LAPPEENRANTA UNIVERSITY OF TECHNOLOGY
School of Business and Management
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MASTER'S THESIS

NEW BUSINESS IDEA GENERATION PRACTICAL IMPLICATIONS OF A SYSTEMATIC APPROACH

Case study of Brazilian and Finnish Startups

First supervisor: Professor Leonid Chechurin
Second supervisor: D.Sc. (Tech.) Daria Podmetina

Date: 19.05.2017, Lappeenranta, Finland

Author: Jose Luis Mendez Fonseca

Address: Korpimetsänkatu 5, C3, 53850 Lappeenranta

ABSTRACT

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First supervisor: Professor Leonid Chechurin
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The challenges entrepreneurs are facing during their entrepreneurial journey are getting an increase attention of academia, society, and governments. The development of a new business is a long process that starts with a new business idea based on a recognized opportunity. New ventures are responsible for a relevant number of new job opportunities, an increase of their probability of success, by a systematic method, might generate positive effects in many dimensions of the new venture development.

The purpose of this research is to adapt existent systematic methodology TRIZ to support the process of new business idea generation of startups. The study implements multi-case study research strategy focused mainly on startups from Brazil and Finland. The research presents 24 interviews with startup founders to clarify their process of business idea generation and opportunity recognition. Also, an idea generation workshop with students of the Lappeenranta University of Technology is presented to deploy TRIZ for new business idea generation.

Research findings show frustration with the corporate life and personal motivation as the two main motivations for entrepreneurs to start their ventures. An even importance between personal traits, prior knowledge, and network for the recognition of opportunities. Also, entrepreneurs from developing countries present more an effectual approach than entrepreneurs from developed countries. Finally, this research suggests the value a systematic creativity approach might generate for entrepreneurs, as well as, a new deployment of TRIZ tools such as 9-windows, ideality, separation principles, and Su-field, into new business idea generation as an enhancement of entrepreneurs´ alertness.

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My final message, for all of you, is to always believe in your dreams, dare for your best, and deliver your own future. Thank you all!

Jose Luis Mendez Fonseca

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ABBREVIATIONS

BMG	Business Model Generation Canvas
B2B	Business to business
B2C	Business to consumer
CEO	Chief Executive Officer
COO	Chief Operation Officer
FEE	Fuzzy Front End
GEM	Global Entrepreneurship Monitor
IFR	Ideal Final Result
IT	Information Technology
MVP	Minimal Viable Product
NPD	New Product Development
SME	Small and Medium Enterprises
SWOT	Strengths, Weaknesses, Opportunities, Threats
R&D	Research and Development
TRIZ	Theory of Inventive Problem Solving
UBI	User based Insurance
VC	Venture Capital

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1. INTRODUCTION

This chapter is structured in five subchapters for the reader. Firstly, the research background, where the reader finds the explanation for this research importance. Secondly, the research gap, where is presented the need for further research on the topic. Thirdly, research objectives, problem, and questions, as a guideline for the boundaries of this research and its goals. Fourthly, research delimitations, to define the ecosystem which this research is concerning. Finally, the report structure, where the structure of the following chapters is presented.

1.1. Research Background

Entrepreneurship is one of the career dreams of many people around the World. The creation process of a successful startup that will generate a future small and medium enterprise (SME) and potentially will generate in a far future a multinational enterprise is attracting increased attention from national governments and researchers. Such importance is related to the impact of the new businesses on the generation of new job opportunities for society (Kritikos, 2014). Countries, from both developed and developing world, are investing heavily in ways to foster the development of startups and in methods to support entrepreneurs to achieve their objectives. The relevance of new companies for countries' economic growth is another factor that reinforces their value around the globe (Bartik, 1991; Kritikos, 2014; Wiens and Jackson, 2015).

Every new business starts with an initial idea. It may include a completely disruptive innovation or just a new way to generate and capture value from its target market (Osterwalder and Pigneur, 2010). Innovation is another subject that attracts attention from academia and politicians. It is the main driver for a nation to grow in the long term as discussed initially by Schumpeter in 1934 and by Solow in 1970 (Grossman and Helpman, 1993). Strategically, large companies have their research laboratories to foster the development of new products. Also, governments invest a substantial amount of their budgets per year in research and development (R&D) (Grossman and Helpman, 1993). However, an expressive number of new products and services are generated inside startups and SMEs based on open innovation or investors´ capital (Kritikos, 2014; Hadjimanolis, 1999; Chesbrough, 2006).

The size of the market for startups can be estimated by the investments of Venture Capital firms (VC) to develop these businesses for a future trade. The report from Ernest&Young (2016) shows that VCs invested in 8381 deals globally in 2015, meaning a total amount of 148 billion dollars. On the other hand, the market for startups is highly competitive, and just a few of them can succeed (Stevenson and Jarillo, 2007; DeTienne, 2010; DeTienne, McKelvie and Chandler, 2015). Also, previous researchers had found that less than one percent of all business ideas presented to VCs received their investment as well as that only ten percent of these investments end up in successful businesses. In fact, entrepreneurs tend to have a natural euphoria and believe in unreal prospects of potential success (Cooper, Woo and Dunkelberg, 1988).

The entrepreneur faces many different challenges in the stages of the entrepreneurial process. At the early stages, the first objective is to generate a robust business plan that will convince customers and future investors of its market value (Osterwalder and Pigneur, 2010). Also, a feasible business plan starts with the idea that will generate value for its target market. However, during the process of launching and developing a startup, many problems and new challenges come up for the entrepreneur to solve (McGrath and MacMillan, 2000; Chesbrough, 2010).

Generation of ideas is a process that all individuals have the capability to do. Soon artificial intelligence will enable machines to do the same as humans (Yuste and Bargmann, 2017). Idea generation is the initial stage of any new development, innovation, or creation. The most famous process for idea generation is brainstorming, which is a non-systematic approach that consists of individuals working together to generate new ideas to solve a problem or generate a new concept or business (Dreu, Nijstad, and Baas, 2011; Thompson, 2003). In a market where competitiveness is always growing, entrepreneurs who invest their lives and dreams in one business idea need to increase their probability of success by selecting the best ideas and solutions at all stages of their business development.

1.2. Research Gap

There is a developed literature on entrepreneurial theory and entrepreneurs' behavior. The motivation for an entrepreneur to start a business and all phases of development of a new business are well covered in the literature. However, all previous research are normally focused on the theoretical concepts of the entrepreneur mindset, teamwork, and decision-making process, while the entrepreneur specific process of idea generation for both the initial business concept and its modifications along the new business development life-cycle might be considered as scarce. Furthermore, one may find an extensive amount of research papers on brainstorming within academic literature considering particular deployments and adaptations to foster idea generation. However, within academic literature one may find scarce papers about a systematic approach to support the idea generation of a new business.

This study seeks to exploit the theory of inventive problem solving (TRIZ) to solve this gap in the new business idea generation process by performing a holistic analysis of an extensive group of entrepreneurs from different countries in Europe and America. The adaptation of a systematic approach might increase the number, quality, as well as the feasibility of new business ideas.

1.3. Research objectives, problem, and questions

The principal goal of this research is to perform a holistic analysis of the new business idea generation process of startups in Europe and America. Hence, the first objective of this study is to analyze the real process which entrepreneur's face to generate their business ideas. In addition, the second goal is to understand the potential benefits of a systematic approach for entrepreneurs during their business development. The deployment of TRIZ in new business idea generation is the problem-solving methodology selected by this study. Accordingly, the second objective is to select and validate which components of TRIZ may be integrated into the actual process of new business idea generation.

The central research question (RQ) of this academic research is "*How to generate value for entrepreneurs via a systematic approach for new business idea generation?*"

For the sake of delivering stated research objectives, following research questions are aimed to be exploited by this study (Table 1). The answers for these questions shall achieve all the previously stated objectives; hence, they together aim to answer the presented central research question..

Table 1. Research questions

“	**Research Question**	**Research Objective**	**Research Method**
RQ1	How are new entrepreneurs generating their businesses ideas?	To analyze the real process, which entrepreneurs face while generating business ideas	Multi-method qualitative study
RQ2	Which implications could a systematic approach have for entrepreneurs?	To understand which components of TRIZ may be integrated into the new business development	Multi-method qualitative study
RQ3	How to deploy TRIZ for new business idea generation?		

Source: The author

The presented research framework is applied within a case study research strategy. As a detailed understanding of the defined phenomenon is needed, a qualitative method is applied in order to answer all stated research questions to full extent. Divided into three parts: an initial elaboration of questions together with pilot entrepreneurs; complete interviews with founders and co-founders of startups; a workshop with students. The research implies a multiple holistic case study of startups from Europe and America.

1.4. Delimitations

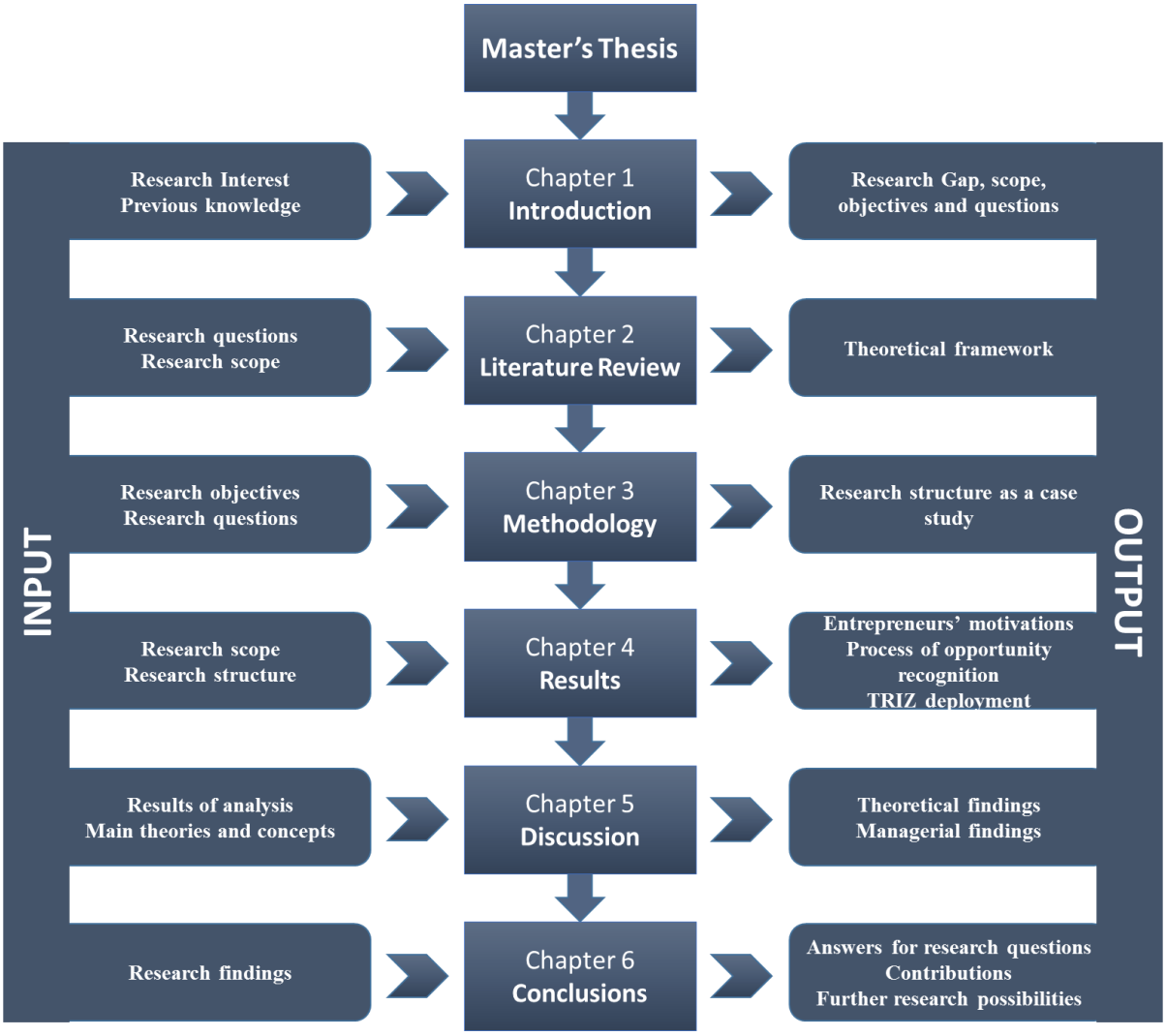
This research is focused on the challenges entrepreneurs have to meet in order to develop their startups. In a global market, where startups offer more job opportunities than large corporations, the optimization of the entrepreneurial process is a key challenge for the individuals, researchers, and nations. Also, in order to deliver a global perspective of the entrepreneurial journey, opposite countries such as Brazil and Finland were selected to be part of the developed case study. Even though a case study is not an easy research strategy to provide generalizations of research findings, a large sample of 24 startups increases the value and possibilities of generalization for this research. The scope of this research is focused only on startups, and its findings may not be valid for larger corporations or stable

companies with big experience in their markets. Considering the presented sample, this research fully addresses stated research questions, therefore, reaches both research objectives.

