose what disturbs your target
 6 customers. Here it is detailed what creates friction and what they are anxious to solve, all kind of
 6 negative emotions, risks, contingencies and costs. This helps to get specific.

8 The gains are the last sector of customer profile. This is not the opposite of pains Here it is
 8 enumerated the fondness of customers and can be a powerful indicator. Also, the hidden ambitions
 10 customers have, their goals in life and things that make them happy should also be considered,
 10 social benefits, savings, increasing profits. From here it should be conducted a series of tests to
 12 validate what it is thinking as a true, helping refining your design focus.

12 On the left side of the canvas it is represented the Value map. In this side the Pain relievers
 14 are evaluated. Here it is documented how the product or service could relieve the existing
 14 customer pains. It must be considered how the proposed product affects the pain of potential
 16 customer.

16 In this side of canvas, the Gain creators are defined. Here it is documented how the product
 18 or service offered could satisfy or benefit the desired customer gains.

18 The last sector is Products and services. Here is how the value proposition manifests itself,
 20 being necessary to be specific. After establishing the consumer profile, the company can offer its
 20 product, that is the value proposition. The value proposition canvas is the starting point to begin
 22 work of a conceptual idea (Gierej, 2017).

22 The purpose of designing a canvas and a value proposition exercise is to establish a fit among
 24 the two faces of canvas.

24 This works results in a success *“when your value map meets your customer profile-when
 26 your products and services produce pain relievers and gain creators that match one or more of
 26 the jobs, pains and gains that are important to your customer.”* (Osterwalder et al., 2014)

28 Validating fit also starts informing the business model canvas. These two tools feed and
 28 inform each other. This is how the process really starts coming together.

The tools and approach once incorporated into the existing design process enables to focus on designing and validating value propositions that fit.

A value propositions inform how the company's products and services perform themselves in the market.

Value Proposition Design shows how to use the Value Proposition Canvas to Design and Test great value propositions in an iterative search for what customers want. Value proposition design is a never-ending process in which you need to Evolve your value proposition(s) constantly to keep it relevant to customers.

The Value Proposition Canvas can be applied for all purposes, including topics as social and environmental issues. Muller (2012) developed a new method for a sustainable value proposition. He presented a tool to help companies in the development of innovative and sustainable products either for the environment and for the society designed for his concern that it was how to transform a resource wasting society into a sustainable one.

There are other techniques to define the customer, namely to construct a persona. The persona is the image of the typical user of a product, a potential customer, based on that analysis of data obtained from tests performed on users (Gierej, 2017). The studies to create a persona are costly and time consuming. Another possibility to develop the profile of the potential customer is the construction of an Empathy Map. It analysis further than the typical demographic characteristics of the target audience and it helps on the better understanding of the comportment, concerns and aspirations of people. Creating a solution based on the customer profile increases the chance of a greater interest in the product. The value proposition should be the reason why the customers choose the offer made by a company and not the offer of the company (Gierej, 2017).

2.5 Sustainable Business Models. Triple Layer Business Model Canvas (TLBMC)

The existing key literature about business models presents various perspectives on what business models involve whereby the focus is on how a firm creates and captures value within a value network (Osterwalder et al., 2005). Generating and delivering customer value lies at the centre of any business model and therefore its central component is the customer value proposition (Chesbrough, 2010; Teece, 2010).

The original business model canvas is one widely accepted tool, which determines nine elements of any business model that make up the whole system that are value proposition, customer segments, customer relationships, channels, key resources, key activities, partners, costs and revenues (Osterwalder et al., 2010, 2005). Boons and Lüdeke-Freund (2013) used the

information from various authors to differentiate the following elements of a generic business model concept, which are value proposition (the value embedded in the products/services offered by the firm); supply chain (the relationships with suppliers); customer interface (the relationships with customers); and financial model (cost and benefits, and their distribution across the stakeholders). Based on these concepts, across the literature three core interrelated characteristics of business models have emerged and can be summarized as: the value proposition, value creation and delivery, and value capture. The business model of a company needs to incorporate continuously innovations through a Business Model Innovation (BMI) to keep the competitive advantage of its products. The idea of sustainable development and the more recent concepts of bio-economy and circular-economy are increasingly being seen as a source of competitive advantage when companies incorporate these ideas into their BMI plans.

Similar to the definition of sustainable development, the balanced integration of the environment, society and economic issues into a business models lead, in the last decade, to the emergence of the concept of Sustainable Business Models (SBM), which evaluate the organizational and cultural conditions of BMs that contribute positively to environmental and social development (Lüdeke-Freund and Dembek, 2017). According to Rana et al. (2017), the approach of SBMs allows a more holistic view of the three metrics of sustainability, the environment, society, and the economy.

Several environmental and social challenges are posed currently to the development of business models all around the world. Increasing number of consumers incorporate sustainability issues into their purchasing decisions and, as a consequence, businesses face increasing pressure from consumers and governments to be better protectors of resources and act responsibly concerning the environment (Hankammer et al., 2019). In the last few decades, global concerns over climate change as a result of a rising global population and related increasing resource use and environmental impacts raised in developed and developing societies.

Due to the complexity of the SBMs approach there are very limited practical tools developed at the present (Reinhardt et al., 2019). Joyce and Paquin (2016), developed the Triple Layered Business Model Canvas (TLBMC), which *“is a tool for exploring sustainability-oriented business model innovation. It extends the original business model canvas by adding two layers: an environmental layer based on a lifecycle perspective and a social layer based on a stakeholder perspective. When taken together, the three layers of the business model make more explicit how an organization generates multiple types of value e economic, environmental and social”*.

The TLBMC builds on the original business model canvas by explicitly integrating environmental and social impacts through additional business model layers that align directly with the original economic-oriented canvas. Each canvas layer (Figure 2.5) provides a horizontal coherence within itself which also connects across layers, providing a vertical coherence or more holistic perspective on value creation, which integrates a view of economic, environmental, and social value creation throughout the business model (Joyce and Paquin, 2016).

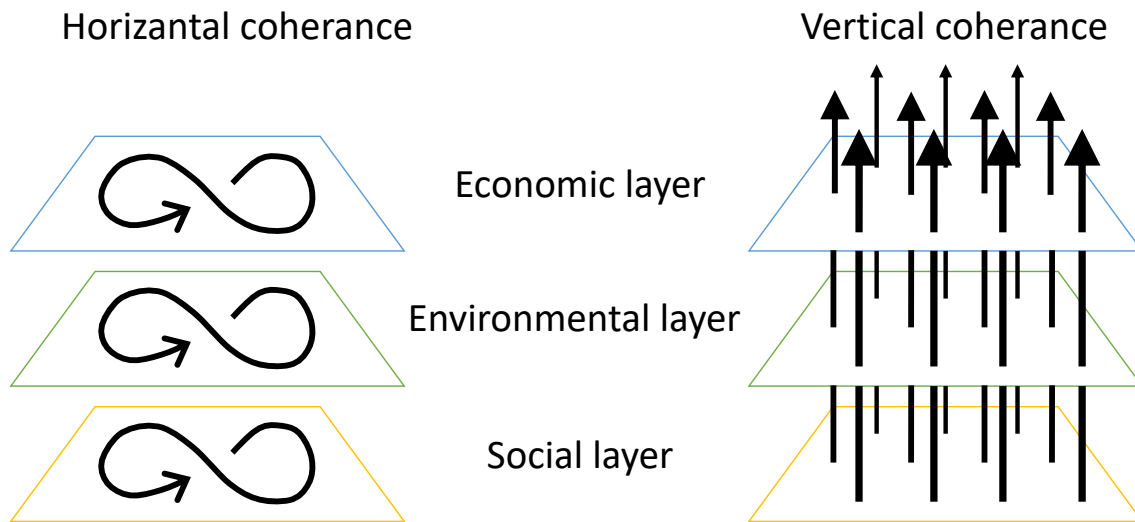


Figure 2.5 Dynamics of the Triple Layered Business Model Canvas and its horizontal and vertical coherence (adapted from Joyce and Paquin, 2016)

2 TLBMC uses the business model canvas proposed by Osterwalder and Pigneur (2010) that
 4 condenses an organization's business model into nine interconnected components: customer value
 proposition, segments, customer relationships, channels, key resources, key activities, partners,
 6 costs and revenues. This canvas's layer has an explicit economic value orientation, although the
 environmental and social value is underlying (Coes, 2014). The TLBMC offers the opportunity
 for users to explicitly address a triple bottom line (Figure 2.5) where each canvas layer is
 8 dedicated to a single dimension and together they provide a means to integrate the relationships
 and impacts across layers (Joyce and Paquin, 2016).

10 The environmental layer of the TLBMC builds on a life cycle perspective of environmental
 impact, which is a formal approach for measuring a product's or service's environmental impacts
 12 across all stages of the its life (Joyce and Paquin, 2016). The environmental layer includes nine
 components: Functional value, Materials, Production, Supplies and outsourcing, Distribution,
 14 Use phase, End-of-life, Environmental impacts and Environmental benefits.

The social layer of the TLBMC builds on an approach, the stakeholder management
 16 approach, that seeks to balance the interests of an organization's stakeholders rather than simply
 seeking maximum gain for the organization itself. Stakeholders are considered those groups of
 18 individuals or organizations which can influence or is influenced by the actions of an organization
 (Joyce and Paquin, 2016). The social layer includes also nine components: Social value,
 20 Employee, Governance, Communities, Societal culture, Scale of outreach, End-users, Social
 impacts and Social benefits.

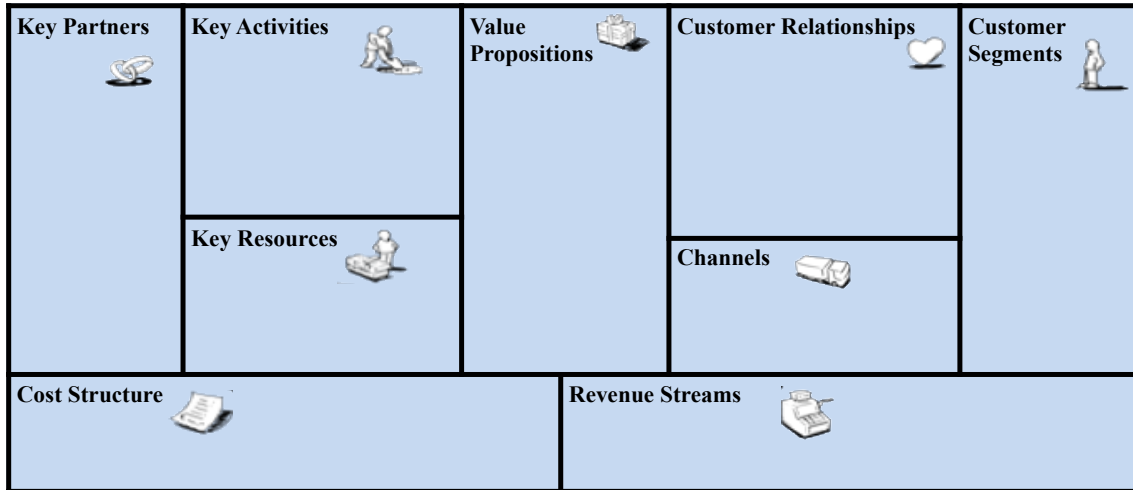
22 As stated by Joyce and Paquin (2016), the application of TLBMC “*expands the economic-*
 24 *centred approach to a standard business model by developing and integrating environmental and*
social canvas layers built from lifecycle and stakeholder perspectives into an extended business”

Chapter 2 – Literature Review

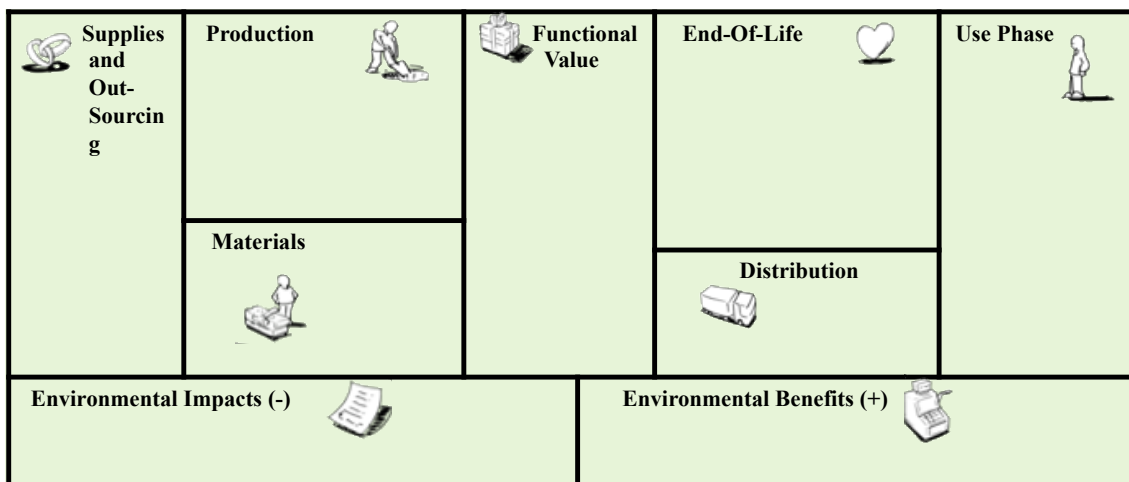
model canvas. This expanded canvas support developing more robust and holistic perspectives on sustainability-oriented business model innovation”.

The application of the TLBMC can be represented as shown in Figure 2.6

Economic layer



Environmental layer



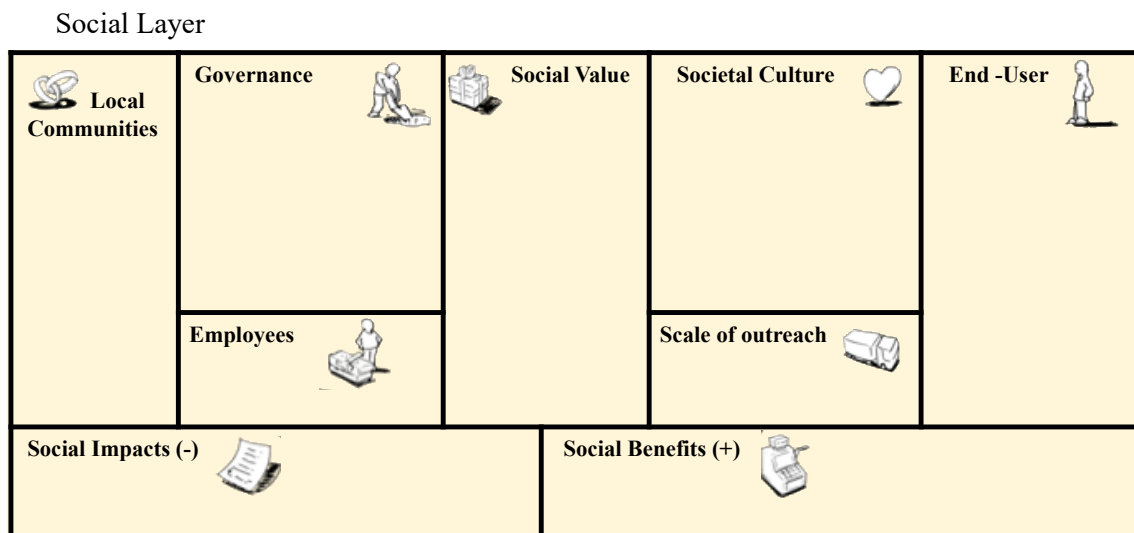


Figure 2.6 Components of the triple layered business model canvas (adapted from Joyce and Paquin, 2016)

2

2.6 Conclusions of the Literature Review

4 This chapter presents the literature review, on the TPM process, and its origin on TEC
 6 program, Business Models and Business Model Canvas, Value Proposition and Value proposition
 8 Canvas and finally Triple Layer Business Model Canvas, as a relevant SBM. Although some
 literature on sustainability business models were explored only the TLBMC was used for this
 study.

10

12

Chapter 3 – Case Study

2 3.1 Introduction to the Case Study

4 As previously discussed in the chapter of the literature review dedicated to the T-P-M
6 process, T-P-M, part of TEC program developed in United States by Barr et al. (2014), in North
8 Carolina State University, is a key construct for generating and capturing of ideas, with a set of
10 tools to find the correct Technology-Product-Market Linkage, being used to successful bridge the
12 Gap between Research and Commercial application.

14 This approach was chosen for application on the NUTRITION TECHNOLOGY of
16 Fraunhofer AICOS due to the alignment to the objectives proposed. In addition, due to time
18 constrains and the specificities of Nutrition Technology case study, some of the steps of TPM
20 methodology were adapted.