1.5. Report Structure

With the aim to present the results of this research in an organized way and to achieve a high degree of readability, this report is divided into six chapters. At this first chapter "Introduction" the research background is presented as well as research objectives, problem, and questions. The subsequent chapter, "Literature Review", discusses all the relevant theoretical frameworks and concepts. This chapter is divided into three subchapters for a better understanding of specific theories. Their names are "Entrepreneurship", "New Product Development", and "Systematic Creativity". After the "Literature Review", the next chapter is "Methodology". It includes a full description of the methodological framework of this study, which comprehends a research design, case description, data collection, data analysis, and data quality.

The next chapter already containing the empirical data of this study is "Results". It has two subchapters that include a qualitative analysis of interviews as well as the adaptation of TRIZ tools for entrepreneurs. Following is the "Discussion" chapter where the empirical findings are compared with the relevant theory presented previously in the "Literature Review" chapter. Also, this chapter aims to answer stated research questions and achieve research objectives. Finally, "Conclusion" chapter is the last part of this research. It presents study's limitations as well as theoretical and business implications. In addition, the chapter challenges researchers with pathways for future developments. The visual structure of this Master´s Thesis is presented in Figure 1.



Source: The Author

Figure 1. Master's Thesis structure

This study has two more sections. "Reference" section with all references that have been cited in this research paper. Also, an "Appendices" section containing all support material for the better understanding of this study.

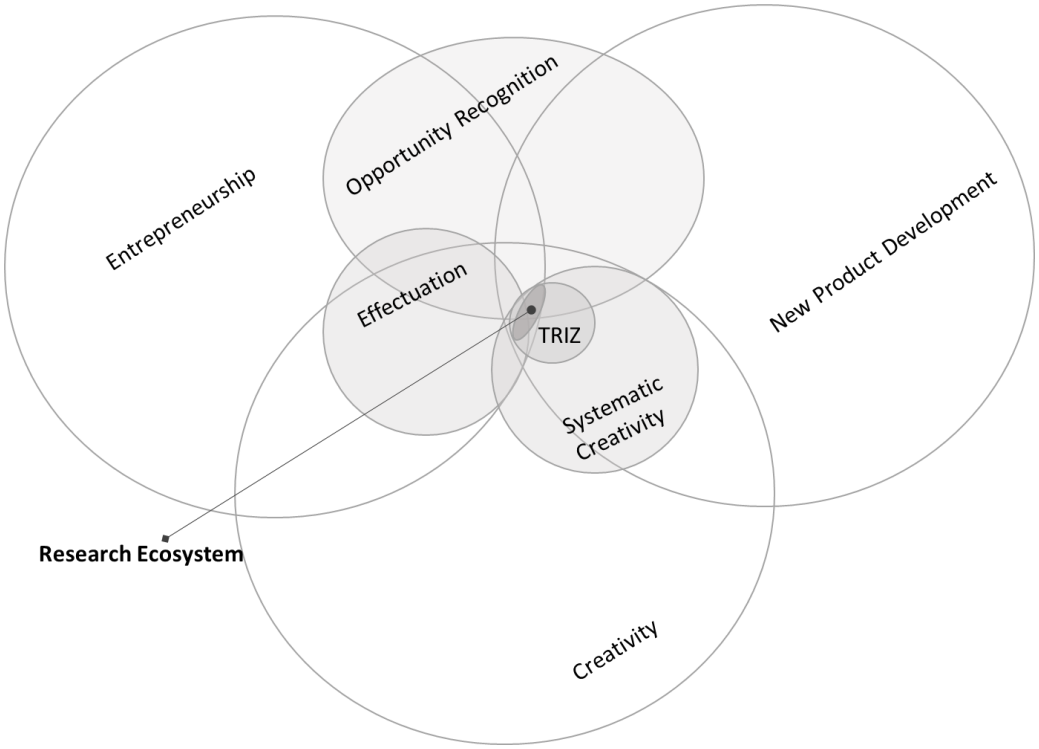
2. LITERATURE REVIEW

This chapter presents an in-depth analysis and review of the theory relevant to this study development. The literature review ground this research framework in order to achieve its objectives and respond to the stated research questions. It includes key theory concepts, previous research models, and elaborates a fruitful background for the empirical part of this study. In addition, the analysis of academic literature, main theoretical findings and recent propositions supports a better structural model for the whole study.

The theoretical review is elaborated considering up-to-date academic literature, books, and trend topics. The literature search used different sources of data. The most relevant database for this research was Scopus and the search tool from Google Scholar. This literature review has articles from refereed journals as well as recent conference papers with the most up-to-date academic topics. Also, the keywords and terms derived from the research question that were used to select the relevant literature for this study were: "Entrepreneurship"; "Effectuation";" Systematic Creativity"; "TRIZ"; "TRIZ in business"; "Opportunity Recognition"; "Pattern Recognition"; "Creativity"; "Idea generation", "TRIZ in SMEs"; "New business development"; among others. For a smooth reading and comprehension, this chapter is divided into three subchapters "Entrepreneurship", "New Product Development", and "Systematic Creativity". The total number of literature sources within the literature review is 91 unique references.

The academic literature review has shown that new business idea generation has roots and influence in many academic domains. The author's choice is to position this research in the interconnection of entrepreneurship, opportunity recognition and creativity. As discussed in the chapter "*Introduction*" and after the review of several articles, this research aims to understand the potential value of a systematic creativity approach for new business idea generation. In order to achieve this objective, inputs of new product development methods and TRIZ methodology are included in this research. In fact, TRIZ is the selected tool within the systematic creativity domain for this research. For that reason, the influence of TRIZ in this theoretical framework is higher than its actual academic importance. The research area is presented in Figure 2 as the intersection of previously described theoretical concepts. In addition, the last section of "*Literature Review*" brings more practical version of the

theoretical framework after all concepts that are presented. The version of the framework (Figure 2) can be considered a strategic and more general version of the theoretical framework of this research.



Source: The Author

Figure 2. Theoretical framework of the research

As stated, the following subchapters have specific and complementary theoretical background. The next section "Entrepreneurship" introduces the concepts related to the human behavior of entrepreneurs, entrepreneurial theory, and opportunity recognition theory. To bridge from pure business concepts to creation, the section "New Product Development" discusses key theories related to the process of NPD, idea generation and human creativity. The last theoretical section of this chapter named "Systematic Creativity" introduces what a systematic approach means and presents an overview of traditional TRIZ, as well as, TRIZ deployment in non-technical fields, and TRIZ frameworks to support SMEs. This chapter ends with a short section, which presents the list of assumptions this study aims to test in the empirical part, as well as, the tactical version of the research framework to answer stated research questions.

2.1. Entrepreneurship

Entrepreneurs have been extremely researched by academia during the last decades. New ventures are relevant for almost all economic sectors and countries. Drivers to become an entrepreneur can be related to many different dimensions of the individual such as education, age, family background, partnering, emigration/ethnicity, and gender (Burns, 2010, chapter 3). Segal, Borgia, and Schoenfeld (2005) findings present as significantly predicted self-employment intentions the tolerance for risk, perceived feasibility and net desirability. Matthew Toren, a serial entrepreneur, listed six common reasons for individuals to pursue their dreams of entrepreneurship: entrepreneurs' creativity does not fit the corporate environment; entrepreneurs want a lifestyle that is not bound from Monday to Friday and from nine to five; entrepreneurs are passionate about new skills and constant learning; entrepreneurs' ideas are unconventional; entrepreneurs want to do things and deliver solutions; a real entrepreneur wants to change the World somehow (Toren, 2015).

Career reasons for self-employment are considered as not homogeneous in academia (Cassar, 2007). Individuals consider that the entrepreneurial journey gives more life and job satisfaction than traditional employment (Blanchflower and Oswald, 1998). The majority of startup founders are looking for independence and not only financial freedom (Cassar, 2007). However, for many entrepreneurs, the biggest challenge is related to the capital constraint that they face to develop their initial ideas into workable businesses (Blanchflower and Oswald, 1998). The action to develop an idea until a business has been studied from many perspectives: in consideration of the real period of the entrepreneurial process (DeTienne, 2010); in order to clarify the importance of a rigid or flexible process of business development (Trimi and Berbegal-Mirabent, 2012). In fact, academia has discussed the topic in such a width perspective that many concepts can be mixed, repetitive or confused, such as *Lean start-up, Agile,* effectuation, causation, opportunity recognition, design thinking and customer development (McGrath and MacMillan, 2000; Müller and Thoring, 2012; Trimi and Berbegal-Mirabent, 2012).

The aim of this subchapter is to clarify the existent literature on entrepreneurship and highlight gaps that previous researchers did not discuss. Firstly, the text presents the characteristics of the entrepreneur's behavior, then, it discusses the trend topics of new firms'

development. Secondly, the subchapter introduces and discusses the opportunity recognition theory and its value for the development of a new business.

2.1.1. Causation and Effectuation

The way entrepreneurs make decisions and run their business is considered to be different than regular managers of stable or well-known companies do (Sarasvathy, 2001). The common lack of resources and scarcity of opportunities changes the mindset and behavior of entrepreneurs (Trimi and Berbegal-Mirabent, 2012). The first academic to use the term "*effectual approach*" was Professor Saras D. Sarasvathy to explain the differences she mapped from companies' managers and successful entrepreneurs (Sarasvathy, 2001). In her research, she differentiates causation or predictive process from the effectual process as "*causation processes take a particular effect as given and focus on selecting between means to create that effect. Effectuation processes take a set of means as given and focus on selecting between possible effects that can be created with that set of means"* (Sarasvathy, 2001, p. 245). In fact, human reasoning is a mix of both causation and effectuation, they might even occur simultaneously. However, her research argues that entrepreneurs have different principles than managers (Table 2). For instance, there is more value for entrepreneurs in their affordable loss rather than expected returns; in strategic alliances rather than competitive analysis; in exploitation of available contingencies rather than exploitation of preexisting general knowledge (Sarasvathy, 2001).