22 In this dissertation the methodology design applied was based on case study type. This
24 methodology was chosen as it provides high conceptual validity, strong procedures for fostering
26 new hypotheses and case studies usually allows a lot of detail to be collected that are not easily
28 obtained by other research designs.

30 According to Simons (2009), cit. by Starman (2013), a case study is an in-depth exploration
from multiple perspectives of the complexity and uniqueness of a particular project, policy,
institution, program or system in “real life” and according to Flyvbjerg (2011) “case studies
were one of the first types of research to be used in the field of qualitative methodology”.

3.2 Subject of the case study

22 The subject of this study will be Fraunhofer AICOS and in the Nutrition Technology, part
24 of Fraunhofer technology portfolio - “*To be able to debate a case study, it has to be defined with
26 an analytical framework or object in the constitution of the study*” (Thomas 2011, cit. by Starman,
28 2013).

30 Fraunhofer Society for the Advancement of Applied Research is a German research
organization with 72 institutes spread throughout Europe (each focusing on different fields of
applied science). With over 25,000 employees, mainly scientists and engineers and with an annual
research budget of about €2.3 thousands of millions it is the biggest organization for applied
research and development services in Europe. Fraunhofer Portugal Research Centre (AICOS),

located in Porto and born in 2009 following a partnership between the Fraunhofer Society (Fraunhofer-Gesellschaft), the Foundation for Science and Technology and the University of Porto (UP), has consolidated competences in: Human-Centred Design, Artificial Intelligence and Cyber-Physical Systems.

AICOS' track record in institutional and commercial collaborations has built a wide network of active partners.

Since 2009, AICOS has been involved in 10 European projects and established partnerships with over 150 organizations in 31 countries and has developed and applied several innovative technologies to the most distinct areas of society.

Concerning the case study, it started in February 2019 and was finished in July 2019, after an initial phase of exploring and meetings with several researchers responsible for the Fraunhofer's AICOS technology portfolio. For this study, the technology that was chosen to work by the researcher, was the Nutrition Technology. It was chosen, due to its perceived potential on generating new products and because of the alignment with the proposed objectives.

Nutrition technology uses artificial intelligence to create personalized meal recommendations and provide shopping assistance by combining different sources of information

The system can balance personal preferences, restrictions, nutritional requirements and budget constrains to create personalized weekly meal plans assisting its users in planning their meals. The system can also support its users in planning their meals and shopping, increasing their awareness and helping them to acquire healthier eating habits.

The following steps of TPM were conducted on this work, respectively:

First Phase

- IP Search
- Competition analysis
- Identification of Capabilities and Uniqueness
- Ideation
- Prioritization

The methodology had a second phase, namely:

- Development of 3 Value Proposition
- Development of 2 Business Models
- Triple Layer Business Model Canvas

3.3 Application of TPM in the Nutrition Technology

2 3.3.1 IP Search

4 After a meeting with the two researchers responsible for the nutrition technology, at
Fraunhofer and the study of literature related to the technology in question, an exhaustive search
6 of intellectual property was conducted in WIPO (World Intellectual Property Organization) using
the following key words:

- 8 • Nutritional Intelligence Models
- Diet Tracking
- Nutrition Plan Generation
- 10 • Meal Planning
- Recipe Recommender System
- 12 • Meal Recommendation and Grocery Shopping Assistance
- Integrated Meals Recommendation

14

It was found that there were three most similar patents, namely:

16 **A. METHOD AND SYSTEM TO RECOMMEND RECIPES**, which applicant was ENGEL
Lawrence Cozi Group Inc. Pub. Date 27.03.2014, Country -WO

18 This patent is mostly based on a recipe recommendation system and on a method which
builds and maintains the user and recipe profiles, at the same time matches the user and recipe
20 profiles to recommend recipes, it also changes recommended recipes based on season and other
factors, it uses the explicit and implicit feedback to adjust the user profiles, it integrates mobile
22 computing and grocery delivery services, offering basically a complete service.

24 **B. ASSESSMENT AND ADVICE ON NUTRITION, ENDURANCE, AND STRENGTH**
BREUILLE, which applicant was NESTEC S.A. Pub.Date - 14.08.2014 Country - WO

26 This patent is more directed to older adults with the goal of enhance their quality of life and
independence through a personalized lifestyle and nutrition program, based on an integrated,
holistic approach. This is achieved by measuring the physical status of the adults with respect to
28 their physical activity. In addition, their nutritional status is assessed. According to those data,
recommendations are provided with respect to particular exercise programs and nutrients. These
30 methods can be implemented as a software program and executed on computer systems.

32 **C-INTERACTIVE ENGINE TO PROVIDE PERSONAL RECOMMENDATIONS FOR**
NUTRITION, TO HELP THE GENERAL PUBLIC TO LIVE A BALANCED HEALTHIER

LIFESTYLE, which applicant was COMOCOMO LTD, Pub. Date - 11.09.2014 Country – United States

This patent intends to provide personal recommendations for nutrition based on preferences, habits, medical and activity profiles of users, and budget constraints, using an algorithm and method. The algorithm can also be fed and takes into account real-time feedback from the user. The method allows creating a personal nutritional schedule based on a set of constraints, which are solved using an optimization algorithm to find the diet best fitting each user. The method also includes analysing a single user by applying various statistical techniques, enabling the algorithm to infer the user's preferences and updating the limitations, analysing and clustering the general user population based on statistical principles. This process will give the algorithm insightful information and allowing improved performance by “machine-learning”. By the end, a list of recommended food items/recipes to help users live a balanced, healthier lifestyle will be created.

Note - WO is short for WIPO, indicates that the patent will be administered by this body.

3.3.2 Competition Analysis

An analysis of the competition was made using App Store and Google Play and an online search. This was done with the objective of knowing what is already on the market in terms of products and services similar to Nutrition Technology. This search revealed the existence of similar competitors with the Nutrition Technology in the market, namely the products designated by Nudge, MyFitnessPal, Nutrino – Food Print, Lose It! (Table 3.1).

The Nudge is essentially a simple manual tracker to complement synced apps and helps the user get comfortable monitoring their daily routine. It tracks the user nutrition, hydration, exercise, sleep, and weight. It revealed that communities that connected people with health shared interest.

The MyFitnessPal tracks diet and exercise to determine optimal caloric intake and nutrients for the users' goals and uses gamification elements to motivate users. It offers the possibility of the users can either scan the barcodes of various food items or manually add them in the database of over five million different foods. Besides this it works in conjunction with over 50 devices and apps including Fitbit and Garmin wearable devices.

The Nutrino – Food Print app uses medical and physical profile, eating habits, preferences, and creates a meal plan tailored to fit the user needs. It enables the user to understand how their bodies respond to the choices they make.

The last competitor, named Lose It!, offers the user a personalized daily calorie budget and weight loss plan, tracks meals and moves with food and exercise databases plus tracking tools. In

addition, it connects devices, fitness trackers and apps for seamless activity and biometric tracking.

Table 3.1 Assembling the several characteristics of the products used in Competition Analysis

	Nutrition	Food Print Diet Nutrino	MyFitnessPal	Lose it!	EatThisMuch	Nudge
Automatic Meal Planning	√	√	•••	•••	√	•••
Food Journal	•••	√	√	√	√	√
Deliveries at Home	√	×	•••	×	√	×
Shopping Assistance	√	×	•••	×	√	×
Consideration of Budget Constraints	√	×	×	×	√	×
Activity Monitoring	√	•••	√	√	•••	√
Mobile App Interface	•••	√	√	√	√	√
Healthy Choices	√	√	•••	•••	√	√
Community	•••	•••	√	√	√	√

* Legend: √ - Offered; × - Not offered; ••• - Partially offered

3.3.3 Identification of Capabilities and Uniqueness

Capabilities

The identification of the capabilities was conducted to find out in concrete what it does, applications, and technology advantages, thinking about what the existing Nutrition Technology can enable a product or a service to do. This was done after analysing literature, provided by Fraunhofer, related to technology and information provided by the researchers. Having in mind the capabilities identified and the two previously steps – IP search and competition analysis – the unique characteristics of the nutrition technology was identified. The level of uniqueness is related to how hard it is to replicate a capability, and the ability to sustain a technical advantage. Following this step, a meeting with the researchers responsible for the Nutrition Technology was

conducted, to present the capabilities and uniqueness perceived by the author, where feedback and discussion occurred

By the analysis of the two articles provided by the researchers responsible for the Nutrition Technology (Oliveira, 2017, Ribeiro et al., 2019) the several capabilities were perceived. Namely a Meal Planning Recommender System.

This service supports all the decision-making processes related to nutrition and the planning of meals. In order for the system to generate adequate meal plans, a user profile - anthropometric data, dietary preferences, activity data and budget constraints is set.

Another capability of Nutrition Technology is a Food/ Groceries Delivery System, that supports the user doing their grocery shopping at home, when such is selected as a food provisioning option. It's used for two purposes - to get access to food products data, such as availability, price or package size and to allow users to create shopping orders on the integrated supermarket.

A third capability is the Ready-made meal delivery. However, this just happens if the meal plan includes a ready meal provider. Here the application will connect to the ready meal suppliers' catalogue.

The Activity Monitoring is another capability of this product. Here, the system is able to collect, and display calories burned, steps and active time. The Activity Monitoring component is responsible for collecting user activity data and feeding those data to the recommender engine. In order to do that the system can be connected to an activity monitoring device such as a Fitbit bracelet.

The last capability recognized was the possibility of Mobile Application. The main purpose of the mobile application is to provide access to meal recommendations, and to allow the user to generate personalized meal plans. In addition to the meal planning, the mobile application also includes a shopping list assistance module to manage the groceries delivery services. The chart representing the capabilities assumed is represented in Figure 3.1.

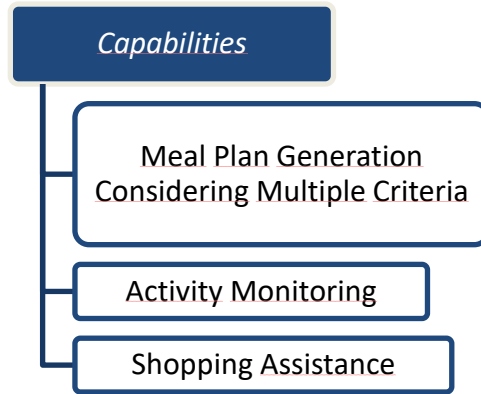


Figure 3.1 Capabilities of Nutrition Technology

2 After a meeting with the researchers, through some discussion and feedback, the main
capabilities highlighted and selected as more important were Meal Plan Generation Considering
4 Multiple Criteria, Activity Monitoring and Shopping Assistance.

6 **Uniqueness**

8 After the IP Search, the competition analysis, the meeting with the researchers and the study
of literature, the following unique characteristics of Nutrition Tech were identified, namely it is
10 the only one that combine healthy meals recommendations, activity monitoring and
food/groceries delivery's, that takes in consideration the cultural factor and is directed to older
adults' specificities. In Figure 3.2 is presented the chart of the uniqueness of Nutrition Tech.

12

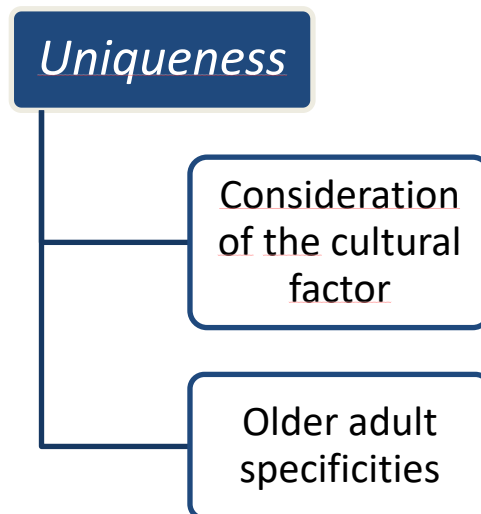


Figure 3.2 Uniqueness of Nutrition Technology

3.3.4 Ideation

2 For this step a workshop with eight participants (researchers responsible for the nutrition
technology, business and R&D personal from Fraunhofer) was conducted. Having in mind the
4 capabilities of the nutrition technology identified previously, the goal of this session was the
identification and generation of several new products, services and different markets, based on
6 the capabilities and uniqueness of the nutrition technology under analysis.

The Ideation workshop originated 38 ideas centred on the Nutrition Technology. The list of
8 these ideas was the following:

- Directed to the grandchildren or children, to help the elderly to have a healthy diet
- 10 • Directed to municipalities in the interior, together with social services, to help feed the
most isolated populations
- 12 • Have a custom recipe guide
- Be a planning for canteens
- 14 • Products must be suggested by seasons and periods of the year
- Be associated with government alerts such as heat spikes
- 16 • Nutritionist monitoring tool - Patient
- Dietitians Tool
- 18 • Have integration with Audio-Nutritionists software
- Have integration with local producers and / or fresh products, directly to the user (2)
- 20 • Include info about carbon footprint / environmental footprint
- Include a certification of origin of products
- 22 • Specialization in diseases (2x)
- Integration with intelligent refrigerators (2x)
- 24 • Canteens (2x)
- Feed feedback intakes loggers / lossers
- 26 • Hospitals to diversify meals
- Homes (diversify meals)
- 28 • Nutritional information provided (2x)
- Homes (Info)
- 30 • Collars - dogs and cats

Chapter 3 – Case Study

- Nutrition plan for pets
- 2 • Integrate into pet food
- Tool to support online shopping and recommend dishes to remember missing ingredients
- 4 • Integrate nutritional values into vending machines
- Geographic location
- 6 • Food education for children
- Integration with culinary demonstration video
- 8 • Niche groups (Athletes, Losing weight ...)
- Healthy Nutrition Social Network
- 10 • Channel for a retailer
- Service for another App
- 12 • Inclusion of traditional recipes (Healthy).

During the workshop, these ideas were grouped in a chart based on the difficulty to implement and the originality of the idea. This chart, named Now Wow How Matrix should contain two axes, with the vertical representing difficulty of implementation and the horizontal axis representing the degree of innovation. On the 2 x 2 grid formed, the three categories are located at the bottom left (now), bottom right (wow) and top right (how), with the top left block

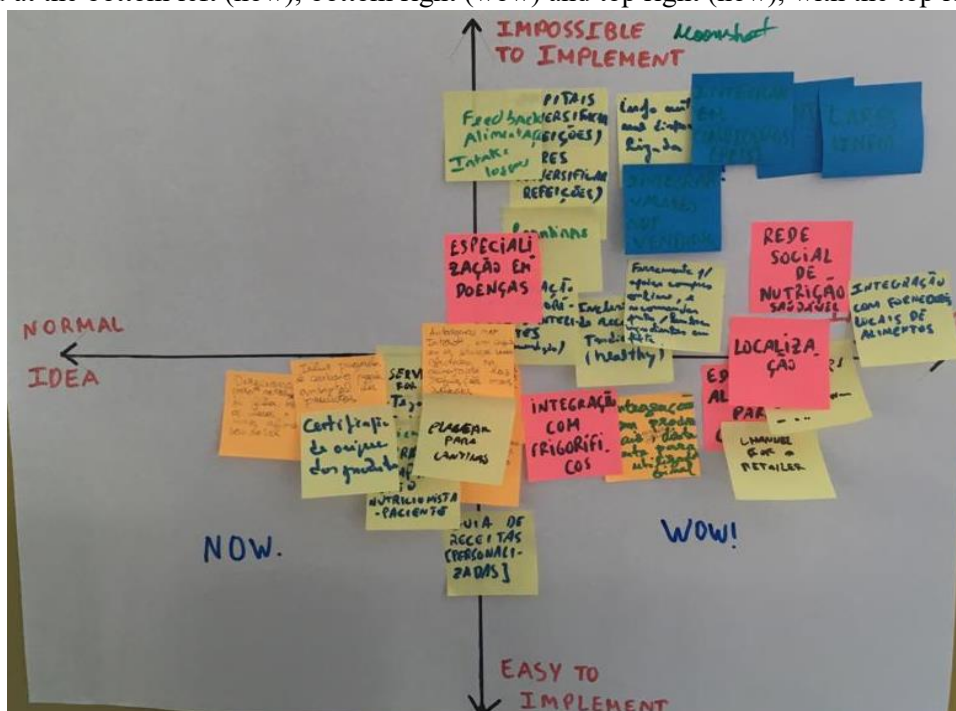


Figure 3.3 Chart representing the “Now Wow How Matrix” of the ideas

Chapter 3 – Case Study

left blank to represent ideas which are impossible to implement (Figure 3.3). It provides an easy-to-follow formula for evaluating the viability of ideas as well as their innovativeness.

After this seriation, these ideas were divided in groups of possible products. One of these groups would be a Nutritional Recommendation System - This group is intended for all products in which the core capability and nutritional recommendation are closer to nutrition technology at present. The ideas to be included are the following:

- Directed to the grandchildren or children, to help the elderly to have a healthy diet
- Municipalities in the interior, together with social services, help feed the most isolated populations
- Nutritionist monitoring tool - Patient
- Dietitians
- Integration with Audio-Nutritionists software
- Hospitals to diversify meals
- Homes (diversify meals)
- Homes (Info)
- Food education for children

The second group is named Information System - This group is intended for all products related to the provision of nutritional information, and it is up to the end-user, to be able to evaluate it freely. The ideas to be included are the following:

- Integrate nutritional values into vending machines
- Nutritional information provided
- Feed feedback intakes loggers / lossers

The third group is named Veterinary - This group is composed of products intended for veterinary nutrition. The ideas to be included are the following:

- Collars - dogs and cats
- Nutrition plan for domestic animals
- Integrate into pet feeder

Chapter 3 – Case Study

2 The fourth group is named Consumables Information - This group is composed of products
that provide information on the production and distribution of food, considering ecological and
environmental factors. The ideas to be included are the following:

- 4 • Products suggested by seasons and periods of the year
- Integration with local producers and / or fresh produce, directly to the user (2)
- 6 • Include carbon footprint / environmental footprint
- Certification of origin of products

8 The fifth group is named Social Hubs / Media Content - This group is composed of products
that have a strong component of social interaction and connectivity. The ideas to be included are
10 the following:

- Social Network of Healthy Nutrition
- 12 • Integration with video demonstration of cooking
- Tool to support online shopping and recommend dishes to remember missing ingredients

14
The sixth group is named Recipes Generation / Database - This group consists of all products
16 that generate revenue from the end-user specifications. The ideas to be included are the following:

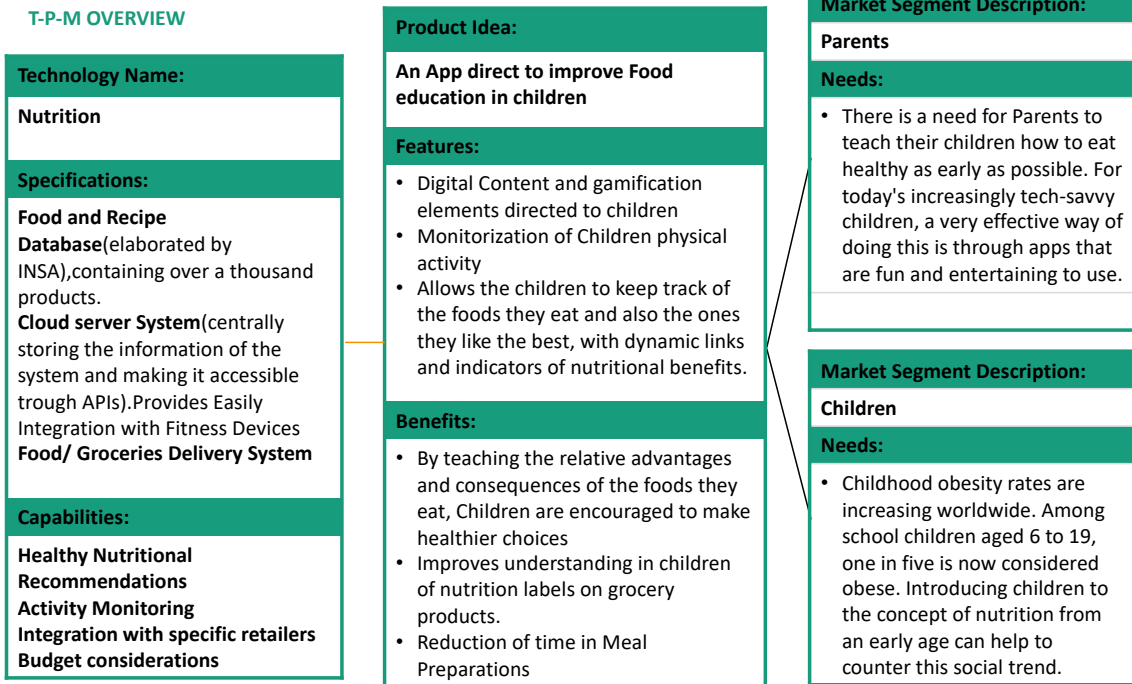
- Custom Recipes Guide
- 18 • Inclusion of traditional recipes (Healthy).

20 The seventh group is named Integration with another Apps / Services. The ideas to be
included are the following:

- 22 • Channel for a retailer
- Service for another App

24
Finally, of the 38 ideas generated in the Ideation process, a triage was made, some similar
26 ideas were put together and only ten ideas were selected for the creation of Technology - Market
- Product Fit tables (Annex II), one example presented below in Figure 3.4.

TECHNOLOGY–PRODUCT–MARKET (TPM) PRESENTATION



2 **Figure 3.4 Model of Technology-Product-Market linkage tables developed after the**
 4 **meetings.**

6 After the generation of multiple ideas (38 ideas), they were divided in ten big groups and
 8 build Technology-Product-Market linkage tables, for each of them. For this phase two meetings
 10 with professors from FCNAUP were conducted. Several aspects related to nutrition in the broad
 sense and needs of the potential market segments where discussed and were essential for the
 elaboration of T-P-M linkage tables, presented in Figure 3.4.

12 **3.3.5 Prioritization**

14 After building the T-P-M linkage tables, a second workshop was conducted for the selection
 16 of three main ideas of potential products and services to be worked on the second phase. The same
 eight participants of the previous workshop were present and based on a criteria matrix developed
 by the author and with the contribution from the participants, the three main ideas for the
 continuation of the case study were selected.

18 In group, a score ranging from 1-5 was given to the criteria's for each idea. Three ideas
 were selected for working on the next phase, that are highlighted in green in Table 3.2.

2 **Table 3.2 The ten ideas that originate the Technology Product Market**

A -Nutritionist-Patient monitoring tool	F - Improve Food education in children
B – Integration with Local Producers	G –Integration in SmartFridges
C - Carbon/environmental footprint and Biological products	H –Specialization in diseases
D -Nutrition plan for domestic animals	I - Social Network of Healthy Nutrition
E -Nutrition of most isolated populations	J - Display of Nutritional Information – VendingMachines

4 From this point on, and in alignment with case study objectives, the development of the
 6 BMC, VP and TLBMC was focused on the Nutritionist – Patient monitoring tool product proposal
 8 – one of the top voted option in the prioritisation phase, since is the one were the current Nutrition
 Tech capabilities and uniqueness are best related. However, since Fraunhofer and the author
 demonstrated interest in the process being used on the other prioritized ideas, another BMC,
 TLBMC and two VP were developed, that will also be discussed in next chapter.

10 **3.3.6 Value Proposition Canvas - Nutritionist Patient monitoring tool**

12 A value proposition canvas was developed by the author using the chart available on
 www.strategyzer.com, as presented below in Figure 3.5.

14 The right side of a Canvas, is the customer profile, focused on the customer, and the left
 side, is the Value Map, focused on how our product solves the customer problem (Osterwalder et
 al., 2014)

16 By using the Value Proposition Canvas, developers behind a potential product, search for
 18 what the customer really want, the issues they are experiencing, how these can be solved, and
 what are their “pains” and “gains”.

20 **Nutritionists –Patient Monitoring Tool**

22 The canvas idealized for the Nutritionists –Patient Monitoring Tool is represented in
 Figure 3.5.

Chapter 3 – Case Study

2 The right side of the canvas was built using information available online concerning
problems that Nutritionists face nowadays, using feedback from friends in the area and using
personal reflection on the subject.

4 As it is showed in the VPC it exists a clear relation between the Gains – Gains Creators, and
Pain – Pain relievers. For example:

6 The “Tracking of patient’s physical activity and eating habits at home” (Gains)– is related
with “Activity monitoring tool through activity measure devices” (Gains Creators).

8 Also, “Cultural Awareness (Different Cultures eat different foods) (Pains) is related with
“Database of cultural food” (Pains Relievers). The “How to know that their patients have adapted
10 the new chances consistently” (Gains) is related with “Monitoring tool that can follow and interact
with patients outside the clinic” (Pains Relievers), and finally, the “Specific characteristics of
12 each patient (diets, conditions, diseases, religion) (Pains) is related with “Meal plan generation,
specific for each patient, taking in account anthropometric data, allergies, diseases, etc. (Pains
14 relievers).

16 Most of the characteristics of left side of the canvas (value map), the pain relievers and gain
creators were build using the capabilities previously identified (activity monitoring, meal plan
generation based on anthropometric data) and uniqueness (data base of cultural food).

18 After the canvas was done, a meeting with a Nutritionist, arranged by Fraunhofer was set, to
find out if the reasoning behind the work was valid and corresponds to the reality.

20 After this meeting the customer jobs were validated, and some other important conclusions
can be taken. In the Pains block, it was explicit for the nutritionist, the difficulty in today
22 multicultural cities, to make recommendations for different cultures (culture awareness) and the
correspondent Pain Relievers provided by our proposed product (database of cultural food), was
24 perceived as a great feature.

26 Another point with a strong emphasis was the difficulty to provide recommendations to
specific conditions (diabetes, allergies) and to people who are vegans or followed a specific diet,
like the paleo diet.

28 In the gain creators, a previous assumption made by the author of online paying options was
not considered important and was excluded from the canvas.

30 A product like this one proposed was considered an important complement for the
nutritionists, but it does not replace the professional contact provided by them nutritionist.
32

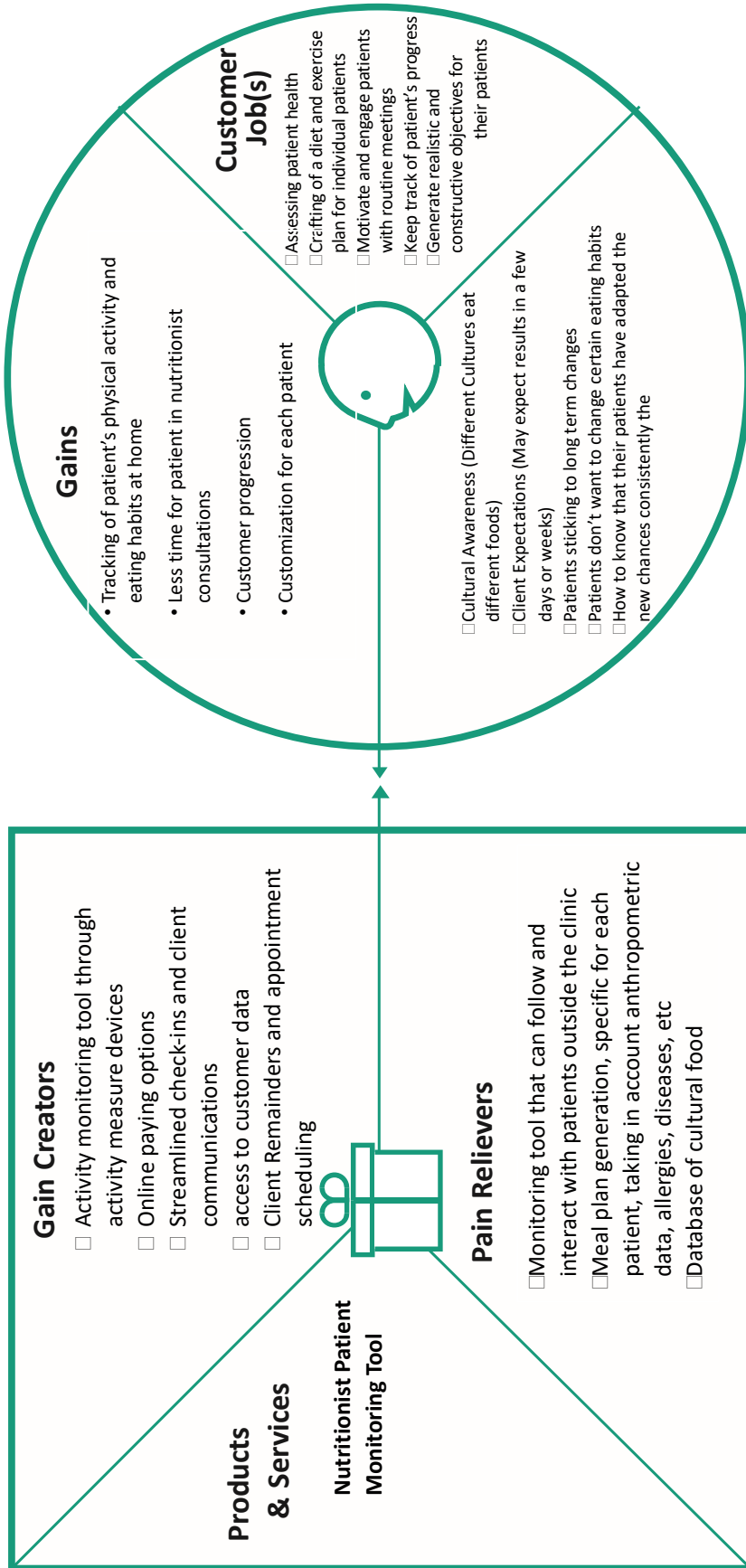


Figure 3.5 Customer profile (right) and value plan (left) of the Nutritionists Canvas

3.3.7 Business Model Canvas (BMC)

2 A Business Model Canvas (Osterwalder & Pigneur, 2011) were developed using the chart available in Strategizer as shown in Figure 3.6.

4










Key Partners  Nutritionists Fraunhofer SNS	Key Activities  <ul style="list-style-type: none"> • Software Development and Maintenance • Constant updates of food Databases • Keeping Up to date with the latest nutritional Research and Trends 	Value Propositions  A digital tool to support the nutritionist in the nutritional recommendations, integrated with activity monitoring devices and specific for each patient;	Customer Relationships  Get: <ul style="list-style-type: none"> • Advertising in health and Nutritional Magazines • In person “Pitch” Meetings in Nutritionists Congresses and Events Keep: <ul style="list-style-type: none"> • Tech Support • Software Updates – Regular Updates of Foods Databases Grow: <ul style="list-style-type: none"> • Word of Mouth 	Customer Segments  Nutritionists
	Key Resources  <ul style="list-style-type: none"> • Platform • Fraunhofer Nutrition Tech and Expertise 		Channels  <ul style="list-style-type: none"> • AppStore • Website • Sales Team 	
Cost Structure  <ul style="list-style-type: none"> • Platform development and Maintenance • Human Resources 		Revenue Streams  <ul style="list-style-type: none"> • Yearly Subscriptions 		

Figure 3.6 Business Model Canvas of the Nutritionists proposal

6

8

3.3.8 TLBNC

2 The Environmental and Social layers of the TLBNC for the Nutritionists Patient Monitoring tool are presented in Figure 3.7.