Table 2. Effectuation principles

Principle	Description
Bird in hand	Start with basic three questions: who you are; what you know; whom you know?
Affordable loss	Invest only the capital you can afford to lose.
Crazy quilt	A network of partner stakeholders willing to commit with your startup.
Lemonade	Openness for surprises and to use them for your benefit, adapt your business to the new inputs and opportunities
Pilot in the plane	Co-create the future with things within your and co-founders control.

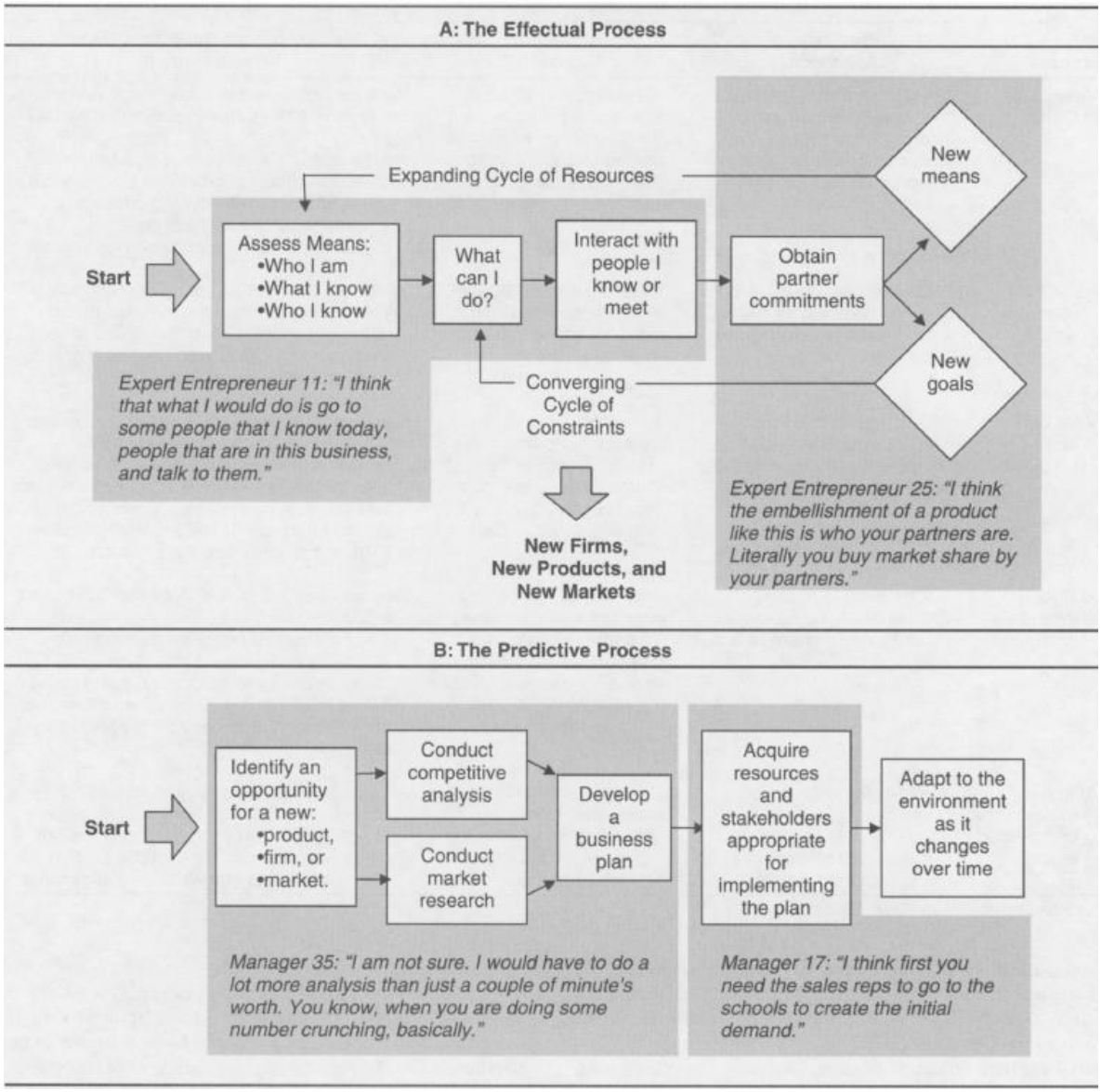
Source: Adapted from Sarasvathy, 2009

In a recent research, Professor Saras D. Sarasvathy and a team of researchers discussed even further the differences of expert entrepreneurs versus general business people. Their findings show that expert entrepreneurs prefer co-creation and they rely on strategies that guarantee them to have close control of situations (Read, Dew, Sarasvathy, Song, and Wiltbank, 2009). The research also offers a process analysis of both the effectual and predictive process, Figure 3. In Sarasvathy (2001), the researcher also presents three propositions for future empirical validation:

1. *Pre-firms or very early stage firms created through processes of effectuation, if they fail, will fail early or at lower levels of investment than those created through processes of causation. Ergo, effectuation processes allow the economy to experiment with more numbers of new ideas at lower costs;*

2. *Successful early entrants in a new industry are more likely to have used effectuation processes than causation processes. With later entrants, the trend could be reversed;*

3. *Successful firms, in their early stages, are more likely to have focused on forming alliances and partnerships than on other types of competitive strategies, such as sophisticated market research and competitive analyses, long-term planning and forecasting, and formal management practices in recruitment and training of employees;*



Source: Read et al, 2009

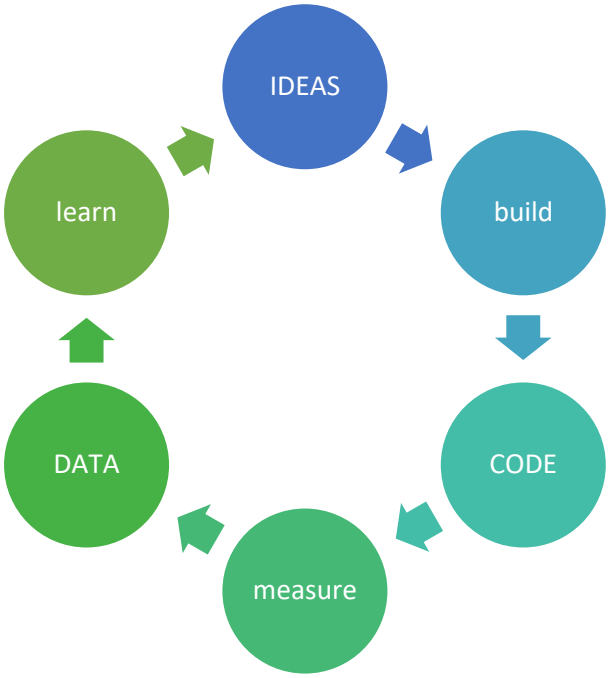
Figure 3. Effectual versus Predictive process

These propositions are of high relevance for this research, as an empirical research comparing entrepreneurs from Europe and America have scarce data in academia. In Sarasvathy (2009), the effectual approach was reviewed, and many examples of ventures and their entrepreneurs were presented to support previous research propositions and conjectures. In order to link the entrepreneurs' behavior with the structure of their ventures, a formal business model is important to clarify the entrepreneur initial goals and vision of an opportunity. To understand a start-up capital definition is essential to comprehend the financial, human and social capital on board the venture (Burns, 2010, chapter 3). Examples

of financial capital are different techniques of bootstrapping (Burns, 2010, chapter 10), which means the use of resources that the entrepreneur may not own. Human capital is related to the knowledge the founder team already have based on their prior knowledge. Social capital is derived from the existent personal network of the entrepreneur (Burns, 2010, chapter 3). After a founder or a team of founders have a clear understanding of their skills, capabilities and affordable loss, the moment to start their venture asks for a methodology. The following subchapters discuss three well-spread methods.

2.1.2. Lean Start-up

A term that became popular by Ries (2011), the "*Lean Startup*" methodology introduces a process of launching a business within limited resources, similar to the perspective of the affordable loss (Burns, 2010, chapter 6). Lean is a well-known concept for manufacture processes, which was developed by Taiichi Ohno and Shigeo Shingo inside Toyota in the past century (Ries, 2011). The "*Lean Startup"* brings together principles of lean practices, as well as, customer development and agile methodologies (Trimi and Berbegal-Mirabent, 2012). The speed to test potential market solutions within consumers at the earliest possible stage is one of the key values of lean. Ries (2011) also introduced the notion of *Minimal Viable Product* (MVP). The idea is to create the simplest marketable product to get a fast feedback loop from users to mitigate future risks of development. The following structure, Figure 4, shows how *Lean Start-up* is deployed. The process is shown as six stages, three with clear external interaction such as "build", "measure", and "learn". A complete version of lean might be found in Appendix A.



Source: Adapted from Ries, 2011

Figure 4. Lean Startup process

In order to terminate with the myth of randomly successful entrepreneurs, the *Lean Start-up* methodology defends that everyone may be an entrepreneur if they follow the steps and process of the method. Companies such as DropBox, Votizen, and Wealthfront are examples of lean users (Trimi and Berbegal-Mirabent, 2012). For these researchers, the adaptation of lean manufacture to startups is valuable, but brings some issues lean faces already for new product development (NPD) as a strategic perspective without useful daily problem-solving tools. Considering the dynamics of entrepreneurs' lives and personal drivers, one may say that lean do not support the execution of a startup plan, only some general guidelines.

2.1.3. Business Model Canvas

The work developed by Österwalder and Pigneur (2010) is the most discussed and reviewed in the past years related to models for entrepreneurs. The *Business Model Generation Canvas* (BMG) and it's nine building blocks is a framework that enhances the visibility for entrepreneurs of their business, processes and key shareholders (Österwalder et al., 2005; Österwalder and Pigneur, 2010). The success of the framework resulted in the creation of a company named *Strategyzer*, which develops solutions to support entrepreneurs to launch and develop their startups (Strategyzer, 2017). The traditional canvas has these building

blocks: customer segments, value proposition, channels, customer relationships, revenue streams, key resources, key activities, key partnerships, and cost structure. One might see the *Strategyzer* canvas in Appendix B.

One may find several articles that adapt or provide suggestions for further development of the BMG (Osterwalder and Pigneur, 2013; Fritscher and Pigneur, 2009; Eppler, Hoffmann and Bresciani, 2011; Trimi and Berbegal-Mirabent, 2012). However, the opposite perspective is not presented in the academia. General critics might be found in Eppler, Hoffmann, and Bresciani (2011) as they argue that it has not yet been systematically tested, as well as, in Coes (2012) as the author argues the exclusion of competition and the narrow focus on profit are gaps of the actual canvas. In general, the framework developed by Österwalder and Pigneur (2010) is the easiest to use for entrepreneurs to develop their ideas.

Considering that a well-developed business model is a bridge for a new business to capture the value they can generate from innovation (Chesbrough and Rosenbloom, 2002), the only unclear point is how the entrepreneur may generate the idea for the new business. Changes within the existent business model are well-discussed in academia to generate innovations. However, research related to BMG falls short in support entrepreneurs to generate the idea of the new business. They focus on the development of a winner business plan or in changes in particularly building blocks as sources of case specific innovations. Opportunities to combine inputs of effectuation approach for further development the business model canvas may clarify this issue of the roots of new business idea generation. Even though for Sarasvathy (2001), the development of a business model is one of the characteristics of a causal approach. As already discussed in the section "*Causation and Effectuation*", both approaches may coexist, so research of the possible inputs of an effectual approach for the canvas might be fruitful.