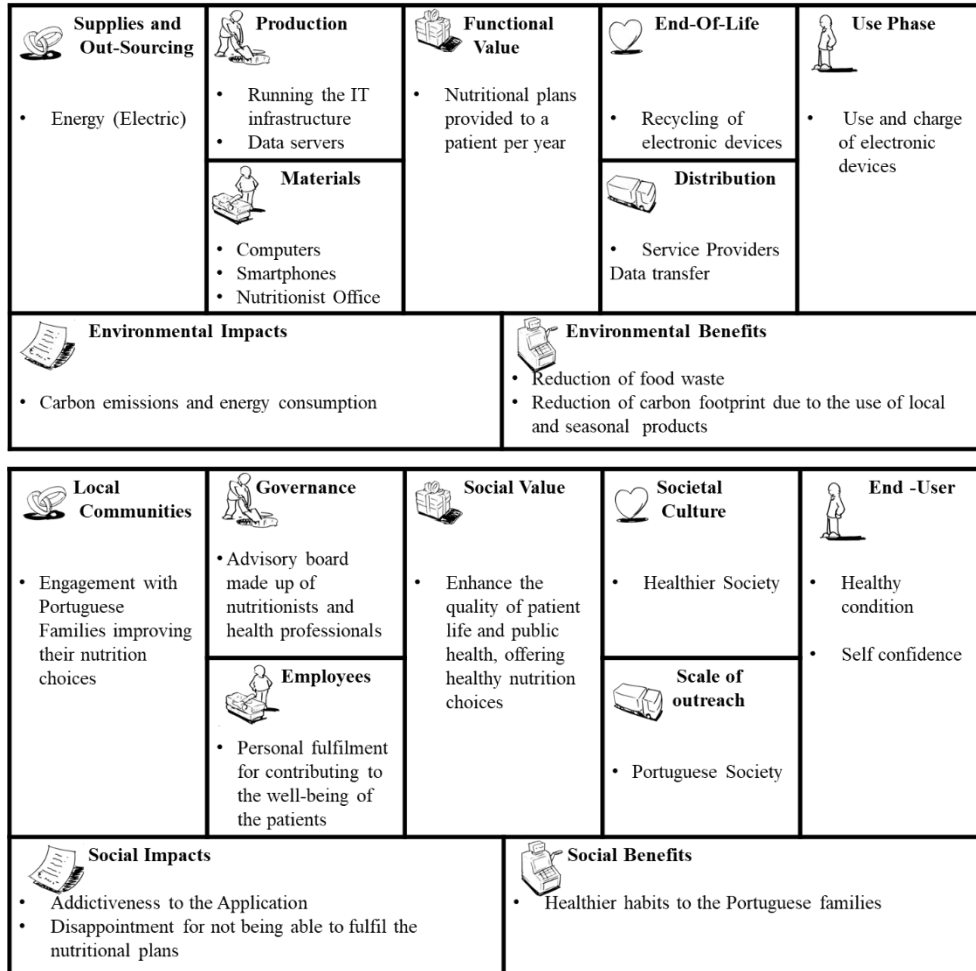


Figure 3.7 Environmental (up) and social (down) layer of the triple layer business model Canvas of the Nutritionists Patient Monitoring tool

4 3.4 Conclusion of the case study

6 This chapter presents the steps and outcomes of the application of the TPM process to the Nutrition Technology and VP, BM and TLBMC that result from that process.

8 For the realization of this work five meetings with the researchers responsible for the Nutrition Technology were conducted as well as two workshops with eight participants from Fraunhofer and two meetings with Professors from FCNAUP.

10 The BMC and the VPC developed for the nutritionist’s segment were present for validation to a nutritionist.

Chapter 4 – Critical Analysis of the Case Study

4.1 Introduction

This chapter analyses in a first phase the application of TPM process to the Nutrition Technology, explaining the difficulties and conclusions behind each step developed. The second phase is focused on the VPC and TLBMC

4.2 Critical Analysis – Phase 1

IP Search

The self-funding agency of the United Nations, the World Intellectual Property Organization (WIPO), have data on Patents from 192 members – states. The author chose to do the search in WIPO as is the most complete database of patents available. By using the keywords “Nutritional Intelligence Models”, “Diet Tracking”, “Nutrition Plan Generation”, “Meal Planning”, “Recipe Recommender System”, “Meal Recommendation”, “Grocery Shopping Assistance” and “Integrated Meals Recommendation” 34 relevant results similar to the Nutrition Technology come by (Annex III).

This step was done with the aim of finding prior art to know if the technology proposed is relevant in terms of novelty and to know what in later stages is better not to explore, that may eventually lead to IP infringement.

When the results were grouped by country, it was apprehended that 15 were from United States; 14 from WO; 3 from China; 1 from the European Union and one from Singapore. WO is short for WIPO, indicates that the patent will be administered by this body.

When the search results were sorted by date, it was found that 5 were from 2000/2010, 12 from 2010/2015 and 17 from 2015/Present – 17, being clear the increase of the importance of nutrition recommendation digital applications and lateral related subjects for the population. Finally, when the search was sorted by Target Segment, the results showed that 26 were addressed

to General Public, 3 to Athletes, 2 to Older People, 1 to Children and 2 to Restaurants\Chefs which in the author opinion, can be translated in the potential to explore some niche markets, as the majority of the patents focus on the general public.

Competition Analysis

After the competition analysis was made, it was possible to perceived that several similar products with the Nutrition Technology are already available in the market, although being less relevant in the Portuguese Market than abroad, and that can be explored by Fraunhofer in the near future, by focusing their technology on the characteristics of the Portuguese population.

There were some difficulties felt in the competition analysis, as there are many nutritional applications available on the market, and was a time-consuming task, figuring out their characteristics and which ones were similar to the Nutrition Technology.

Identification of Uniqueness and Capabilities

This was probably the step on the application of TPM process, were most difficulties were felt, as the author doesn't have an academic background to perceived some of the more technical characteristics behind the Nutrition Technology, and one were the help and feedback from the researchers responsible for the technology was fundamental.

Ideation

As previously presented, for this step, a workshop with eight participants was conducted. In retrospective the objectives of the session should have been better explained to the participants, as some dispersion and a little thinking "out of the box" occurred. Of the 38 ideas for potential products generated, some of them were practical impossible and were not build on the capabilities of the nutrition technology. A second workshop should have been proposed, to do a group triage and analyse the practical implications of some the 38 ideas.

Prioritization

For this step, as in the previously one, a workshop was conducted, with the same eight participants from the ideation workshop. It was presented to the participants, ten technology-product- market fit tables and three proposal products were selected to continue to work on, based on a criteria matrix. Another workshop should also have been conducted on this stage, as for time constraints, there wasn't enough time to properly explore all the possibilities and implications of each idea, which ultimately could have led to another potential products been selected.

4.3 Critical Analysis – Phase 2

2

Value Proposition Canvas

4 As discussed in the previous chapter, in parallel to the main idea selected to work on the case
6 and discussed.

8 **App specialized in diseases, for doctor's usage**

10 Information provided by the literature (Labbé, 2015 and Ahmed et al., 2016) was used in the
12 construction of this canvas. Based on them it was possible to understand the challenges faced by
the sector in nutrition area. The canvas is presented in Figure 4.1.

14 Here, relations between the gain/gain creators and pains/pains relievers are also explicit, for
16 example, “recognizing when and where nutrition is a major factor for the health of the patient and
develop the knowledge and skills to offer advise”(Gains) and “Tool to identify for each health
condition how much impact nutrition have” (Gain Creator).

18 In a meeting where the canvas was presented to the researchers a question arises, related to
the definition of the target segment, the doctors. It is a broad segment that should be better defined,
there is a lacking in specification on what type of doctor, types of patient and conditions that the
20 target segment must deal.

22 This canvas also lacks validation from a professional in the area.

Local Producers

24

To create this canvas the author discusses with interlocutors having experience in production
26 and commercialization of agricultural products and in literature (Renwick, 2014 and www.
foodandagpol icy.org. 2012). The canvas is presented in Figure 4.2.

28 The relations between Gains -Gains Creators were also explicit. Bigger Margins (Gains) and
Selling directly to the end – customer (Gain Creators) are recognizable, wider market (Gains) and
30 (Integration with a network of producers, that allows to reach more customers) (Gains Creators)
are also detectable as well as in the case of Pains -Pain Relievers, in Logistics and Billing (Pains)
32 and Management Software, for online payment and communication between local producers and
customers (Pain Relievers).

34 After this canvas was created, it was presented to the producers, for validation, feedback and
discussion. It was received with great interest, with relevance made to the margins lost when they
36 sell to big retailers instead directly to main customer.

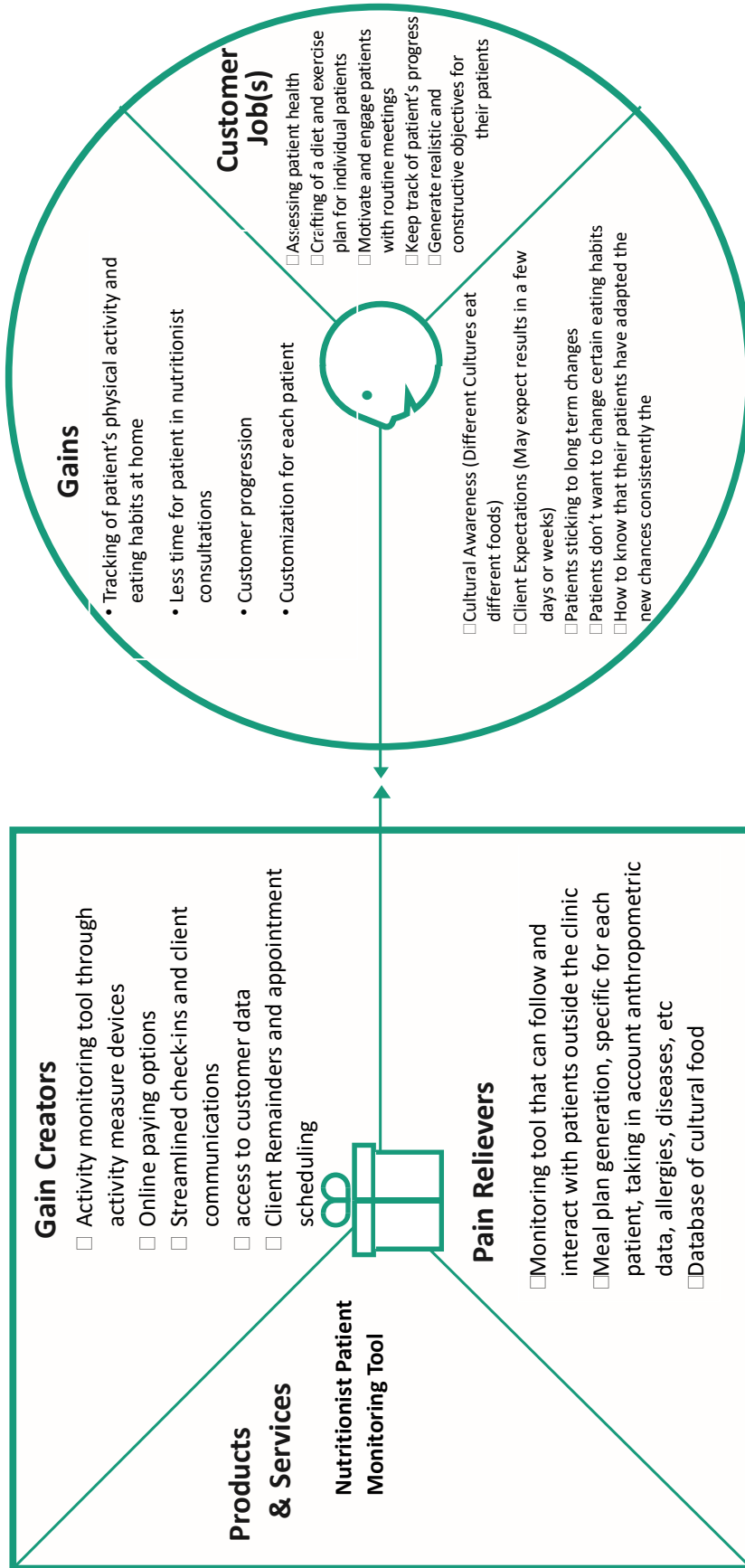


Figure 4.1 Customer profile (left) and value plan (right) of the Doctor's Canvas

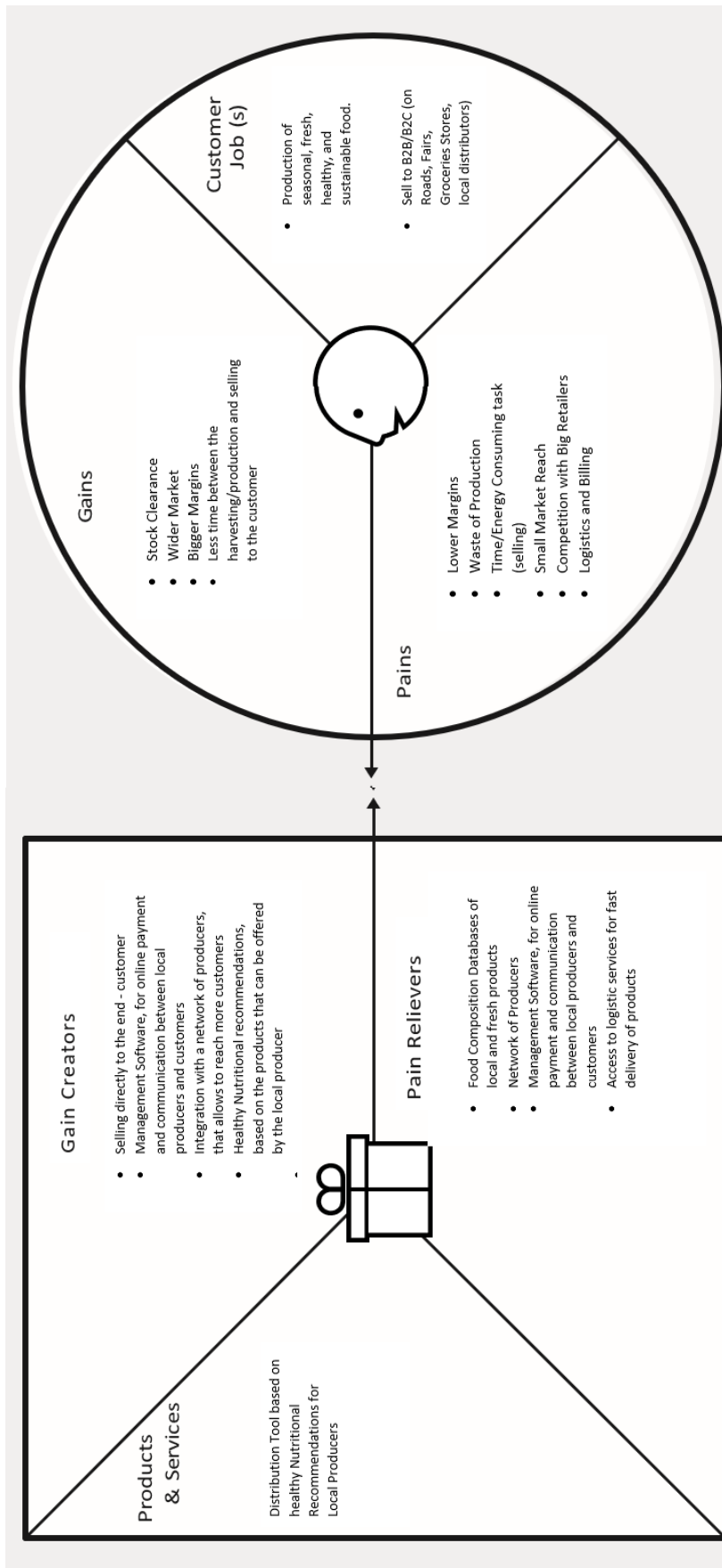


Figure 4.2 Customer profile (above) and value plan (below) of the Producers Canvas

Triple Layered Business Model Canvas

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The Figures 4.3, 4.4 and 4.5 show the three layers of the TLBMC for local Producers. The economic layer in Figure 4.3, the environmental layer in Figure 4.4 and the social layer in Figure 4.5.

For the development of the environmental layer, it was taking in consideration the carbon emissions, water and energy consumption as environmental impacts.








Key Partners  Producers Cooperatives Logistic Companies Fraunhofer	Key Activities  <ul style="list-style-type: none"> Transportation of fresh products from A-B Integration between the suppliers Integration Between Nutrition App and Local Producers Network Software Development 	Value Propositions  A digital tool, that provides to the producer a broader market to sell its agricultural production without being concerned with the billings and deliveries.	Customer Relationships  Get: <ul style="list-style-type: none"> Advertising in Agricultural Magazines In person "Pitch" Meetings Keep: <ul style="list-style-type: none"> Tech Support Software Updates Grow: <ul style="list-style-type: none"> Word of Mouth 	Customer Segments  Local Producers
Cost Structure  <ul style="list-style-type: none"> Platform development and Maintenance Sub – Contracting of Logistic Companies Human Resources 		Revenue Streams  <ul style="list-style-type: none"> Monthly Subscription Fee on transactions on products sold by the producers using the platform 		

Figure 4.3 Economic layer of the triple layer business model Canvas of the Local Producers proposal

Chapter 4 – Critical Analysis of the Case Study










 <p>Supplies and Out-Sourcing</p> <ul style="list-style-type: none"> Local Production Fuel for food Transport Energy and Water for processes 	 <p>Production</p> <ul style="list-style-type: none"> IT infrastructure Transport of agricultural products 	 <p>Functional Value</p> <p>A typical basket of vegetable products (salads, fruits and vegetables) once weekly multiplied by the number of consumers over the period of one year</p>	 <p>End-Of-Life</p> <ul style="list-style-type: none"> Waste and residue management 	 <p>Use Phase</p> <ul style="list-style-type: none"> Food preparation and cooking Washing and cleaning
 <p>Materials</p> <ul style="list-style-type: none"> Vegetable products supplied Packaging materials 	 <p>Distribution</p> <ul style="list-style-type: none"> Vehicle and fuel for Transportation Packaging and Warehouse infrastructure 			
 <p>Environmental Impacts</p> <ul style="list-style-type: none"> Carbon emissions, water and energy consumption 		 <p>Environmental Benefits</p> <ul style="list-style-type: none"> Reduction of carbon footprint due to the use of local products with transport, processing and refrigeration reductions 		

Figure 4.4 Environmental layer of the triple layer business model Canvas of the Local Producers proposal










 <p>Local Communities</p> <ul style="list-style-type: none"> Engagement with local communities of producers in a sustainable farming program and development of successful supplier relationships with them 	 <p>Governance</p> <ul style="list-style-type: none"> Actively engaging stakeholders in Green Thinking Transparency dealing with producers 	 <p>Social Value</p> <p>Creating shared value and sustainable growth from mutually beneficial relationships with local agricultural producers</p> <p>Development of local economies</p> <p>Fresh and Healthy products to the end user</p>	 <p>Societal Culture</p> <ul style="list-style-type: none"> Strong social responsibility practices that respond to present societal challenges 	 <p>End -User</p> <ul style="list-style-type: none"> Bigger Market Improved Quality of life
 <p>Employees</p> <ul style="list-style-type: none"> Local Employers, to the transportation and managing of the warehouses Training activities Strong relationship with end users 	 <p>Scale of outreach</p> <ul style="list-style-type: none"> Local Regional Areas 			
 <p>Social Impacts</p> <ul style="list-style-type: none"> Potential competition between local producers 		 <p>Social Benefits</p> <ul style="list-style-type: none"> Reduction of unemployment Increase income to local communities and producers 		

Figure 4.5 Social layer of the triple layer business model Canvas of the Local Producers proposal

4.4 Comparison between Canvas

2 A Canvas was generated by Fraunhofer for dietitians (Figure 4.4) that were only
presented to the author in the end of this work, so that bias didn't occur in the generation of the
4 canvas. After application of TPM, it is possible to conclude, comparing the VPC of the
Nutritionists to the VPC of dietitians, originated a more refined Value Propositions, than the
6 previously one, made by Fraunhofer, with more defined target Segments, more In-depth
Exploration of the Pains/Pains Relievers, and Gains/Gains Creators of the Target Segment was
8 achieved which is only natural due to the number of people and feedback involved, the time spent
and the application of the TPM process.

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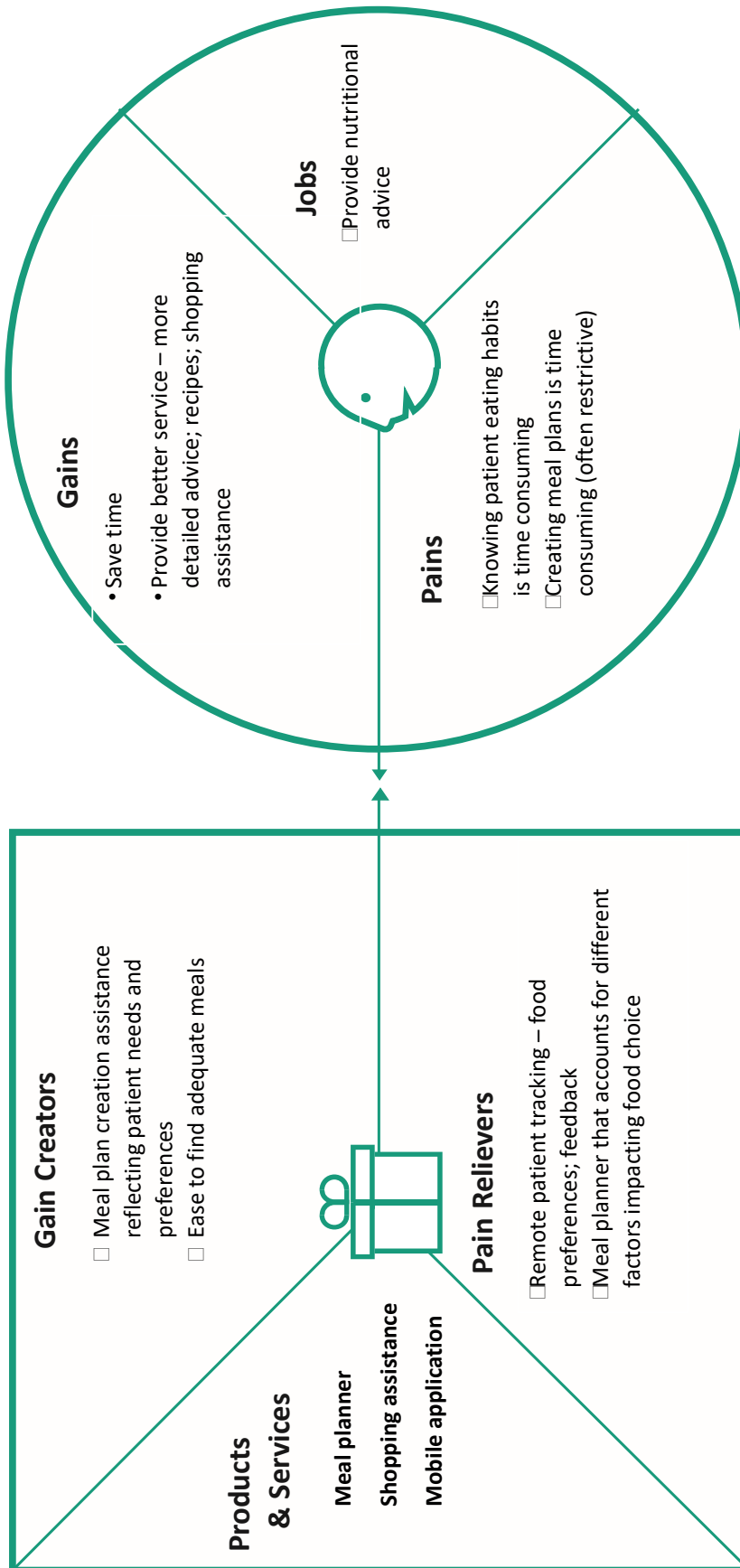


Figure 4.4 Customer profile (left) and value plan (right) of the Dietitians Canvas (from Fraunhofer)

4.5 Conclusion to the critical analysis

- 2 This chapter presents the conclusions and difficulties faced in the application of the TPM process,
a discussion on the VPC created and comparison between a canvas previously created by
4 Fraunhofer and one created during this work. In addition, additional work developed during the
application of the TPM process, and not discussed in the previously chapter is also presented.
6

Chapter 5 -Conclusions

5.1 Difficulties faced during the case study

After the conclusion of this work, the major difficulty presented was related to time constraints – for the complete exploration of all potential products and customer segments, more months of work were necessary. In addition, more workshops and meetings were necessary, although neither Fraunhofer nor the investigator were guilty of this fact. Work and compromise routines made it impossible. Another issue that occurred was the lack of validation of more of the generated possible products to more potential customers, because in the time available it was not possible to arrange or make these contacts.

The last issue relates with the application of the TLBMC as there is few academic research and publications available.

5.2 Conclusions

After the conclusion of this work, it's safe to say that the Nutrition Technology presents a great potential for the development of new products, and an array of markets to be explored in the future. The objectives proposed were accomplished, as a potential new product were defined, also a value proposition canvas and a triple layer business model canvas were created for that product and validated by a potential customer. In addition, two more VPC and a TLBMC were created for other possible products.

The inclusion of the triple layer business model canvas, that presents another two layers – environmental and social – to the traditional economic one, contributes to the nowadays pressing matters of environment and sustainability.

5.3 Future Work

The inclusion of the TLBMC should be included in future works of this type, as it was in this one, as there relatively few works and studies available, due to the fact that most continues to focus on only the economic part, the traditional BM, and don't take into account the sustainability and the environment, that are such relevant issues for our society future.

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Appendix

Annex I

Synthesis of Scopus research

Authors and Year	Keywords and Concepts	Conclusions and Future Research
<p>Dranev & Chulock, 2015</p>	<p><i>Technology road mapping, Economic model Multifactor productivity, Technology-push, Scenario analysis</i></p> <p>This Paper presents a new approach to technology road mapping. Unlike the traditional methodology of TR that mostly relies on qualitative techniques, the proposed approach combines qualitative and quantitative methods. Technology impact is measured in terms of output growth of the industry</p>	<p>This approach has certain limitations as it is based on many inputs for different product groups and retrospective parameters are not always available. The same problem may arise when we are looking for scenarios for macro parameters. The simplification of the model also poses some risks. Further research could consider the effect of technology on the parameters of other product groups and estimate the demand for substitutes, which can change with the growth of output due to material costs.</p>
<p>Anokhin, Wincent, & Frishammar, 2011</p>	<p><i>Misfit technology, Technology commercialization, Open innovation, Commercialization modes</i></p> <p>This paper develops the novel concept of misfit technology, which are not aligned with a firm current knowledge but can still be of great value to them if alternative commercialization options are considered. By developing a framework, it theorizes on how different modes of commercialization relate to misfit technology commercialization success.</p>	<p>As an often-overlooked phenomenon, the study of misfit technology is a worthwhile path for further research.</p>
<p>Ilevbare, Probert & Phall, 2013</p>	<p><i>TRIZ, Practical challenges, Creativity Innovation</i></p> <p>This paper distance himself from conventional TRIZ literature, by exploring the benefits associated with TRIZ knowledge and the challenges associated with its acquisition and application based on practical experience. It also indicates what tools among the several contained in the TRIZ toolkit would be most useful to learn first based on a survey it conducted</p>	<p>As the examples of how organizations have successfully/unsuccessfully applied TRIZ in innovation are usually sketchy with little detail of the actual problem solving process, further research should focus on how well TRIZ works in practice, giving examples, and whether it is worth the extensive training it requires.</p>

<p>Nielsen, C., & Lund, M. 2014</p>	<p><i>Business Model; Business Model Evolution</i></p> <p>The concept of business models has reached global effect, both for company's competitive success and in management science. Its application by authors from diverse areas has led to a earlier very diverse understanding of the concept.</p>	<p>There is additional need for research, especially concerning the interfaces of the business model concept with created concepts of business management. For instance, even though literature agrees that a business model is not equal with corporate strategy or overlaps with the latter, commonalities of business models with other concepts have been rather overlooked.</p>
<p>Zott, C., Amit, R., & Massa, L. 2011</p>	<p><i>Innovation; business model; value creation; value capture; strategy</i></p> <p>This article provides a broad and multifaceted review of the received literature on business models in which the authors examine the business model concept through multiple subject matter lenses.</p>	<p>Employing more detailed concepts would allow other researchers to better understand what the business model in the corresponding study is meant to denote. This review suggests at least three concepts that might justify distinct consideration: These distinct concepts could all be effectively investigated—separately, as well as in relation to each other—under the umbrella theme of the business model</p>
<p>Barr, S., Baker, T., Markham, S., & Kingon, A. 2014</p>	<p><i>TPM, COT, Valley of Death</i></p> <p>As interest in commercialization of technology (COT) has increased, so has academic research interest in this area. This increased interest in technology-based new business ventures at universities has not converted into a distinct body of knowledge that delivers the education paradigm and process of university COT education programs. To respond to this the Technology Entrepreneurship and Commercialization program (TEC) was initially developed at North Carolina State University from 1995 to 1999.</p>	<p>A major advantage of this academic approach is the tackling of the factors that cause technology and innovation to languish in the Valley of Death, a significant problem in technology commercialization. The program is designed to bridge this gap between the creation of technologies and the commercialization of these technologies</p>

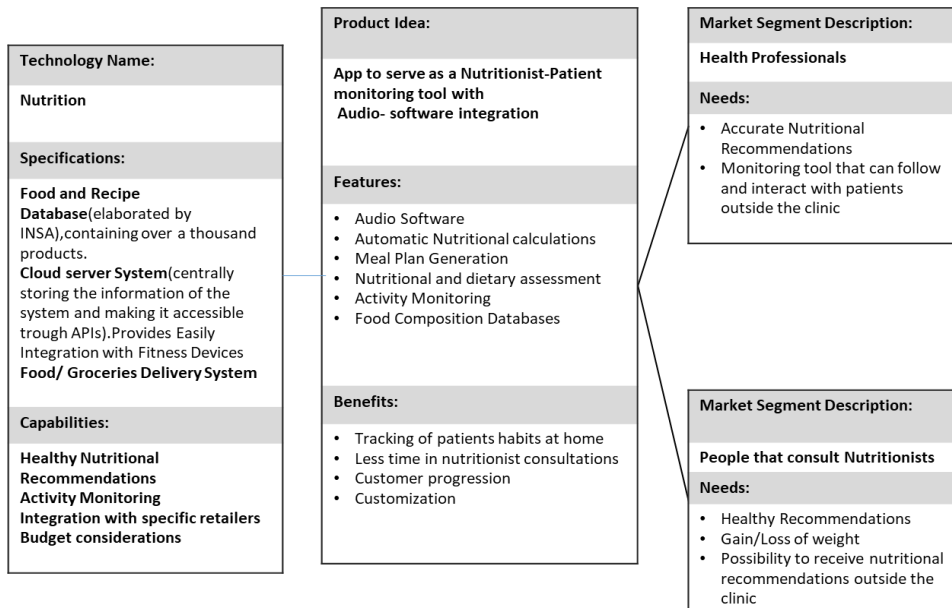
<p>Gierej, S. (2017).</p>	<p>Industrial Internet of Things, Minimum Viable Product, outcome-economy, persona, Value Proposition Canvas, Value Proposition Design.</p> <p>The purpose of this article is to analyse and present some techniques that support the design of a value proposition in the context of the outcome-economy. The proposed techniques are intended to support traditional companies in the design of innovative solutions.</p>	<p>The presented techniques are used in the process of designing value propositions. They are mainly used in the initial stage of the process, the aim of which is to accurately define preferences of potential customers.</p>
<p>Teece, D. J. 2010</p>	<p><i>Business Models, Innovation and Business Strategy.</i></p> <p>This article analysis the how an enterprise delivers value to customers, entices customers to pay for value, and converts those payments to profit</p>	<p>The aim of this article has been to improve understanding of the significant significance of business models and to explore their relationships to business strategy, innovation management and economic theory.</p>
<p>Osterwalder, A., Pigneur, Y., Tucci, Christopher L., 2005</p>	<p><i>Business models, business model concept</i></p> <p>This paper seeks to refine the concept of business models, its practices, and its roles in the Information Systems domain. A review of the literature shows a comprehensive diversity of interpretations, usages, and places in the firm. The paper recognizes the terminology or ontology used to describe a business model, and compares this terminology with previous work</p>	<p>This paper outlines the beginnings, the distinct interpretations, and the evolution of the business model concept. It shows that the business model concept still needs clarification. Builds the foundations needed to explain insights in the business model domain. Finally, it proposes a business model terminology used to describe business models.</p>
<p>Joyce, A., & Paquin, R. L. 2016</p>	<p><i>Business model innovation; Sustainable business models; Business models for sustainability; Triple layered business model canvas; Triple bottom line</i></p> <p>The authors present the Triple Layered Business Model Canvas a tool for exploring sustainability-oriented business model innovation. It expands the previous business model canvas by adding two layers: an environmental layer based on a lifecycle perspective and a social layer based on a stakeholder perspective. Jointly, the three layers of the business model make more clear how an organization creates several types of value – economic, environmental and social.</p>	<p>This paper contributes to the current research on sustainable business models by delivering a framework in the form of the triple layer business model canvas (TLBMC), to allow a triple bottom line perspective to sustainability – that of economic, environmental and social effect - applied to a business model.</p>