2.1.4. Design thinking

Developed by consultants of IDEO at the end of the last century, design thinking is similar to lean startup as both methods focus on users or customers' perception and interaction (Müller and Thoring, 2012). Common inside R&D departments of companies to foster innovation, design thinking is "*a flexible sequence of process steps and iteration loops, each*

including several tools and resulting in different artifacts" (Thoring and Müller, 2011, pg. 1). As a systematic process, based on engineering concepts, Appendix C presents the whole framework. Design thinking has six major stages: understand, observe, the point of view, ideation, prototyping, and test. Considering its feedback loops, the design may return to initial stages depending on the type of negative feedback the solution receive from the target market (Müller and Thoring, 2012; Cooper and Vlaskovits, 2010).

For this research, the comparison of design thinking and lean startup is of high value. In order to visualize similarities and differences, Table 3 is presented:

Table 3. Design thinking versus Lean Startup

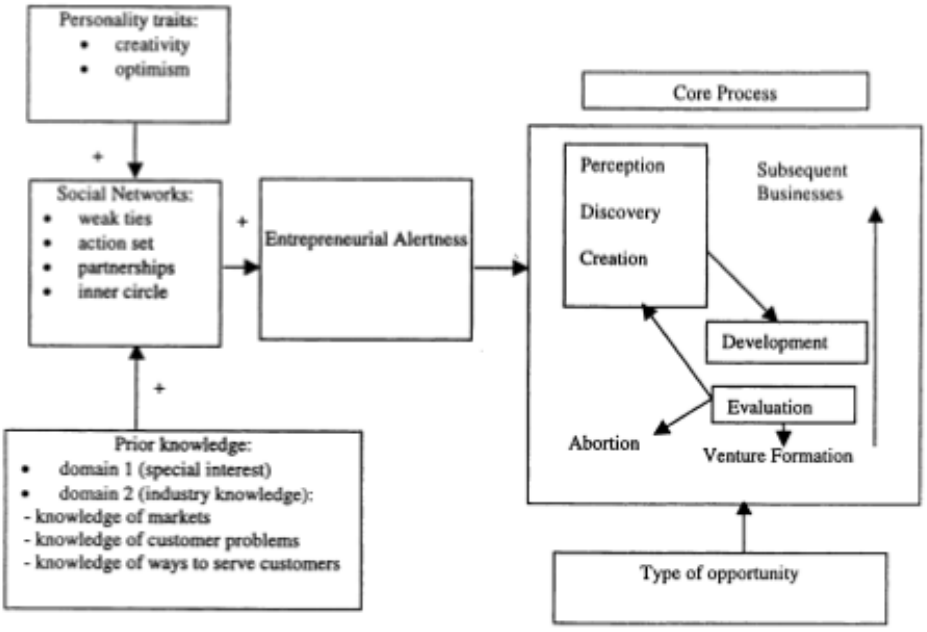
Similarities	Differences
Innovation focus: an idea must be desirable, viable and feasible.	Scope: lean is only for startups, and design thinking has a broader focus.
User-centered approach: both methods take into account users and stakeholders' point of view.	Project initiation & ideation: lean considers that an initial idea already exists and design thinking starts with a problem to be solved.
Test prototypes: to gather feedback since the early stages of the development.	User research and synthesis: while design thinking focuses on extensive research and has sophisticated methods for synthesizing, lean does not any synthesis methods or qualitative frameworks.
Rapid iteration: the solution for the problem is unknown in the beginning.	Business Model: while Lean Startup suggests the use of BMG, design thinking does not suggest any business model.

Source: Adapted from Müller and Thoring, 2012

The list of differences may also include quantitative and qualitative evaluations, pivoting of ideas, and adaptation of deployments (Müller and Thoring, 2012). Based on Table 3 and on the previous sections, lean startup presents a need for an initial idea, similar to a causal approach. On the other hand, design thinking is focused on the problem to be solved and challenge the individual has to solve it, based on individuals' skills, knowledge, and network, closer to an effectual approach. In both cases, entrepreneurs need to have some degree of interaction with the market they want to participate, or to develop an existent idea or to solve a latent problem. The recognition of this potential opportunity may be the difference between entrepreneurs and non-entrepreneurs.

2.1.5. Opportunity Recognition

The theory of entrepreneurial opportunity recognition was first proposed by Ardichvili, Cardozo, and Ray (2003). Researchers define the theory as "*It identifies entrepreneur's personality traits, social networks, and prior knowledge as antecedents of entrepreneurial alertness to business opportunities.*" Also, the authors continue to explain their theory by "*Our theory conceives of opportunity identification/ recognition as a multistage process in which entrepreneurs play proactive roles. We argue that both individual and situational differences influence the process*." These new business opportunities are identified when entrepreneurs "connect the dots", by using relevant cognitive frameworks. These connections may be related to changes in technology, markets, unrelated events, and then detect patterns for potential new products or services (Baron and Ensley, 2006; Baron, 2006). The model developed by Ardichvili, Cardozo, and Ray (2003) is presented in Figure 5.



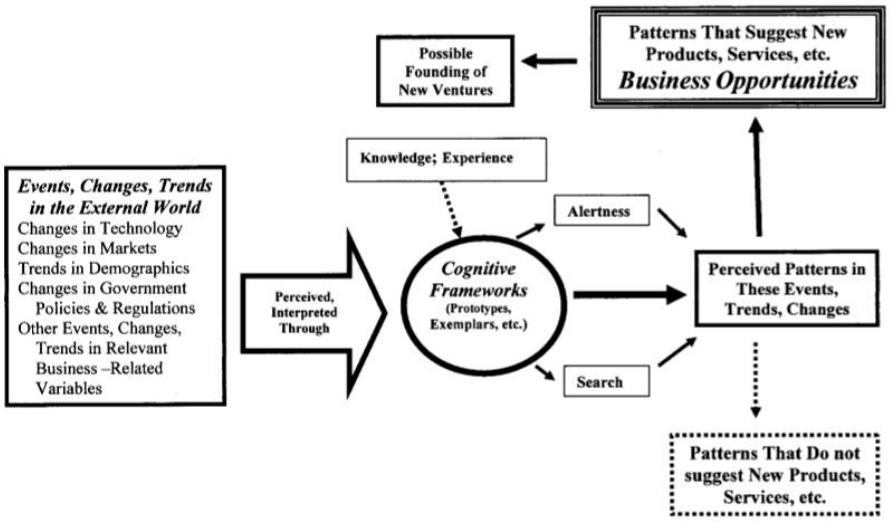
Source: Ardichvili, Cardozo, and Ray 2003

Figure 5. The model for opportunity identification and development theory

Different then common sense may suggest, opportunity recognition does not require a special level of creativity (Ardichvili and Cardozo, 2000). It is correlated with five factors, such as entrepreneurial alertness, information asymmetry and prior knowledge, discovery versus purposeful search, social networks, and personality traits (Ardichvili, Cardozo, and

Ray, 2003; Corbett, 2005). In fact, creativity is one of the components of personality traits, but it also includes risk-taking, optimism, and self-efficacy (Ardichvili, Cardozo, and Ray, 2003). In a complementary research, Baron (2006) also found three factors that play an important role in opportunity recognition: engaging in an active search for opportunities; alertness to opportunities; prior knowledge of an industry or market. Also, more than one previous research have argued that entrepreneurs with greater experience and knowledge recognize more opportunities than entrepreneurs with lower capabilities (Baron, 2006; Ardichvili, Cardozo, and Ray, 2003; Corbett, 2005).

As defended by Corbett (2005), opportunity identification and exploitation is something that one might learn. Also, individuals who have a high alertness of the ecosystem around them may recognize opportunities even without actively searching for them (Baron, 2006). In order to enrich this discussion, the role of patterns recognition in opportunity recognition is important. It supports the idea that individuals can be trained to increase their assertiveness in selecting business ideas (Baron, 2006). In other words, current or would-be entrepreneurs can be more successful at recognizing opportunities from changes in the world (Baron, 2006). For this research, the framework of patterns recognition is important as it directly influences opportunity recognition (Figure 6).



Source: Baron, 2006

Figure 6. Role of pattern recognition in opportunity recognition

In this subchapter, several dimensions of entrepreneurship were discussed. It also leaves a list of open questions related to the process entrepreneurs may follow to generate and further develop their ideas. The following subchapter discusses how multinational companies develop their new products. Research and Development teams (R&D) might be considered "*intrapreneurs*" for these companies. Their characteristics are similar to entrepreneurs that pursue their venture. Similarities between entrepreneurship and new product development are related to the high risk of failure, market uncertainty, budget restrictions, among others. Also, many startups are launching new products to the market. Several reasons to look for possible inputs for academic gaps in the actual entrepreneurial process.

2.2. New Product Development

The development of new products and services is a routine for the large majority of companies around the World. One might consider new product development (NPD) as the most important activity for a company in a dynamic market full of uncertainties. Utterback and Abernathy (1975) define "*A product innovation is a new technology or combination of technologies introduced commercially to meet a user or a market need.*" This concept from the 70´s is still largely accepted in academia. Rothwell (1994) divided the previous decades of new developments into five generations of the innovation process, showing the evolution NPD has been facing inside organizations. In addition, Griffin and Page (1996) discuss the concept of NPD portfolio, as well as, which dimensions of value are important to measure an initiative success based on its newness to the firm and the market.

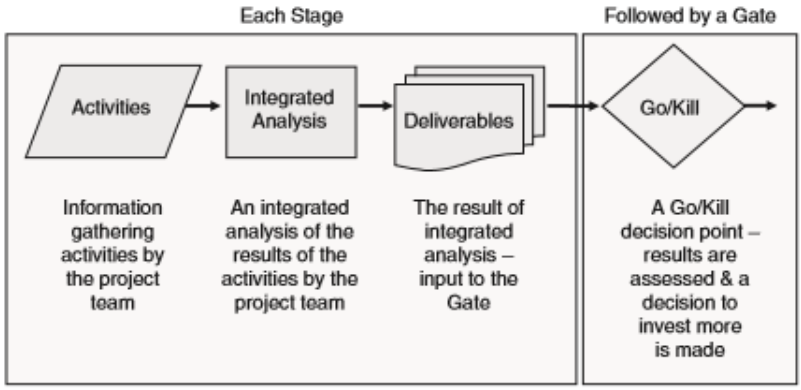
In a general perspective, an NPD has different typologies and classifications depending on its dimensions and on its position inside a firm portfolio. Utterback and Abernathy (1975) focus their model on three different reasons such as product innovation performance-maximizing, sales maximizing or cost-minimizing. At the company level, NPD may be positioned as a reflex of company's strategy into the market such as prospectors, analyzers, defenders, or reactors (Griffin and Page, 1996). In fact, a new business starts when a new product development is in its incumbent stage.

Many decisions related to launching a new product are correlated to a new business generation. Hence, measurements of product success such as market share, competitive

advantage, net profit goal, and others (Griffin and Page, 1996), might be adopted by SMEs and startups to measure their success. In addition, the market of a product is important for the correct launch decision and product success. For instance, there are particular differences between launching a consumer product (B2C) and an industrial product (B2B) (Hultink et al., 2000). Furthermore, one can find a large number of articles related to NPD methods, frameworks and different approaches. However, the *Stage-Gate* process has been the most deployed inside companies during the last three decades (Cooper, 2008).