Annex II

Technology - Product – Market Fit tables

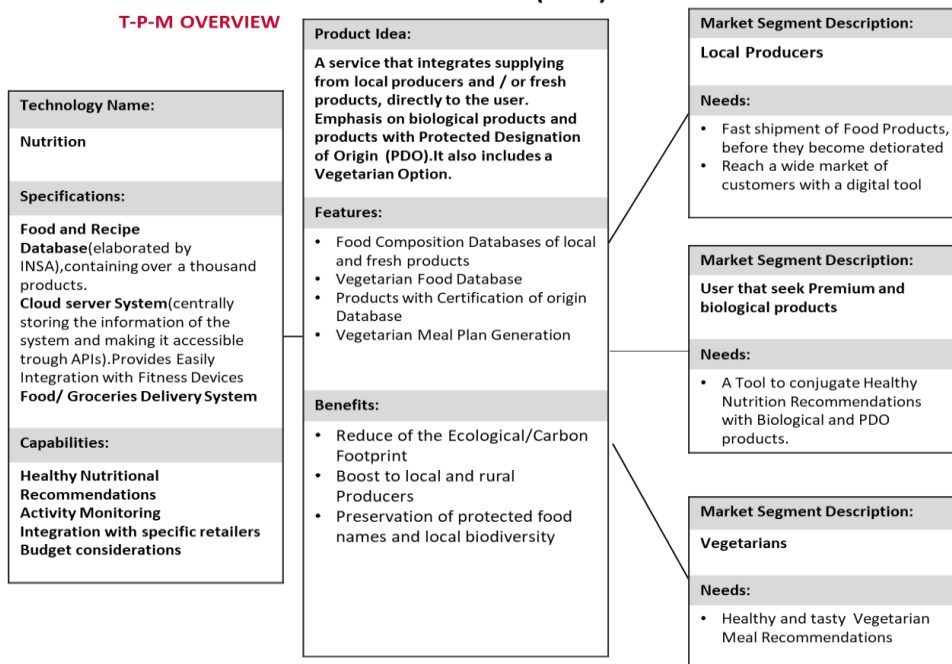
TECHNOLOGY–PRODUCT–MARKET (TPM) PRESENTATION

T-P-M OVERVIEW



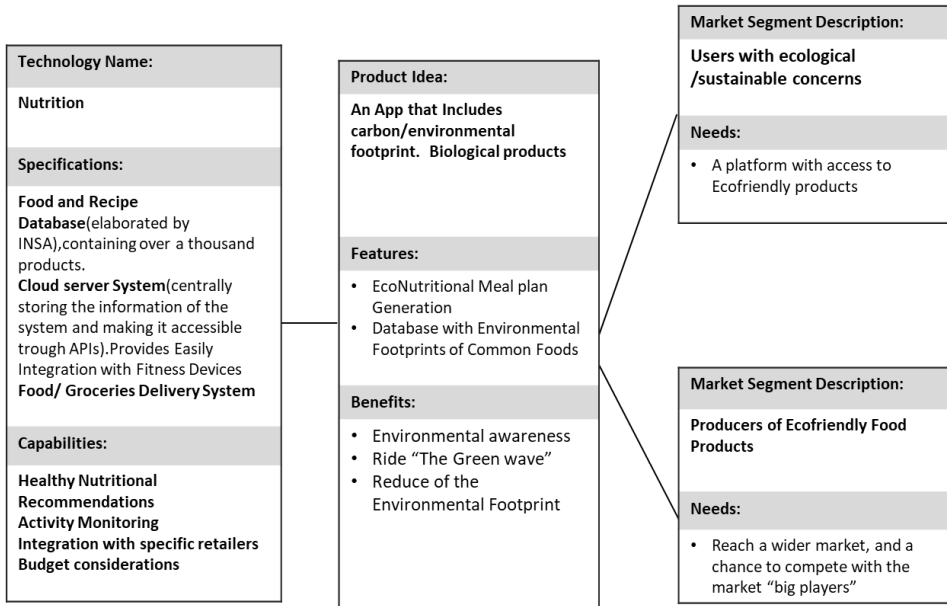
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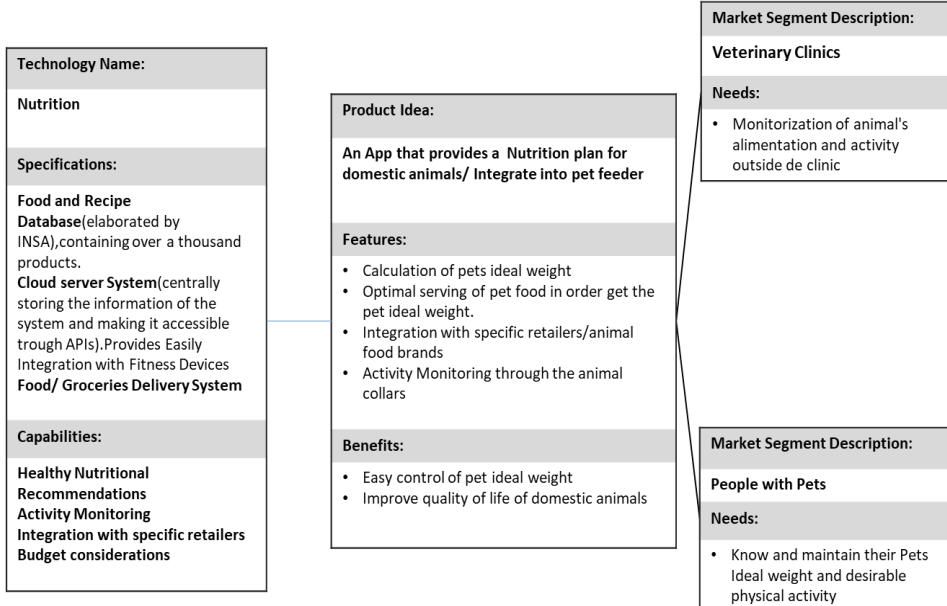
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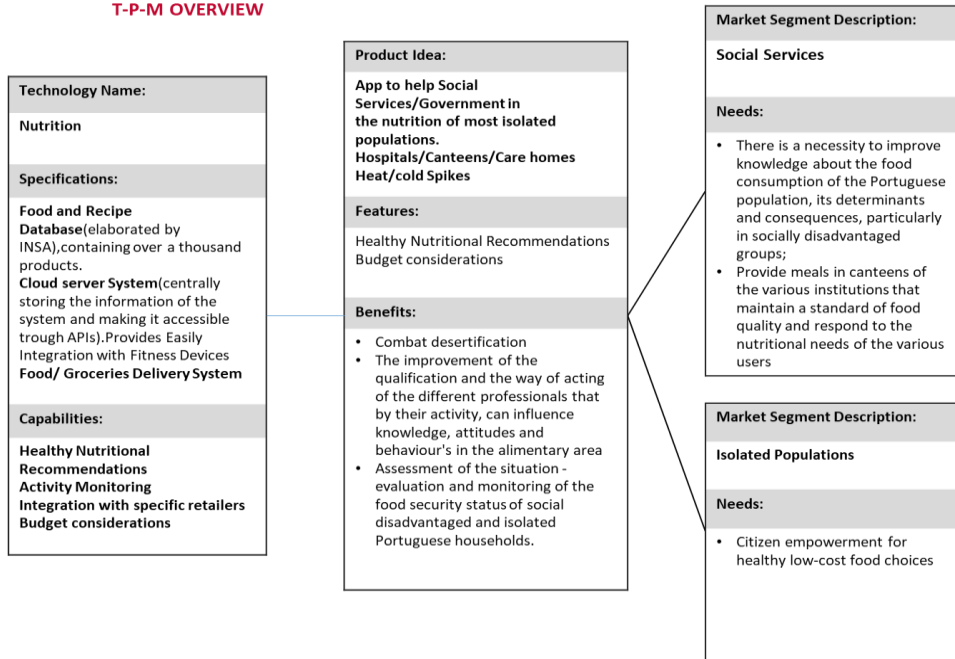
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T-P-M OVERVIEW



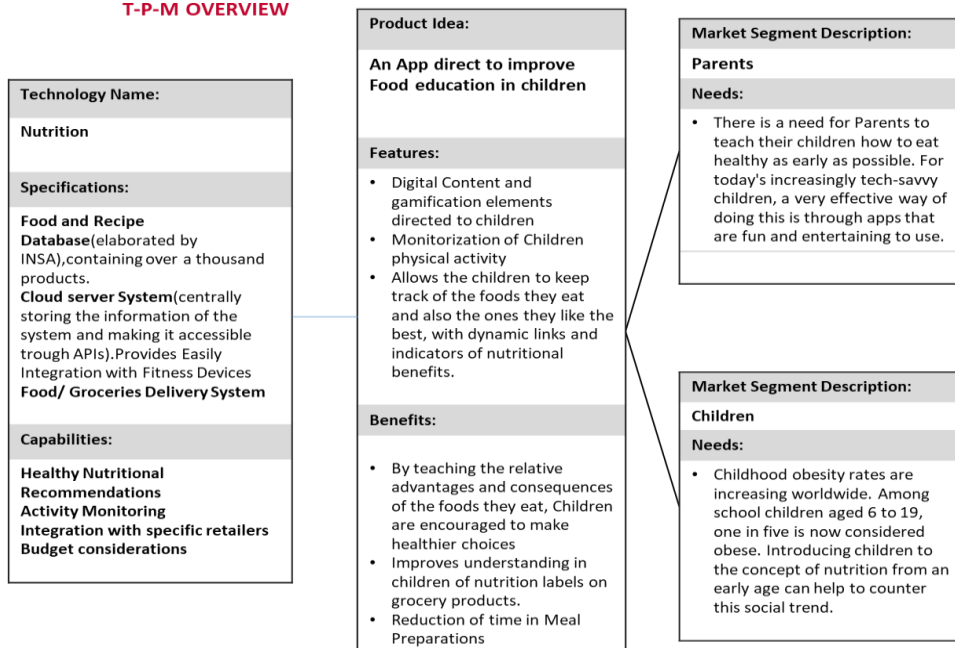
TECHNOLOGY–PRODUCT–MARKET (TPM) PRESENTATION

T-P-M OVERVIEW



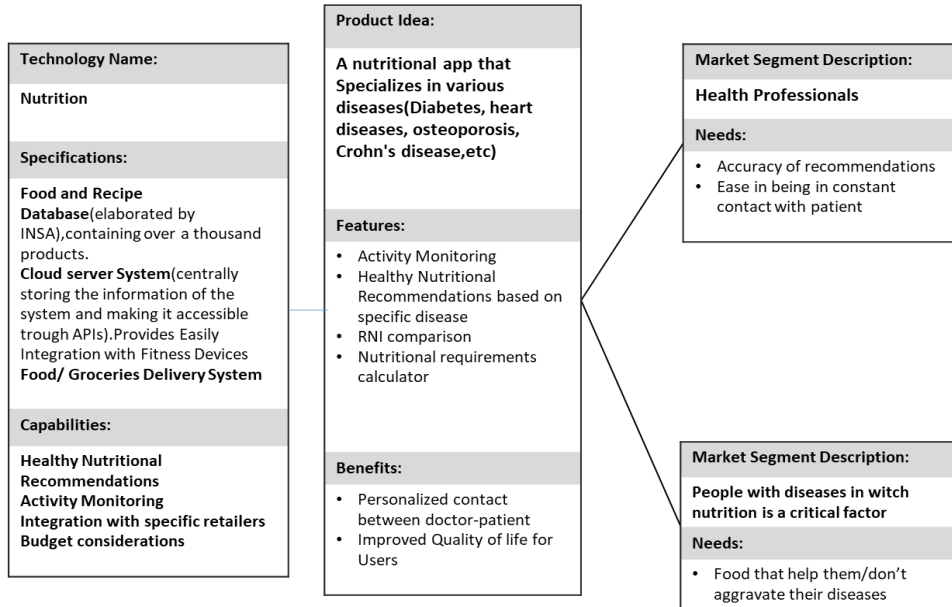
TECHNOLOGY–PRODUCT–MARKET (TPM) PRESENTATION

T-P-M OVERVIEW



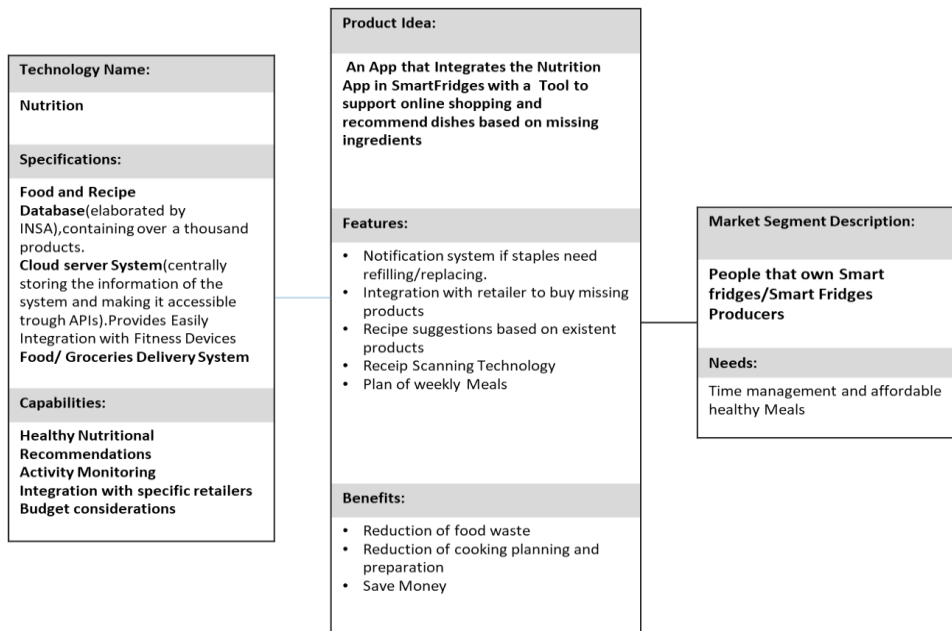
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T-P-M OVERVIEW



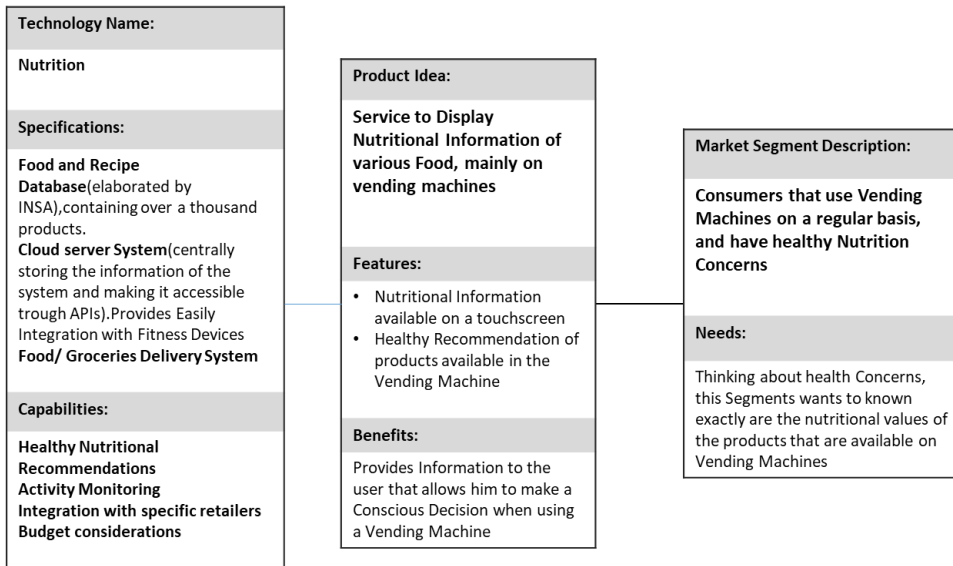
TECHNOLOGY–PRODUCT–MARKET (TPM) PRESENTATION

T-P-M OVERVIEW



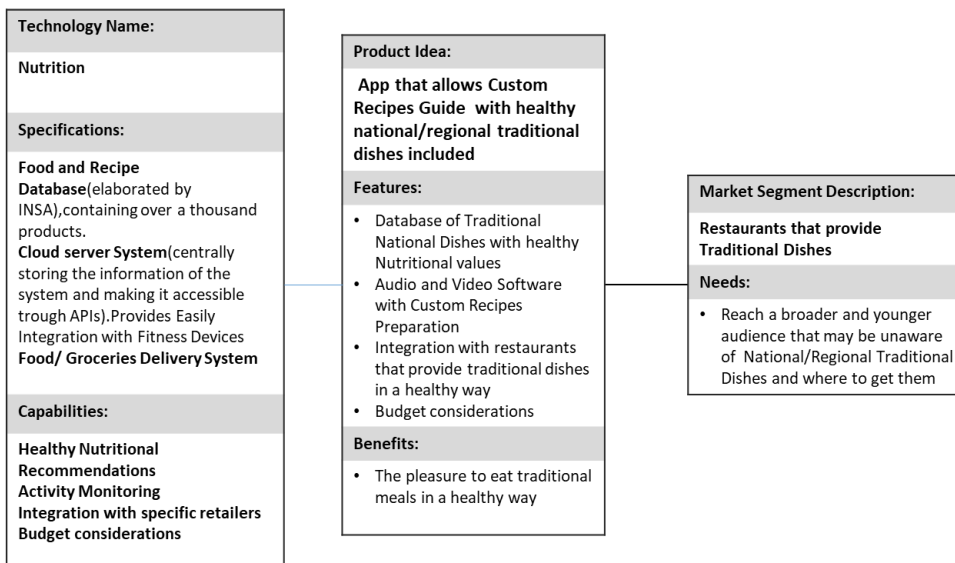
TECHNOLOGY–PRODUCT–MARKET (TPM) PRESENTATION

T-P-M OVERVIEW



TECHNOLOGY–PRODUCT–MARKET (TPM) PRESENTATION

T-P-M OVERVIEW



Annex III

Results of the IP Search on the Nutrition Technology

IP SEARCH WORKSHEET

Reference:	CHT_2015_W_IPJ
Version:	1
Release:	marsp 1, 2019

#	Title	Application					Keywords	Abstract		
		Inventor(s)	Applicant(s)	Priority Date	Application Number	Publication Number			Publication Date	Countries
1	METHOD AND SYSTEM TO RECOMMEND RECIPES	ENGEL Lawrence	Cost Group Inc		13623031	20140689327	27.03.2014	WO	Disclosed is a recipe recommendation system and method which builds and maintains user and recipe profiles, which matches user and recipe profiles to recommend recipes, which changes recommended recipes based on season and other factors, which adjusts user profiles based on explicit and implicit feedback, which integrates mobile computing and grocery delivery services, and which offers a complete service.	
2	NUTRITION MANAGEMENT AND KITCHEN APPLIANCE	ERNERTODD, Rene	ERNERTODD, Rene	62463,262 02.02.2017 US		WO/2018/156975	30.08.2018	WO	A nutrition management system including patient mobile application stored on non-transitory computer-readable media in electronic communication with home nutrient-testing device, and dietitian software stored on non-transitory computer-readable media in electronic communication with the patient mobile application. Method of nutrition management, by patient testing their nutrition levels on home nutrient-testing device, and creating personalized daily dietary recommendations on a meal-by-meal basis for the patient based on results from the home nutrient-testing device. Kitchen device for creating hot and cold meals or drinks, including an ingredient chamber, an interface screen in electronic communication with said ingredient chamber, and an accessible preparation chamber in operable connection with said ingredient chamber and in electronic communication with the interface screen, the kitchen device being in electronic communication with a patient mobile application stored on non-transitory computer-readable media. Method of using the kitchen device.	
3	SMART SENSOR BASED ENVIRONMENT FOR OPTIMIZING A SELECTION OF MEAL PLANS	Angel Robert Lee Friedlander Robert R. Kraemer James R.	International Business Machines Corporation		13049580	20090224839	17.09.2009	US	A computer implemented method, apparatus, and computer program product for selection of meal plans. In one embodiment, a set of prospective guests are identified from at least one of a set of sensors collecting historical attendance data and a calendaring application. A set of nutritional requirements is then identified for the set of prospective guests. Thereafter, a set of meal plans is selected on an availability of ingredients and the nutritional requirements of the set of prospective guests, wherein the availability of ingredients is determined by sensors from the set of sensors monitoring the ingredients.	
4	AVATAR HAVING ARTIFICIAL INTELLIGENCE FOR IDENTIFYING AND PROVIDING MEAL RECOMMENDATIONS	Brazel Robert	Brazel Robert		13926847	20140127651	08.05.2014	US	The present invention extends to methods, systems, and computer program products for implementing an avatar having artificial intelligence for identifying and providing meal recommendations. The avatar acts as an electronic representation of a user. The avatar searches available information and makes recommendations to the user based on initial input, the user's response to previous recommendations regarding meals, and/or other information regarding the user. In this way, the avatar continually learns more about the user to improve future recommendations regarding meals that the user will enjoy and also meals that meet a user's nutritional requirements or dietary goals. Accordingly, the avatar can make many meal related decisions for the user that, given the learning the avatar can obtain, can closely approximate the decisions the user himself would make.	
5	DEVICE, METHOD, AND SYSTEM FOR RECIPE RECOMMENDATION AND RECIPE INGREDIENT MANAGEMENT	Chang Sherry S. Baron Charles Chen Oliver W.	Chang Sherry S. Baron Charles Chen Oliver W.						A method, device, and system for generating a list of recipe recommendations includes determining the type and quantity of ingredients available to a user of a mobile computing device or smart storage. The available ingredients may be determined using text input or voice input from the user. A camera may also be used to capture images of the available ingredients for analysis. The list of recipes may be generated as a function of the type and quantity of available ingredients, meal preferences of the user, and the context of the meal. Recipe complements and/or supplements may be suggested in response to the user selecting a recipe from the list of recipe recommendations. Further, a meal planner may be used to track the shelf life of the ingredients, plan a meal schedule, and generate a shopping list.	
6	SYSTEM AND METHOD FOR A PERSONAL DIET MANAGEMENT	Krishna Srinanth	Krishna Srinanth	1660/CHE/2011 11.05.2011 IN		14116750	20140080102	20.03.2014	US	A system and method for enabling a personal diet management service is disclosed. The system enables users to communicate with the system and receive recommendations throughout the day. The system recommends recipes and restaurants serving the recipes based on a plurality of factors comprising of the calorie and nutrient intake of the person for each meal. Identified deficiencies based on the recommended daily intake among others. The system also allows user to communicate with restaurants for reserving tables and specifying any further requests.
7	SYSTEM AND METHODS FOR VIRTUAL COOKING	Jone Joshua A. Tokuda Yulie J. Vyvoda Michael A. Vachalek Robert S.	Jone Joshua A. Tokuda Yulie J. Vyvoda Michael A. Vachalek Robert S.		13333518	20130149675	13.06.2013	US	Methods for generating recipe recommendations based on virtual cooking results from a virtual cooking system are described. In some embodiments, a virtual cooking result is generated based on a recipe for making a particular food or beverage. The virtual cooking result may include quantitative representations of various selected ingredients, resulting in a virtual recipe. For example, the virtual recipe may include a list of ingredients, the particular food or beverage, and estimates regarding one or more flavors associated with the particular food or beverage. The generation of different virtual cooking results associated with different recipes allows computer programs to leverage machine learning techniques and solve optimization problems in order to determine an optimum recipe or set of recipes for a given set of recipe constraints. The recipe recommendations may include recipe pairing recommendations, multi-meal recipe recommendations, and new recipes optimized to satisfy a particular flavor profile.	

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8	MACHINE LEARNING BASED RECIPE SYSTEM FOR ENHANCING CONSUMER AND BUSINESS DECISIONS USING DIETARY HABITS OF INDIVIDUALS	Mishref Mishra Karth Agarwal Lsv/Agarwal	SYNAPSE TECHNOLOGIES PTE. LTD.		10201608875R	30.05.2018	IG	A machine learning method and related cloud software architecture are provided that enables tracking of consumer dietary habits across time. The invention comprises three sub-systems, namely, restaurant and food item recommendation, user habit recommendation, and recipe recommendation. The recommendation framework is based on modeling the user habits as a mixture model with Gaussian components. These mixture components over time will represent the user habits of eating at particular times within a 24-hour period (each day). For each item, if the mixture distribution exceeds a fixed threshold number of components, the item is defined as having a uniform distribution across time. This kind of data structure simplifies search, update and query operations for the machine-learning algorithm. Following this machine learning step, many inferences are calculated in a Bayesian framework such as, the expected amount of traffic in a restaurant within a certain time period of the day, the expected number of orders, the expected number of items ordered, the expected number of items consumed, and business entities can alter their decision-making process in a manner that optimizes the functionality of a business establishment leading to improved profit margins and provides a personalized experience to the consumers. FIG. 6 best represents the invention to be published.
9	METHOD FOR RECOMMENDING RECIPE BASED ON USER'S DIETARY HABITS AND RECOMMENDATION SYSTEM	ZHANG, FENGJIA	ZHANG, FENGJIA		PCT/CN20160091247	01.02.2018	WO	A method for recommending a recipe according to ingredients and a recommendation system. The method comprises: recording recipe information (S101); reading a main course input by a user (S102); searching for recipe information consistent with the main course input by the user (S103); and putting the recipe information to the user (S104). The method further comprises: recommending a recipe to the user according to the user's dietary habits; and recommending ingredients to the user, so that the trouble of the user buying ingredients according to a recipe is eliminated, and nutritious and delicious meals can also be made, thereby improving the user experience.
10	System and method for recipe recommendation of healthy recipes	ZHANG YU CHEN XUAN	QICHUAN CHANGHONG ELECTRIC CO., LTD.		2.01711E+11	07.01.2018	CN	The invention discloses a system and method for recipe recommendation of healthy recipes. The system includes an intelligent refrigerator system, a cloud service platform, and a mobile terminal. The intelligent refrigerator system is connected with the cloud service platform, the cloud service platform is connected with the intelligent mobile terminal, the intelligent refrigerator system acquires food information and uploads the food information to the cloud service platform, and the cloud service platform gives nutritious and responsible recipes through match of the food information with the combination of user information submitted by a user through the intelligent mobile terminal and pushes the recipes to the intelligent mobile terminal. According to the scheme of the system, the intelligent refrigerator system can provide a more accurate and personalized recommendation of healthy recipes to the user. The user can make responsible and nutritious meals, a lot of time wasted by preparation of meals is saved, and the convenience is improved.
11	INFORMATION PROCESSING DEVICE, INFORMATION PROCESSING METHOD, AND PROGRAM	UCHIDA, YUKI	RAKUTEN, INC.		PCT/JP2016/061395	12.10.2017	WO	The purpose of the present invention is to provide a service which is capable of providing information for preparing meals which do not become tiresome while suffering the effects of time of day, meals, and taking into account the menu selection tendencies of a user. Accordingly, this information processing device is provided with a user identification unit for identifying a target user who will become the information presentation destination; a meal information acquisition unit for acquiring meal information which includes at least utilization times, and which corresponds to information-provision-source users associated with the identified target user; a utilization period identification unit which, on the basis of the utilization times included in the acquired meal information, identifies utilization periods of each cuisine category; a recommendation unit which identifies a cuisine category of a recommended meal on the basis of the utilization periods of each cuisine category; and a control unit which has been calculated on the basis of the identified utilization periods, and the last utilization times, i.e. the latest utilization times among the utilization times included in the acquired meal information, and a presentation control unit which, on the basis of the recommended category, implements control for presenting recommendation information to the target user.
12	Dietary recommendation method based on typical taste of user	YIN JIANWEI YIN JUNLIANG LI YING DENG SHUIGUANG WU JIAN WU ZHAOHUI	ZHEJIANG UNIVERSITY		10E548005	29.03.2017	CN	The invention discloses a dietary recommendation method based on the typical taste of users. The method comprises the following steps: S1, understanding the real taste of users; S2, downloading the latest food list from a cloud server, and screening the list based on the taste of the users; S3, providing a food recommendation order according to the comprehensive consideration of the current meal time, the eating preferences of the users, the recent eating times and other aspects; and S4, recording the taste feedback of the users after meals, further understanding the taste preferences of the users, and adjusting the food recommendation order according to the real taste of the user. The invention provides a dietary recommendation method based on the typical taste of the user, which can be reasonably and effectively arranged based on the typical taste of the user, a currently-acquired recipe which meets the taste of the user can be recommended to the user, so that the user can eat the food which meets their own taste, and the functions of promoting appetite, ensuring good health effect of the diet and bringing great benefits to the health of people can be achieved.
13	Method and system for generating personalized meal schemes	LIU XIAODONG YANG YUFEI	LIU XIAODONG YANG YUFEI		201210263473.X	03.07.97	CN	The invention relates to the technical field of generation of personalized lifestyle intervention schemes and discloses a method and a system for generating personalized meal schemes. The method includes calling personal information of a user from a user profile database, and generating a personalized food quantization recommendation value corresponding to the user; displaying the personalized food quantization recommendation value of the user on a user terminal through a network; receiving recipes and the number of meals chosen by the user through the user terminal; displaying the received recipes and the number of meals chosen by the user on the user terminal; calculating a difference value between users' choosing conditions and local nutritional requirements according to the recipes and the number of meals chosen by the user; and showing the difference value to the user through the network; generating a meal scheme corresponding to the user according to the recipes and the number of meals chosen by the user; and showing the meal scheme to the user through the network. By the method and the system, personalized lifestyle intervention schemes aiming at different users can be automatically generated, and interactively with the users can be improved.

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		Inventor(s)	Applicant(s)	Priority Date	Application Number	Publication Number			
		BREUILLE, Denis; CHIFFORD CAVIN, Robert; MOORE, Daniel; RYAN, CA GANNON, Richard; HORCAJADA, Marie Noelle; FRIBOSET, Jean-Francois; HOEHNE, MICHAEL; CH MICHAEL; NESTEC S.A.							
14	ASSESSMENT AND ADVICE ON NUTRITION, ENDURANCE, AND STRENGTH	MINVILLE Eugenio	NESTEC S.A.	62/188,896 06.07.2015 US	PCT/EP2014/051381	WO/2014/120332	14.08.2014	WO	The present invention relates to a new integrated, holistic approach to empower older adults to enhance their quality of life and independence through a personalized lifestyle and nutrition program. This is achieved by providing personalized recommendations for the consumption of nutrients and micronutrients. The nutritional status is assessed. Based on those assessments recommendations are provided with respect to particular exercise programs and nutrients that support the functions bones, muscles and cartilage. These methods can be implemented as a software program and executed on computer systems.
15	SYSTEM FOR MANAGING THE NUTRITIONAL CONTENT FOR NUTRITIONAL SUBSTANCES	MINVILLE Eugenio	NESTEC S.A.	62/188,896 06.07.2015 US	PCT/EP2014/051381	3839425	15.03.2015	WO	Disclosed herein is an information encoding, marking, tracking, and transmission system for information related to nutritional substances including nutritional content. Upon the creation of a nutritional substance, whether grown, raised, caught, collected or synthesized, information regarding the nutritional substance is accumulated, encoded and referenced to the particular nutritional substance. This information can be marked directly on the nutritional substance, but can instead be stored elsewhere, and referenced to the nutritional substance by means of a marking, unique identifier, a unique inherent property, unique genetic attribute, or an induced genetic attribute. A consumer of the nutritional substance can use this reference to retrieve the information regarding the creation of the particular nutritional substance.
16	SYSTEM AND METHOD FOR CALCULATING, DISPLAYING, MODIFYING, AND USING PERSONALIZED NUTRITIONAL HEALTH SCORE	SOLARI, Soren	NESTEC S.A.	62/188,896 06.07.2015 US	PCT/EP2015/07694	WO/2015/050958	07.04.2015	WO	The disclosed system calculates a single score for a consumable that indicates the nutritional health of that consumable. Nutritional health in one embodiment is an indication of whether nutrients within a consumable are present in a quantity that is beneficial to the individual's nutritional health by determining whether the nutritional content of a consumable is within a range customized to the individual. The disclosed system thus tracks and displays the impact of consumables on individuals personalized nutritional requirements. The disclosed system also generates nutritional advice, enabling the individual to discover the impact of changes to nutritional habits on the individual's overall nutritional health. In an embodiment, the disclosed system determines and displays consumables that would need to be consumed to meet an individual's nutritional health needs over a specified period, such as in a given day.
17	PERSONALIZED NUTRITIONAL AND METABOLIC MODIFICATION SYSTEM	Kate Coles Mark Springer	Kate Coles Mark Springer	15934549	20180211723			US	A personalized nutritional and metabolic modification system is described. The personalized nutritional and metabolic modification system includes a processor and a visual interface, which through a software program and in response to a user data set provides an avatar which transforms its appearance in response to changes in the user's nutritional and metabolic status. The system is configured to generate personalized nutritional advice according to the characteristics and goals of the particular individual using the system by using evidence-based formulae to develop and adjust a comprehensive nutritional plan in response to the individual's goals and changing activity. Changes in appearance of the avatar in response to changes in the user data over time provide feedback for tracking the user's progress through the visual interface.
18	SYSTEM AND METHOD FOR MONITORING ADMINISTRATION OF NUTRITION	Nathania Alexandra FRANCIS	Nathania Alexandra FRANCIS	14889342	20160058673		03.03.2016	US	A system for monitoring a patient's nutrition administration, the system including a processing device and a memory storing instructions executable by the processing device for: accessing nutrition administration information for a plurality of patients describing nutrition administered by different forms to the plurality of patients; accessing medical information about the plurality of patients from a healthcare information system; accessing nutritional requirement data describing a nutritional requirement for the plurality of patients; determining a difference between a nutritional requirement for a patient and the nutrition administered to the patient; and the nutrition administration information for the patient, the medical information for the patient, and the nutritional requirement data for the patient, for determining a nutritional adjustment for administering the amount of the nutrient to the patient based on the difference.
19	System and methods for nutrition monitoring	Hazan Ghassemzadeh Nisobar Hezarjardi	Washington State University	15334852	20180004913		04.01.2018	US	An apparatus comprising a natural language processor, a mapper, a string comparator, a nutrient calculator, and a diet planning module, the diet planning module configured to generate a diet action control, the diet action control comprising a list of nutrients to be consumed, the diet planning module to perform a diet change recommendation on the diet device, and supply the diet action control to the diet device.
20	SYSTEM AND METHOD FOR FOOD ITEM SEARCH WITH NUTRITIONAL INSIGHT ANALYSIS USING BIG DATA INFRASTRUCTURE	Marshall Kenneth Dempsy Edmond Trey Collins Robert Turner Elizabeth Turner Marie Elisabeth	Marshall Kenneth Dempsy Edmond Trey Collins Robert Turner Elizabeth Turner Marie Elisabeth	13845011	20140220516		07.08.2014	US	A nutritional insight recommendation system using machine-learning software to calculate increasing/large user base and food items to provide real-time updates on nutritional guidelines. The system provides a universal system that use and share data among end users, nutritionists and dietitians, food service providers (such as restaurants) and manufacturers, and health providers and government entities.