2.2.1. Stage-Gate Process

Stage-Gate is the most famous process to foster innovation and NPD inside companies. An estimate shows that the *Stage-Gate* Idea-to-Launch Process is implemented by almost 80% of North American companies (Stage-Gate, 2017). Dr. Robert G. Cooper describes it as "*A Stage-Gate process is a conceptual and operational map for moving new product projects from idea to launch and beyond—a blueprint for managing the new product development (NPD) process to improve effectiveness and efficiency*" (Cooper, 2008). Moreover, the developer of the method describes it as a simple, replicable process of go/kill decisions, which has several benefits for the project team. The logic of the process is described as "*The innovation process can be visualized as a series of stages, with each stage composed of a set of required or recommended best-practice activities needed to progress the project to the next gate or decision point*" (Cooper, 2008) (Figure 7). The traditional process normally has five gates such as an initial screen, second screen, the decision on the business case, development review, and pre-commercialization business analysis (Cooper, 1990). Also, there are many examples in academia with a higher or lower number of gates (Cooper, 1990; O´Connor, 1994; Cooper, 2008; Copper, Sommer, 2016).

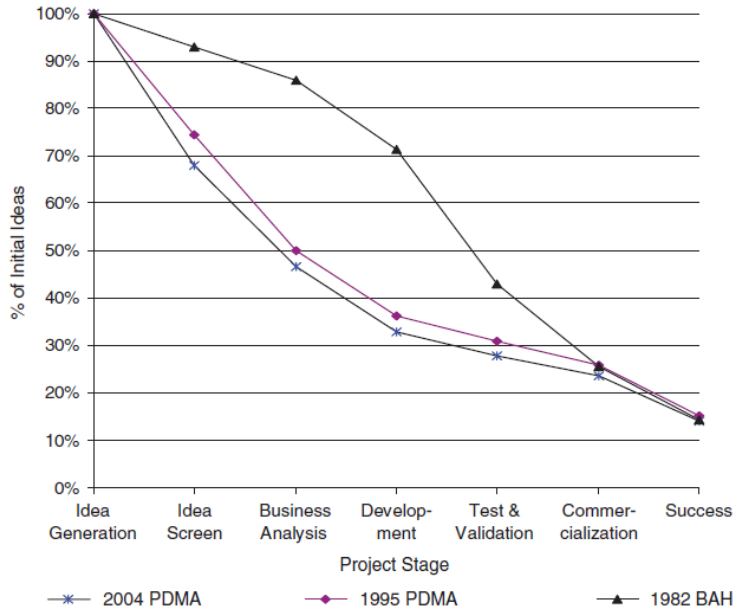


Source: Cooper, 2008

Figure 7. Stage-gate individual process

Many critics and further developments have been included in the traditional process. One can find research in academia which integrates *Stage-Gate* with open innovation (Grönlund, Sjödin, and Frishammar, 2010) as well as with TRIZ (Abramov, 2014). The state-of-the-art version adapts the agile method with the traditional *Stage-Gate* (Copper, Sommer, 2016). The *Agile Manifesto* states values that emphasize "*individuals and interactions over processes and tools, working software over comprehensive documentation, customer collaboration over contract negotiation, and responding to change instead of following a plan*" (Copper, Sommer, 2016). The new approach, "*The Agile-Stage-Gate hybrid model*", presents an improved communication and knowledge sharing than previous methods, as well as, it shows a reduction of project cycle time among other benefits (Copper, Sommer, 2016). In contrast, the consequences of NPD speed to market may influence positively or negatively new product performance depending on market characteristics (Cankurtaran, Langerak, Griffin, 2013). As a matter of fact, Agile is already a component of the Lean Startup methodology presented previously in this chapter and a well-spread method among entrepreneurs of high-tech startups.

One of the great benefits of the *Stage-Gate* is the positive effect it has on the mortality curve of projects (Barczak et al., 2009; Markham and Lee, 2013) (Figure 8). The mortality curve is related to an escalation of commitment that managers and developers have related to their ideas as well as initiatives. This curve has a negative effect on the portfolio of projects. As the amount of money and workforce invested in failure projects might risk the capital to high potential ideas (Biyalogorsky et al., 2006; Behrens and Ernst, 2014).



Source: Barczak et al., 2009

Figure 8. New product ideas mortality curve

The principles that ground the *Stage-Gate* are related to the particularities of an NPD project. From the ideation to the launch stage, the NPD process has an increase in cost and managerial commitment, in contrast, reduction in market and technological uncertainty (Cooper, 2008). This approach naturally generates an NPD-funnel to select the ideas with higher potential via the *Stage-Gate* process (Grönlund, Sjödin, and Frishammar, 2010). Hence, Stage-gate is expected to be the most traditional process of *Fuzz Front End* (FEE) (Eling, Griffin, Langerak, 2013). FEE is used mainly in companies as their innovation process. The relevance of this research for the whole NPD process is to link the business component of an NPD, which allows entrepreneurs to launch their startups, with the process of creating a new product or service. The structure of the *Stage-Gate* can generate insights for a systematic creativity method of a new business idea generation.

2.3. Systematic Creativity

Lego Company has the simplest definition in their Systematic Creativity Report which explains the term for the general public "*Systematic Creativity is about using logic and reasoning along with playfulness and imagination, to generate ideas or artifacts that are new, surprising and valuable.*" (Ackermann and Gauntlett, 2009, p. 4). The same authors listed twelve myths related to creativity such as "*creativity is something you are born with*",

"*creativity is spontaneous inspiration*", "*creative people are liberated, free-spirited and childlike*", and "*children are more creative than adults*", just to cited part of the list. Mihaly Csikszentmihalyi is considered to be the first researcher to structure the creative process in five simple steps: Preparation; Incubation; Illumination; Evaluation; and Elaboration (Csikszentmihalyi, 1996). This basic process includes, in general terms, the majority of non-systematic and systematic methods that exist in academia.

The comparison of non-systematic methods, such as brainstorming, with systematic creativity methods, such as lateral thinking suggests that the later increase the creativity of individuals (Ogot and Okudan, 2006; Bono, 2010). The idea that creativity is something people can learn has been of academic interest for years, and several researchers discuss the topic (Ogot and Okudan, 2006; Ward, Patterson and Sifonis 2004). For the interest of this research, is important to understand how the systematic method, named Theory of Inventive Problem Solving (TRIZ), could generate value for opportunity recognition within the entrepreneurship perspective, as TRIZ is already a powerful methodology of idea generation for other fields.

Ogot and Okudan (2007) results with students of engineering show that TRIZ had a positive effect on students' creativity output versus students without any training. Their research also reinforces that creativity is something that can be taught in school and universities. However, Ward, Patterson, and Sifonis (2004) alerts for the threats a systematic method might deliver to the ability of people to balance abstraction and specificity in the creative process. Ward (2004) highlights how creativity and entrepreneurship are correlated with cognition factors of the entrepreneur. The author presents several examples on how individuals' minds elaborate problem-solving activities. The most important examples are presented in Table 4. This list of examples supports the vision of this researcher of the value of TRIZ for entrepreneurs during their process of opportunity recognition.

Table 4. Creative process drivers versus TRIZ.

Citation	Authors	Connection with TRIZ
"*Integrating two opposing ideas, a process termed Janusian thinking underlies creative acts… combining concepts is a crucial component in several process models of creative functioning.*"	Davidson, 1995; Mumford et al., 1991; Sternberg, 1988; Ward, 2004.	The analysis of contradictions is the most well-known tool of TRIZ.
"*the application or projection of structured knowledge from a familiar domain to a novel or less familiar one.*"	Gentner et al., 2001; Holyoak and Thagard, 1995; Ward 2004.	Review of patents and the search for particular solutions from different fields are both components of TRIZ.
"*the role of analogy in major creative accomplishments, such as Kepler's reasoning about planetary motion … Edison's development of an electric light distribution system … the Wright brother's efforts to craft a workable flying machine … Not surprisingly, then, analogy has been a key ingredient in proposals for enhancing creativity and has been listed as a component process in cognitive process models of creativity.*"	Gentner et al., 1997; Basalla, 1988; Friedel and Israel, 1986; Crouch, 1992; Gordon, 1961; Finke et al., 1992; Ward 2004.	The value of generalization and abstraction to develop solutions is an intrinsic value of TRIZ.
"*LP record albums, for example, can be thought of as instances of the more general category of records, which in turn are instances of music storage devices, which in turn are instances of storage devices.*"	Ward 2004.	9 windows representation of TRIZ allows this view.
"*an idea to improve on existing kennels might lead an innovator to add new features to a basic kennel structure, but a consideration of more abstract ideas about why people use kennels might lead to a new venture altogether.*"	Ward 2004.	Function Analysis and Ideal Final Result are tools of TRIZ support this view.

Source: Adapted from Ward (2004)

2.3.1. TRIZ in Creativity

Creativity is a key component of people' lives. The first time it was recognized as an academic discipline, which could be taught and learned by psychologists was in the fifties. Later, in the seventies, many corporate creativity-consulting firms started to offer some training programs. TRIZ was one of them since the beginning. It offers a systematic approach for individuals to solve complex problems (Bertoncelli, Mayer & Lynass, 2016).

Also, Burroughs et al. (2011) proved the value of internal training for companies' creativity process with a particular citation to the value of TRIZ for these companies.

In fact, the most common way companies' foster creativity is the well-known brainstorming or via tools such as "SCAMPER" (Substitute, Combine, Adapt, Modify, Perform Other, Eliminate, and Rearrange) or 5 W's (who, what, why, when, where) (Hipple, 2003). A simple way to compare these methods with TRIZ is "*These are all good idea generation and problem definition techniques, but as those in the TRIZ community know, these stimulation processes are somewhat random and do not necessarily have a particular link with the problem at hand*." (Hipple, 2003, p.3). In addition, research in this field had shown the benefits of the integration of TRIZ within the traditional brainstorming process (Bertoncelli, Mayer & Lynass, 2016). Furthermore, TRIZ might add value to any corporate creativity strategy (Gronauer & Naehler, 2016) (Table 5).