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	INTERACTIVE ENGINE TO PROVIDE PERSONALIZED NUTRITIONAL RECOMMENDATIONS FOR GENERAL PUBLIC TO LIVE A BALANCED HEALTHIER LIFESTYLE	Hagai Yaros Liron Jonathan Cora Ido	COMOCO.COM LTD	13784845	2014025882	11.05.2014	US	An algorithm and method to provide personal recommendations for nutrition based on preferences, habits, medical and activity profiles for users and constraints. The algorithm can also be fed and takes into account real-time feedback from the user. The method allows creating a personal nutritional schedule based on a set of constraints, which are stored using an optimization algorithm in the diet selection engine. The method also includes a weight-loss optimization engine that allows for adjusting the diet selection engine to account for user preferences and updating of the constraints, analyzing and clustering of the general user population based on statistical principles, giving the algorithm insightful information and allowing improved performance by means of "machine-learning," and creating a list of recommended food items/recipes to help users live a balanced, healthier lifestyle.	
21	SYSTEMS AND METHODS FOR AUTOMATICALLY IDENTIFYING AND RECOMMENDING PURCHASES (E.G., IN-APP PURCHASES) TO A USER BASED ON THE USER'S PERSONAL GENETIC PROFILE. IN CERTAIN EMBODIMENTS, OFFERS FOR SUCH PURCHASES ARE CONVENIENTLY PRESENTED IN THE SAME SOFTWARE APPLICATION (E.G., SMARTPHONE APP OR OTHER COMPUTING DEVICE APPLICATION) IN WHICH A USER SECURELY ACCESSES HIS OR HER PERSONALIZED GENETIC PROFILE TEST RESULTS. ALSO PRESENTED HEREIN ARE SYSTEMS AND METHODS FOR COMPUTER APPLICATION DEVELOPERS TO CUSTOMIZE OFFERS FOR PRESENTATION OF RECOMMENDED PURCHASES BASED ON A USER'S PERSONAL GENETIC PROFILE. IN CERTAIN EMBODIMENTS, THE SYSTEMS AND METHODS DESCRIBED HEREIN PROVIDE FOR ISSUING OF GENETICALLY TAILORED NOTIFICATIONS TO ONE OR MORE MOBILE HEALTH DEVICES OF AN INDIVIDUAL BASED ON AN ASSESSMENT OF THE INDIVIDUAL'S GENETIC PROFILE. SUCH NOTIFICATIONS, FOR EXAMPLE, CAN ASSIST AN INDIVIDUAL IN THEIR ADHERENCE TO PARTICULAR RECOMMENDED REGIMENTS, SUCH AS WORKOUT REGIMENTS.	Robin Y. Smith Marc A. Glickman Sami Anant Gupta Edward Joseph Coffey Kate Blanchard Stephanie Lentz Shabazz Ogar Frazier		13784845	2014025882	11.05.2014	US	Presented herein are systems and methods for automatically identifying and recommending purchases (e.g., in-app purchases) to a user based on the user's personal genetic profile. In certain embodiments, offers for such purchases are conveniently presented in the same software application (e.g., smartphone app or other computing device application) in which a user securely accesses his or her personalized genetic profile test results. Also presented herein are systems and methods for computer application developers to customize offers for presentation of recommended purchases based on a user's personal genetic profile. In certain embodiments, the systems and methods described herein provide for issuing of genetically tailored notifications to one or more mobile health devices of an individual based on an assessment of the individual's genetic profile. Such notifications, for example, can assist an individual in their adherence to particular recommended regimens, such as workout regimens.	
22	PROFILES	KRANS, Jan Merrin, NL SCHUT, Maria Heenda, NL DE VRIES, Judith Schuurman, NL SCHWALZ, Anastasia, NL	Origin, Inc	PCT/US2017/067 277	WO/2018/140156	02.08.2018	WO	In an embodiment, an apparatus (42) that provides advice on nutritional and caloric intake requirements for a child based on the child's current growth phase activity behavior and status corresponding to the child's current body composition requirements determined in terms of a ratio of nutrient components that are tailored to the growth phase of the child.	
23	NUTRITION COACHING FOR CHILDREN	KONINKLIKE PHILIPS N.V.	63,083,830 11.2014	PCT/IB2015/05950 16	WO/2016/079719	26.05.2016	WO	Automated personalized and community-specific eating and activity planning, linked to tracking with automated data capture, for determining and recommending eating and activity plans to users. The system includes links to healthy eating and activity plans. The data capture system or other computing device, such as a management unit that is capable of being connected to and interacting with each of the one or more computing devices over a link, and the nutritional management unit further comprising a nutritional planning unit that uses multimodal recognition to determine one or more food, an exercise and other items from images and voice recordings and substituting to menus upon checking into a specific food venue, and a recommendation unit that recommends, based on user data, one of a meal and an activity to the user to balance the caloric and nutritional intake, and caloric output, physical to activity methods and sleep duration of the user.	
24	SYSTEM AND METHOD FOR TRACKING EATING AND COMMUNITY-SPECIFIC PLANNING LINKED TO TRACKING WITH AUTOMATED MULTIMODAL ITEM IDENTIFICATION AND SIZE ESTIMATION	LANGHEIER, Jason JASON, TOHENG, David, KIM,	LANGHEIER, Jason (US/US); US (US/ON) TOHENG, David, Kim (US/US); US (US/ON) ZIFONGO	611334,168 12.05.2010 US 362	PCT/US2011/036 25	WO/2011/143513 12.05.2011	WO	In the case of supporting the purchase and the inventory management of actual foods by a user with respect to the user's eating and activity plans, the system includes a management unit that is capable of being connected to and interacting with each of the one or more computing devices over a link, and the nutritional management unit further comprising a nutritional planning unit that uses multimodal recognition to determine one or more food, an exercise and other items from images and voice recordings and substituting to menus upon checking into a specific food venue, and a recommendation unit that recommends, based on user data, one of a meal and an activity to the user to balance the caloric and nutritional intake, and caloric output, physical to activity methods and sleep duration of the user.	
	COOKING SUPPORT SYSTEM, PROGRAM, METHOD, AND DEVICE FOR TRACKING AND MANAGING COOKING AND PURCHASE AND INVENTORY MANAGEMENT OF FOODS FOR COOKING	James J. Mrowka Daniel S. Robey Athanasios G. Christ	HASHIMOTO Hiashi	11.02.2016 US 201615161588 23.05.2016 US 201615212051 2016-03-22 183238.08.2 DWP	PCT/JP2010/05449 25	WO/2010/110239 30.09.2010	WO	The present disclosure provides a system that quantitatively tracks an individual's diet and exercise using smart devices (phones, watches, and other wearables). Unlike existing programs, which work in energy units (calories), the present system works in mass units (grams) and adheres to the fundamental physical law of conservation of mass. Food ingested is tracked as well as exercise in order to place the user on a quantitative, custom diet that safely and effectively results in weight loss. In addition to rigorously treating the problem of weight loss by addressing the physics that underlies diet and exercise, the system empirically learns about the user over time such that performance may be optimized.	
25	Automatic diet tracking system and method	Genesant Technologies, Inc.	Genesant Technologies, Inc.	16828338	3334504	20.06.2018	EP	A wearable diet and exercise tracking device that provides one-time submission input of foods eaten, quantities consumed, exercises performed and exercise quantities, the reporting of tracked information and comprehensive diet and exercise tracking directly via the device. Embodiment of the invention may be in the form of, or integrated with, wrist-worn bands, smartwatches, clothes and fitness gear attachable/embedded devices and other portable and/or wearable enclosures.	
27	QUANTITATIVE DIET TRACKING AND ANALYSIS SYSTEMS AND DEVICES	Justin Crepp	Minotifi Projects, LLC	15899711	20160240288	23.06.2018	US	The present disclosure provides a system that quantitatively tracks an individual's diet and exercise using smart devices (phones, watches, and other wearables). Unlike existing programs, which work in energy units (calories), the present system works in mass units (grams) and adheres to the fundamental physical law of conservation of mass. Food ingested is tracked as well as exercise in order to place the user on a quantitative, custom diet that safely and effectively results in weight loss. In addition to rigorously treating the problem of weight loss by addressing the physics that underlies diet and exercise, the system empirically learns about the user over time such that performance may be optimized.	

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28	METHOD FOR PROVIDING PERSONALIZED DIET AND ACTIVITY RECOMMENDATIONS THAT ADAPT TO THE METABOLISM OF EACH DIETER INDIVIDUALLY USING FREQUENT MEASUREMENTS OF ACTIVITY AND TRISGLYCERIDE LEVELS	RAVIV, MIKI; ORON, AVIGAD; DOTAN, NITZ	GUARDLYFF S.A.	62,069,726; 10.20.06	PCT/CA2015051593	WO/2016/065546	06.05.2016	WO	The present subject matter relates to models and methods for providing personalized diet and activity recommendations that adapt to the metabolism of each dieter individually using frequent measurements of physical activity and energy expenditure, and/or body composition, and/or body weight, physical activity, and/or daily diet and activity guidance using real-time feedback and ongoing tracking of body weight, physical activity, triglyceride levels, and possible use of various other physiological and behavioral parameters such as age and food preferences. The subject matter provides a method for generating a personalized metabolism model for predicting the effect of food intake and activity on triglyceride levels. The subject matter provides a method for generating a personalized diet model for determining the range of triglyceride levels for achieving the dieter's weight goals. The subject matter provides methods generating diet and activity recommendations using the personal metabolism and diet models to help the user achieve his diet goals. Such adaptive diet recommendations can keep the user balanced and improve diet regime adherence and can result in ongoing weight loss and improved weight maintenance.
29	NUTRITION MANAGEMENT AND MEAL PLANNING PROGRAM	ATKIN, STUART LEE; STREIN, JEFFREY; SAMANAN, KAUSHIK; GUINN, JONATHAN	SAFEWAY, INC.	11,745,672; 16.05.2007 US	26,304,62	26,304,62	16.11.2008	US and CA	In one embodiment, computerized systems and methods for nutritional planning are disclosed that may comprise providing a database coupled to a central terminal, storing in the database a plurality of records comprising nutritional information for a plurality of products, and identifying the products in the database that correspond to the database the nutritional information with products purchased using the loyalty profile. These systems and methods may further comprise identifying deficiencies in a nutritional profile and displaying products which compensate for deficiencies.
30	SYSTEM AND METHOD FOR GENERATING A MEAL PLAN	HOGKINS, Donald, J.; US CONRAD, Donald, J.; US EDMOND, Shane, D.; US GARDNER, Danik, J.; US FRICKETT, Curtis, A.; US MCGARRY, Michael, US	FTNESS VENTURE GROUP, INC	60,223,886; 08.20.08	PCT/US20010024518	WO/2002/013045	14.02.2002	WO	A multi-user meal planner for providing users with an individually customized, daily meal plan is disclosed. The multi-user meal planner includes a user interface and a relational database management system. The database management system includes nutritional information and an algorithm operationally connected to the nutritional information. The database management system further includes user information that is input through the user interface and is stored in the relational database management system. The algorithm generates a meal plan for the user based on the user information and the database management system. The algorithm generates a meal plan for the user based on the user information and the database management system. The algorithm generates a meal plan for the user based on the user information and the database management system. The algorithm generates a meal plan for the user based on the user information and the database management system.
31	COGNITIVE HEALTH AND NUTRITION ADVISOR	VIA R. Moser Mark D. Smith Andrew P. Wack Mara R. Ward	International Business Machines Corporation		54,931,79	20180308389	25.10.2018	US	Embodiments describing an approach to creating a user profile and linking a mobile device to one or more mobile fitness devices. Continuously collecting user fitness data from the one or more mobile fitness devices and continuously collecting user data. Analyzing the user fitness data and the user data, and responsive to the user fitness data and user data analysis, generating a personalized nutrition plan based on the optimum parameters.
32	SYSTEM AND METHOD FOR GENERATING PERSONALIZED MEAL PLANS	YEAGER JOHN J	YEAGER JOHN J	99,483,17 94,930,001 US 94,933,340 16.03.2005 US	11,942,866	20,881,98835	21.08.2008	US	A system for personalized meal planning is provided which includes a client device and a meal planning center configured to communicate with the client device and to receive a customer's information, including a weight designator, a gender designator, a goal designator, and an activity level designator. The meal planning center includes a storage device and a processing unit. The storage device is configured to store recipe template files having an ingredient designator and a plurality of recipe rule factors, which include a nutrient contribution value, a minimum ingredient value, and a maximum ingredient value. A plurality of recipe rule factors are each assigned to each ingredient designator. The processing unit is configured to determine a nutritional allowance based upon the recipe template files and the recipe rule factors. The processing unit is further configured to generate a meal plan assigned to the ingredient. The meal planning center is further configured to transmit the recipe to the client device.
33	Recommending food items based on personal information and nutritional content	Narendra Babu Ramach Koobizery Riju Jan	Wal-Mart Stores, Inc.		14,548,204	20150140644	19.05.2016	US	The present invention extends to systems, methods, and computer program products for recommending food items to a customer based on personal information and nutritional content. The present invention includes a merchant computer system that provides nutritional information for members of the group (e.g., family members) to the merchant computer system. The merchant computer system uses the nutritional information to recommend food items to the customer. As a customer shops, the merchant computer system compares the nutritional content of the shopping cart items with nutritional needs of the customer. Recommendations are furnished to the customer based on the shopping cart content and the nutritional needs of the customer.
34	Personal Nutrition and Wellness Advisor	Abujbara Nabil M.	Abujbara Nabil M.		13,525,20	20120083669	05.04.2012	US	Personal nutrition and wellness advisor system comprised of at least one computing platform, medical and nutrition knowledge databases, food nutrient databases, receives and analyzes each user's initial personal and health-related information to intelligently estimate his initial energy & nutrient budgets and physical activity needs; interactively constructs and presents to the user personalized energy and nutrient content-based, location-based, activity-based, and event-based ranked available food item lists and recipes to encourage the user to be physically active and to consume food items containing the most needed nutrients; tracks the user food consumption, physical activity, updates to energy and nutrient budget balances, any physiological parameter measurements, any taken medication types, doses, and times, and any other external events which may cause changes to user-specific health-related information; and generates a personalized list of recommended available food items in the recommended available food item list based on the results of tracked activities.

Annex IV-
Prioritization Matrix

Criteria	Weight (%)	A	B	C	D	E	F	G	H	I	J	Total	Relative weight
Size of the market	10	1	4	-	3	2	4	-	4	2	2	22	8,8
Fit with team knowledge	10	5	5	-	2	4	4	-	4	3	4	31	12,6
IPR	5	5	5	-	4	4	5	-	4	1	5	33	6,6
Adoption barriers	10	2	4	-	2	2	4	-	2	4	2	22	8,8
Ease of dev/Impl.	10	4	3	-	1	2	2	-	4	1	3	20	8,0
Ease of integration with present system	10	5	4	-	3	3	3	-	5	1	1	25	10,0
Distinctivennes to existing products	15	4	5	-	2	5	4	-	5	1	5	31	18,7
Customer pain	10	4	5	-	2	3	4	-	5	4	3	30	12,0
Time to market	10	4	3	-	1	2	2	-	2	1	3	16	6,4
Cost to enter market	10	3	2	-	2	3	4	-	2	1	2	19	7,6
Total:	100	37	40	-	22	30	36	-	37	19	30	249	≈100