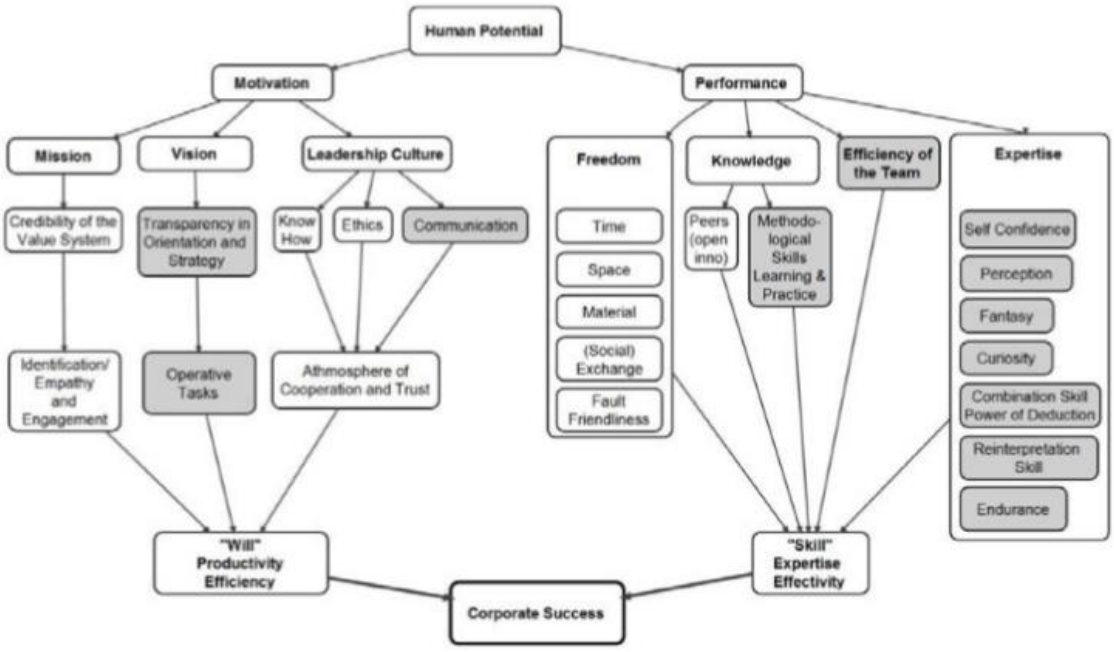
Table 5. The value of TRIZ for the brainstorming process

Analyze	Effect
Problem identification stage	Develop this stage as a pre-work so members without TRIZ literacy can use TRIZ tool immediately with the group
Pre-session of discussion	A session for member to familiarize with TRIZ, to active a different thinking mode for the further inventive session
TRIZ tools	Su-Field Model shows better results for short meetings. Considering all scenarios, contradictions are the most powerful idea generation tool to exploit.
Creative process	Split the allocated time into multiple shorter session, so that the creative process can take advantage of users' evolution
Team diversity	Gather experts of different backgrounds to allow analogies and metaphor thinking

Source: Adapted from Gronauer & Naehler, 2016, p 196

The knowledge of TRIZ strengthens many skills that are highly important for individual's creativity process. It increases positive self-awareness, abstract thinking, and reinterpretation of personal skills (Gronauer & Naehler, 2016). The goal of a systematic approach to creativity is to reduce the influence of individual particularities in the process of idea generation. Even though TRIZ still requires abilities of the individual to translate the recommendations from the tools to specific domain solutions, it mitigates this gap (Bertoncelli, Mayer and Lynass, 2016).

The human creative process can be considered as "*creativity refers to the way people think how inventively they approach problems, for instance. Indeed, thinking imaginatively is one part of creativity, but two others are also essential: expertise and motivation*" (Amabile, 1998, p. 78). Creativity is also related to the individual motivation and wiliness to develop new solutions or to solve problems. Motivation is discussed in academia as both prosocial and intrinsic (Grant, 2011). Intrinsic motivation focuses on novelty, on the other hand, prosocial motivation encourages perspective-taking to assure that individuals novel ideas are also useful (Grant, 2011). In fact, the motivation an entrepreneur has to launch a new enterprise was discussed in subchapter "Entrepreneurship". However, to foster creativity, hence, to foster new idea generation, one needs to keep a high level of motivation to overcome inertia barriers. Once more TRIZ might complement the creativity of an individual and his ability to innovate, because it decreases the development cycle times of products and solutions, by its positive influence into the competence to invent from individuals (Gronauer and Naehler, 2016). Furthermore, it might reduce the frustration of the creation process and its effects on one's motivation. In addition, Gronauer and Naehler (2016) developed a framework that presents the particular potential benefits TRIZ might generate for human capital in an organization perspective. These benefits might work for all types of companies, including startups (Figure 9).



Source: Gronauer and Naehler, 2016, p 189

Figure 9. Potential TRIZ Advantages (marked in gray) for the Human Potential

The relevance of TRIZ for creativity in companies and at the individual level seems to be a fruitful field of research in academia. However, it falls short in relation to the value TRIZ might generate for business in the whole process of a new product or new business generation.

2.3.2. TRIZ Theory

TRIZ is the Russian acronym of *Teoriya Rescheniya Izobretatelskich Zadach*, the Theory of Inventive Problem Solving, had proved to be one of the best theories for the process of new ideas generation and it was developed by Genrich Altshuller in USSR in 1956 (Dumas, Schmidt and Alexander, 2016; Chechurin, 2016). From the review of a relevant population of patents, Altshuller found common trends and concepts that were applied to solve different technical problems (Altshuller, 1984; Altshuller, Shulyak, and Rodman, 1999). Many versions have been created throughout the last decades to adapt and improve TRIZ results in different fields of engineering. Also, in several fields of knowledge such as teaching, services, human resources, among others (Spreafico and Russo, 2016). It is accepted as a successful theory to support invention and general problem-solving in fields such as mechanical engineering and chemical engineering. Recently, it has been deployed in business as well.

TRIZ consists of a bundle of tools that might be used in combination or separately (Moehrle, 2005). A recent research of Ilevbare, Probert, and Phaal (2013) listed the most used tools of TRIZ. In order, they are 40 inventive principles, ideality and the ideal final result (IFR), function analysis, and contradiction matrix. Also, results from Moehrle (2005) show that industry does not use all TRIZ tools together. This study divided TRIZ application into three main clusters: basic TRIZ, resource and ideality based TRIZ, and substance-field based TRIZ. In fact, not all tools listed in each cluster were used every time in his research, most of them in more than 50% of the cases of each cluster. The modern classification of TRIZ tools that has a high number of citations divides these tools into five groups based on its field of application (Moehrle, 2005; Ilevbare, Probert, and Phaal, 2013) (Table 6).

Table 6. Classification of TRIZ tools

Field of application	Tool	Main function
Current state	Function analysis	to define positive and negative functions of a specific system
	Contradiction	to confront desired functions with their harmful effects
	Substance field analysis	To model the substances and fields of a problem
	Evolution analysis	To analyze the previous evolution of the focus system
Resource analysis	Resource analysis	To map all available resources in and related to a system
Transformation	Inventive principles	To apply the inventive abstract principles
	Contradiction Matrix	To confront the contradictions against inventive principles for an abstract solution field
	Separation principles	To separate the conflicting system requirements
	Substance field analysis	To apply the standard form of operations
	Evolution analysis	To forecast the next development stage of the system
	Resource analysis	To apply all available resources
	Effects database	To use scientific effects and phenomena of different disciplines
Goals	Ideality	To challenge the status quo to achieve the best potential solution
	Fitting	To consider the restriction of basic conditions
Intended state	Strong solution	To find the correct balance between ideality and fitting

Source: Adapted from Moehrle, 2005, p. 6 and Ilevbare, Probert, and Phaal, 2013, p. 33

The importance of TRIZ in the world leading companies and academia is well-known. Researches trying to understand how TRIZ has been deployed, used, integrated, developed and applied are common in academia, which normally focuses on one of these possibilities for the analysis of TRIZ (Chechurin, 2016). Also, the integration of TRIZ with other theories, tools, and techniques were covered by many papers in academia throughout the past years, as the previous research has shown. However, all different attempts to integrate TRIZ with Axiomatic Design (AD), Lean, Case-Based Reasoning (CBR), and Robust Design (Taguchi), just to illustrate a few of them, have shown partial success and further

possibilities for developments (Chechurin, 2016). Within this large theoretical background, this study focuses on the relationship of TRIZ with human creativity, TRIZ frameworks for business deployment and new idea generation.

2.3.3. TRIZ in Business

The deployment of TRIZ in business is still a secondary application of the theory if it is compared to technical fields (Chechurin, 2016). However, it is a growing field for TRIZ practitioners. For instance, the research of Stelian Brad and Emilia Brad (2015), which fosters the development of a traditional SWOT analysis by applying TRIZ tools. This research focuses on hidden elements of the SWOT analysis. Also, it elaborates means that TRIZ might support the development of strategies for an existent business, as well as, for a new business. This research is complementary to the research of Ruchti and Livotov (2011), which argues the latent demand of management people for more systematic thinking solutions. In addition, the same research discusses how organizational management decisions are based on executives' intuition and personal experience. Hence, a systematic approach could increase the assertiveness of the management team, as well as, a reduction of related risks by the application of five components of TRIZ for business (Table 7).

Table 7. TRIZ five components for business and management

Component	Explanation
Identification and theoretical exaggeration of conflicts	Formulation of non-technical contradictions from administrative conflicts and their extrapolation
A positive attitude towards complexity	Instead of simplifying or compromise during a contradiction analysis, TRIZ methods support a multidimensional interconnection to explore potential solutions
Consideration of patterns of evolution	The systematic consideration and evolutionary development of involved entities play a key role in possible decisions
Anticipatory evaluation of risks	The use of the Anticipatory Failure Identification method to find weaknesses related to each possible solution
Utilization and expansion of resources and knowledge	Knowledge management to optimize the access to ideas and to broaden the boundaries of existent knowledge

Source: Adapted from Ruchti and Livotov, 2011

As previously presented, one of the most popular tools of TRIZ is the contraction matrix and the inventive principles to support innovation. Domb and Mann (1999) adapted the famous inventive principles from Altshuller and created their 40 inventive business principles. Their principles might be too complex for business practitioners because of its technical vision and fidelity with the original tool from technical TRIZ (Appendix D). However, Ruchti and Livotov (2011) developed a specific version for business and management that contains only 12 principles. Each of them is a combination of two opposite principles named "*12 double principles*" (Table 8). These principles are completely business-oriented that facilitates its application.

Table 8. TRIZ principles for business and management

12 double principles		
Combination - Separation	Symmetry - Asymmetry	Homogeneity - Diversity
Expansion - Reduction	Mobility - Immovability	Consumption - Regeneration
Standardisation - Specialisation	Action - Reaction	Continues action - Interrupted action
Partial action - Excessive action	Direct action – Indirect action	Preliminary action – Preliminary counteraction

Source: Ruchti and Livotov, 2011

Other tools of TRIZ already have a strategic focus which is easier to connect with business needs. For instance, Darrell Mann (2001) presents an adaptation of the 9 windows of TRIZ based on Neuro-Linguistic Programming (NLP). The author framework delivers a better individual analysis of a product or market based on different dimensions (physical, behavior, capabilities, and beliefs/values). Concepts of the ideal final result (IFR), function analysis, separation principles, and trends of system evolution are other tools of TRIZ related to the certain extent to business needs.

More than just deploying TRIZ in business and management, the theory has been developed to support new business development and MNEs to tackle their everyday problems. This process is particularly different for startups and SMEs by meanings of budget resources, human capital, team qualification, and affordable loss (Read et al., 2009). For these reasons, the next section focuses on academic research just for this specific group.

2.3.4. TRIZ in SMEs and new business development

TRIZ has been deployed to support local entrepreneurs in different regions of the World. Successful cases of TRIZ training for new business development are presented in Italy and Chile (Russo, Regazzoni and Rizzi, 2015; Chandia et al., 2017). Both types of research adapted the traditional TRIZ tools to support SMEs to solve their problems. Russo, Regazzoni e Rizzi (2015) developed a methodology named *SPARK* defined by the authors as "*SPARK merges traditional TRIZ Tools with requirement management strategies, and with tools for knowledge management.*" It consists of a sequence of five steps to generate a very accurate result between steps, hence, a number of potential solutions for the stated problem. However, the paper did not present a systematic process to replicate the SPARK methodology. In addition, to develop the TRIZ knowledge for entrepreneurs, formal training options were developed such as a TRIZ course of 40 hours and a longer course for high-potential start-up companies that has 180 hours and takes eight months (Russo, Regazzoni e Rizzi, 2015). Such a long period goes against the need for fast and hands-on solutions for entrepreneurs. Also, a clarification is needed as TRIZ represented just a block of the 180 hours course.

Chandia et al. (2017) adopted a different approach to adapt TRIZ for solving entrepreneur's problems. The study presents six steps framework to solve problems and to rank potential solutions using analytic hierarchy process (AHP). Moreover, the findings of this research show the benefit an entrepreneur might face by considering TRIZ tools to tackle actual and future problems, as well as, an easy-to-use TRIZ for a business approach. The next goal in their vision is to automate some of the TRIZ tools to improve their support for entrepreneurs (Chandia et al., 2017). Just as a comment, this research is only available in Spanish but its relevance for this literature review could not be ignored, so it was partially translated into English by the author (Table 9).

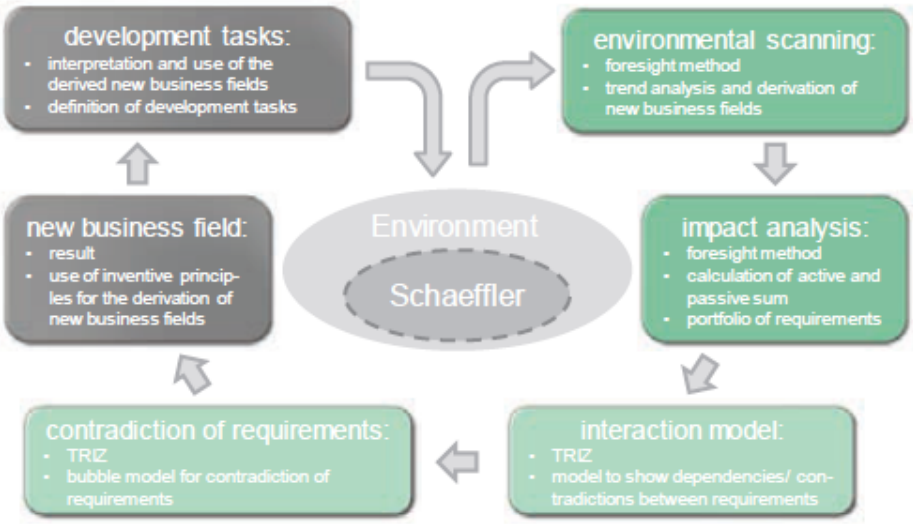
Table 9. Solving entrepreneur problems in six steps

Stage	Action
Description of the initial situation	To define the boundaries of the new business in different fields such as technical, economic, environment and social. To identify the previous and future evolutions of the related system. Also, to identify all involved super systems and subsystems.
Identification and classification of all available resources	To map all available resources for the entrepreneurs based on a classification of material, energy, information, time and space.
Development of a problem matrix for the identification of limitations and actual conflicts	To define all problems with its ideal situation. Find partial solutions by solving conflicts, then, to follow a logical order of importance of the listed problems. To create a RDC (Cavallucci and Khomenko, 2007).
Prioritization of partial solutions of the RDP based on AHP	To define decision criteria and their relevance. Identify and analyze all solutions and build a final ranking.
Development of a contradiction matrix based on the AHP ranking	To separate important than not important solutions. Analyze the contradiction among them.
Development of conceptual solutions for contradictions	To deploy TRIZ tools to find general solutions for the previous contractions. To contextualize these solutions for the specific entrepreneurial case.

Source: Translated and adapted from Chandia et al., 2017

The theoretical research of TRIZ for entrepreneurship has not only developed models to support entrepreneurs and SMEs to solve problems, but attempts to deploy TRIZ to generate new business ideas. Pfeuffer and Scherb (2016) integrated TRIZ with a foresight vision for the identification of new business fields and development directions using existent contractions (*Figure 10*). For the authors "*Foresight can be defined as a systematic, participatory, future intelligence gathering and medium-to-long-term vision building process aimed at present-day decisions and mobilizing joint actions.*" (Pfeuffer and Scherb, 2016, p. 198), which have a direct correlation with individual TRIZ tools such as the evolution laws and S-curve. In addition, the authors developed an interesting framework for new business idea generation considering TRIZ and other external factors. (*See figure 9*). Another research of Gazem, Rhaman, and Saeed (2016) argues how TRIZ can support SMEs to generate new services and products by a good understanding of elements which are important for customer and market needs. Their framework has five steps: situation analysis; problem definitions; problem; integration; solution evaluation. Similarities between their research and previous business frameworks show the direction TRIZ has found in the

business academic literature (Chandia et al., 2017; Ruchti and Livotov, 2011; Gazem, Rhaman and Saeed, 2016). However, none of these recent researches discussed how TRIZ could be integrated with entrepreneurship theory or its importance for the opportunity recognition process. In fact, an empirical research to validate assumptions and potential frameworks is not yet present in academia. A fruitful and challenge field of research this study aim to cover.



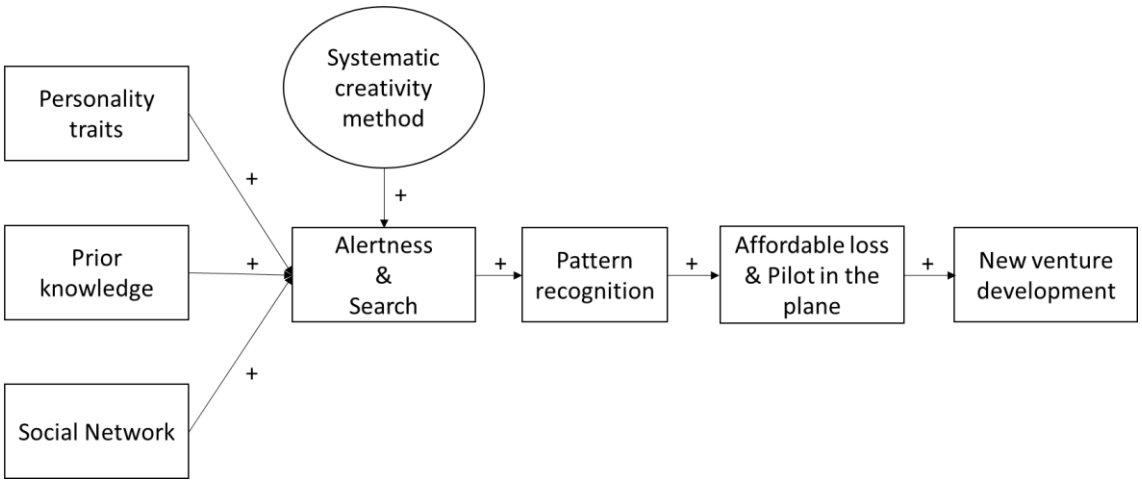
Source: Pfeuffer and Scherb, 2016, p 200

Figure 10. Framework for the derivation of new business field opportunities

2.4. Summary

The presented literature review discusses the issue of new business idea generation for entrepreneurs. The academic interest related to entrepreneurship has been growing during the past decades because of the importance of startups in our societies. Several dimensions of the phenomenon have extensive literature review, but one may not find a lot of research related to the process of idea generation for business. Many presented methods support the development of a business by entrepreneurs. However, they fall short in providing an efficient method to develop an initial idea for a thriven business. In this context, opportunity recognition theory highlights key elements for an entrepreneur to successfully discover a new business such as personality traits, prior knowledge, network, and alertness. However, means to enhance the recognition of opportunities does not provide a replicable method. It may vary between individuals. To change this aspect, the framework of this research

includes principles of effectuation and a proposition to include the positive effect a systematic creativity method might generate for the opportunity recognition theory (Figure 11). For the research framework, only two principles of effectuation are introduced. The reason for this selection is the relative similarity of the other principles with existent components of the model.



Source: The author based on Ardichvili, A., Cardozo, R., Ray, S., 2003 and Baron, R. A., 2006

Figure 11. Theoretical framework to increase opportunity recognition assertiveness

The performed literature review discussed different topics and their connections in the academic literature. This literature review reveals many theoretical gaps unbridged by previous academic research. Hence, further development is needed to answer open questions of the relations of entrepreneurship theory, opportunity recognition and systematic creativity (e.g. TRIZ). Moreover, there is a lack of empirical studies on entrepreneurship methods of new business idea generation. In fact, existing literature considers only non-systematic approaches for entrepreneurs to develop their business ideas (e.g. brainstorming). The presented analysis shows that there is scarce academic knowledge of TRIZ deployment in business topics, as well as, the process entrepreneurs apply to solve their business conflicts and challenges in a systematic approach. Even though recent papers tried to deploy TRIZ for SMEs and startups, the literature falls short of empirical data and field study analysis to understand the vision of entrepreneurs of the value of a systematic approach to problem-solving or new business idea generation. The next chapter presents the structure of the research. The "*Methodology*" also explains the case study developed by this research to validate the previous theoretical framework.

3. METHODOLOGY

The research methodology has a unique value to guarantee and support the quality of the research. A precise research methodology contributes to the readability and comprehension of all research findings and future propositions. This chapter presents the methodological approach deployed in this master thesis study.

The "Methodology" chapter is presented in five sections each covering important criteria of the research methodology. Firstly, "Research Design" section shows the research strategy, research objectives, and research questions. Secondly, "Sampling" presents all descriptive information of this research and case companies' descriptions. Thirdly, "Data collection" provides the stages of gathering all data related to this research. Fourthly, "Data Analysis" presents techniques and methods to analyze all collected data. Finally, "Data Quality" provides the strategy this particular research used to address issues related to data quality in order to ensure the credibility of research findings.

3.1. Research Design

This research aims to understand the process of new business idea generation within startups. The central objective is to identify the value a systematic approach might generate for startups all around the World. For this reason, the main research question (RQ) of this research is:

"*How to generate value for entrepreneurs via a systematic approach for new business idea generation?*"

To address the stated main research question more three research questions were formulated. All research questions aim to guide this research to achieve its two main objectives. Following table presents a summarized research design table. Within it, the research objectives, research questions, method, and data collection strategies are presented (Table 10).

Table 10. Research Design

Research Objective	Research Question	Research Stage	Research Method	Data collection
To analyze the real process, which entrepreneurs face while generating business ideas	How are new entrepreneurs generating their businesses ideas?	In-depth study	Multi-method qualitative study	• Semi-structured Interviews • Companies website • User Experience • Companies reports
To understand which components of TRIZ may be integrated into the new business development	Which implications could a systematic approach have for entrepreneurs?			
	How to deploy TRIZ for new business idea generation?	In-depth Analysis	Multi-method qualitative study	• Workshop • Semi-structured interviews • Direct observation

Source: The Author

Based on the exploratory nature of this study the most appropriate research strategy is a case study. An exploratory research has the characteristic to be more flexible and adaptable to the research problem. Also, the research framework questions "Which?" and "How?" are particularly common within a case study strategy (Yin, 2009). This research aims to learn from existing startups how they developed their business ideas. A characteristic that fits perfectly within a case study strategy that focuses on the understanding of a complex phenomenon (Yin, 2009). In addition, a case study always involves an empirical investigation of a real-life phenomenon gathering different sources of data to support its research findings (Yin, 2009).

A case study might be elaborated as one critical case or multiple cases (Yin, 2009; Saunders, Lewis, and Thornhill, 2009). Considering the nature of startups and their plurality, a multi-case study research is selected. For this particular case, the variety of fields, technologies and culture claims for a holistic and multi-perspective view. Since the group of 24 startups covers equally developing and developed countries, as well as, products, services, and hybrid

offer solutions, this sampling achieves a particular diversity to challenge or reinsure previous theoretical propositions within this research field. Also, regarding unit of analysis this research can be considered as a holistic case study since just one unit of analysis is stated for this research – business idea generation in startup companies. An important concern for such an abstract level of analysis may impact the accuracy of data collection and data analysis (Yin, 2009). To mitigate these impacts, different sources of data were used, and only startup founders participated in interviews.

The developed research is a multi-method qualitative study as it presents different types of qualitative data such as semi-structured interviews, workshop, and reports, among others. Even though the number of interviews and part of the data could be used for quantitative analytical procedures, it is just applied to support the classification of research findings related to specifics such as company revenues, the number of employees and years in the market. Respecting to the time horizon of the research framework, this research is cross-sectional, where a phenomenon is analyzed in a specific period (Saunders, Lewis, and Thornhill, 2009). Even though founders, where challenged to think about different moments of their entrepreneurial lives, the research cannot be considered a longitudinal research because of the unique time of data collection. In fact, the learning curve of founders during this process enriches the cross-sectional perspective, as different levels of experience can be compared within this research framework. Also, the workshop presents only the opinion of students for that specific period of time.

The research framework has two separate stages: in-depth study is focused on a deep understanding of entrepreneurs' behavior related to idea generation and opportunity recognition; in-depth analysis is focused on the development of a strategy to support the idea generation and opportunity recognition skills of startup teams. The later receives inputs of the first as well as uses other methods and techniques of data collection.

3.2. Sampling

The multi-case study aims to address the stated research questions in order to reach research objectives. Therefore, this research framework is focused on gathering real data of successful and failures cases of entrepreneurs from different cultural and economic parts of the globe.

Then, a workshop was elaborated with master students of the Lappeenranta University of Technology to simulate the benefits a systematic approach could generate for the recognition of business opportunities. The workshop was elaborated as a focus group to test the potential TRIZ tools could have into the process of new business idea generation.

The selection of companies respected a heterogeneous purposive non-probability sampling technique. This sampling technique is selected to include all opinions and different views of the research objectives. In order to achieve this research structure, twenty companies from Brazil and twenty companies from Europe and the United States were invited to participate in the research. This division was based on the research of Geert Hofstede (2001) to ensure a diversity of cultural perspective for this research framework as the Brazilian population shows a significant difference in all five cultural dimensions when compared with developed countries, such as Finland, United States, and Italy. Furthermore, the Global Entrepreneurship Monitor (GEM) (2017), created by well-known institutions such as *Babson Business School* and *Tecnológico de Monterrey*, presents developing countries, such as Brazil, in the efficiency-driven category and developed countries, such as Finland, in the innovation-driven category. Based on network availability, the majority of startups invited from developed countries were from Finland, and the majority of startups invited from developing countries were from Brazil. In the end, a relevant number of twelve companies from each subgroup agreed to collaborate with this research.

Even though the majority of the companies allowed their information to be published, a decision to increase readability was needed, and for confidential reasons of a part of the sample, the name of all case companies and their respective founders were not revealed by this research. As the list of companies includes a wide variety of business fields and different technological solutions, a summary of the participants in this case study is presented in Table 11. After all the interviews. their translations and transcriptions had been done, a workshop of 4 hours was organized with students of the Inventive Product Design and Advanced TRIZ course as the second stage of this research framework. The workshop had 7 participants and the author presented it. Interview inputs and literature review insights were used to elaborate the material for the workshop.

Table 11. List of interviews

Company	Participant	Years in the market (year)	Startup situation (stage)	Country where the company is managed	Nationality of the participant	Yearly turnover (euros)	Size of the company (number of people)	Business Description
A	Founder	5	Mature	Brazil	Brazilian	More than 1 million	48	Manufacturer of special cables for electricity transmission
B	Founder	0.5	Early	Brazil	Brazilian	Not relevant profit at the moment or none.	3	Restaurant focus on exotic burgers and exotic drinks
C	Co-founder	2	Growth	Brazil	Brazilian	Between 200 thousand and 1 million	33	New technology to optimize transportation services
D	Co-founder	4	Growth	Brazil	Brazilian	More than 1 million	21	App and intelligent system to market and opinion research
E	Owner	3	Mature	Brazil	Brazilian	More than 1 million	70	Manufacturer of healthier snacks and sweets
F	Founder	2	Growth	Brazil	Brazilian	Information was not shared	60	App and intelligent system to compare prices of goods
G	Co-founder	1	Exit	Brazil	Brazilian	Not relevant profit at the moment or none.	3	Platform of on-line sales for local markets

H	Founder	2	Growth	Brazil	Brazilian	Less than 200 thousand	4	Manufacturer of 3D printers and design solutions
I	Founder	1	Growth	Brazil	Brazilian	Less than 200 thousand	60	Civil construction solutions for small and medium size buildings
J	Founder	3	Growth	Brazil	Brazilian	More than 1 million	30	Manufacturer of special beers
K	Founder	5	Growth	Brazil	Brazilian	More than 1 million	26	Smart data solutions in sensing to capture customer's interactions
L	Founder	2	Growth	Brazil	Brazilian	Less than 200 thousand	5	Manufacturer of gourmet popcorn
M	Co-founder	2	Early	Finland	Indian	Not relevant profit at the moment or none.	8	Platform to share pictures with gaming features
N	Co-founder	1	Early	Finland	Finnish	Not relevant profit at the moment or none.	4	Platform to compare prices of public transportation
O	Co-founder	3	Declining	Finland	Finnish	Not relevant profit at the moment or none.	5	On-line training for pre-university exams
P	Co-founder	1	Early	Finland	Tunisian	Not relevant profit at the moment or none.	5	Platform for students to increase job opportunities

Q	Founder	0.5	Early	Finland	Venezuelan	Less than 200 thousand	5	Design agency solution
R	Founder	0.5	Growth	Finland	Ukrainian	Less than 200 thousand	10	Marketplace to connect companies and consultants in the training sector
S	Co-founder	5	Declining	Finland	Finnish	Less than 200 thousand	10	Gaming developer
T	Co-founder	1	Early	Finland	Finnish	Not relevant profit at the moment or none.	4	On-line travel agency focus on social interaction with local communities
U	Founder	1	Early	Finland	Finnish	Not relevant profit at the moment or none.	1	Food solutions using a local fish
V	Founder	1	Exit	Finland	Russian	Not relevant profit at the moment or none.	3	Marketplace for second-hand tickets
W	Co-founder	2	Growth	Italy	Italian	Information was not shared	5	Platform to support reallocation mobility
X	Founder	0.4	Early	USA	American	Information was not shared	1	Personal solution consultancy

Source: The author

3.3. Data Collection

The research framework has a plurality of data sources. The data collection techniques selected for this research framework are qualitative, and they can be divided into primary and secondary sources of data. The researcher decided together with both research advisors the boundaries of the data collection process. However, during data collection of interviews, few interviewees declined to answer specific questions related to their financial status or plans. This information is not mandatory to answer stated research questions; hence, all interviews are fully included in this research.

There are several sources to collect data. The six most important stated by Yin (2009) are interviews, direct observation, participant observation, physical artifacts, documentation, and archival records. For this research, primary data was acquired via semi-structured interviews and a workshop. The workshop can be considered in this case as a direct observation as well as a participant observation of the behavior of students with the proposed actives. In fact, the workshop can be classified as a focus group discussion as it provides a diversity of opinions and all the participants had the chance to share their perspective. In addition, interviews with startup founders are a delightful and unique source of empirical evidence for this case study. The number of 24 interviews supplies this research framework with almost endless possibilities for further analysis and development. This valuable source of data was an important input for the material and discussion during the practical workshop.

Secondary data had a support value within this research framework. Data was collected from companies' websites, consultancies' websites and user experience of companies' solutions. The availability of secondary data was not uniform distributed. The majority of companies hold a user-friendly website to collect information about their solutions and value chain. However, just part of the sample has a solution that could be used by the researcher to fully understand the product or service they offer to the market.

The process of data collection took two months. It was divided into three stages. The first one lasted for one week to develop the questions for the interviews. The second one was

around five weeks to schedule, run and transcript interviews. Finally, the last stage considers the workshop and its length was 4 hours during one day.

3.3.1. Initial Stage of Data Collection

The initial stage was used to ensure the quality of the interview guide which was used for the main stage of data collection. Firstly, a bilingual list of questions was developed, both in Portuguese (the native language of Brazil) and in English. To elaborate the interview guide, the presented literature review was fundamental. The questions were developed based on previous research propositions, theories and on the objectives of this research. Secondly, four potential interviewees, two for each specific interview guide, were selected to review and criticize the material. In parallel, two entrepreneurs simulated a recorded answer to demonstrate a clear understanding of the topic and proposed questions. Finally, the feedback of the reviewers was discussed with both research advisors, and the final interview guide was developed. Also, an informal invitation was elaborated to invite potential collaborators for the research. Both interview guides might be found in Appendix E & F. The final version of the interview guide has fifteen core questions such as the following ones and descriptive questions related to the entrepreneur and its venture.

- *What was the primary reason for you to become an entrepreneur?*
- *Could you please describe your business? Also, to which market categories it belongs.*
- *What kind of products or services do you provide? How often do you need to generate new product or services ideas?*
- *How did you recognize the business opportunity?*
- *Do you believe that luck helped you to a certain extent? How?*
- *Do you have a formal or informal process to generate ideas and solve problems? Could you please example it and its roots? Is it a standard process for all personnel or just for you?*
- *How do you believe your personal traits helped you to recognize the opportunity of your current business?*
- *How do you believe your prior knowledge helped you in the opportunity recognition of your business?*

- *How do you believe your social network helped you in the opportunity recognition of your business?*
- *Do you define your entrepreneurial behavior as causal or effectual?*
- *Have you ever heard about TRIZ, Theory of Inventive Problem Solving, before this interview? If yes, where and what is your opinion about the toolkit.*
- *Do you believe that a systematic creativity approach could contribute to the opportunity recognition process for entrepreneurs? If yes, how do you believe it could add value?*
- *Would you be positive to apply a structured process to generate solutions for your business? If yes, what stages are "must have" for you?*
- *What are your plans for the future of the venture?*
- *Do you plan to create new ventures within the next five years?*

In parallel with the development of the interview guide, the analysis of the systematic creativity approach, TRIZ, was elaborated. This process used the presented literature review, as well as, informal meetings with a specialist in TRIZ with more than 20 years of experience. At the end of this initial stage, the researcher created an initial list of tools which had a high chance to generate value for entrepreneurs.

3.3.2. Main Stage of Data Collection

The main stage started by the selection of channels to invite potential interviewees. In total 40 founders or co-founders of startups were invited to participate via professional social media LinkedIn, personal network and indications of colleagues. The high rate of volunteers for this research, 60% of the target contacts, can be explained by the strong ties all interviewees have with at least one closest colleague from my personal working experience, bachelor degree, or master degree. The importance of a large network and respectfully invitation supported this relevant number of interviews. Table 12 presents the distribution of interviews during the data collection period.

Table 12. Calendar of interviews

March 14 Company A&M	March 15 Company N&O	March 16 Company B&C&W	March 17 Company D&P	March 18 Company E&F	March 19 Company Q&R	March 20 Company G&S
March 21 Company X	March 22 Company H	March 23 Company I	March 24 Company T	March 25	March 26	March 27
March 28 Company J&K	March 29	March 30 Company V	March 31	April 1	April 2	April 3 Company L
April 4 Company U						

Source: The author

In order to meet the planned research schedule, the process of transcription and partial translation was developed in parallel with the interviews. The majority of interviews were collected via Skype, part as video conference and part only voice conversation. Only six interviews were face to face in Lappeenranta, Finland. Also, in two cases the interviews were via the exchange of e-mails due to the short time availability of the interviewees. On average, each interview lasted for 30 minutes and resulted in three pages of transcriptions. The transcriptions were focused on the interviewee answers following the presented interview guide. At the end of this main stage, the researcher reviewed the initial list of TRIZ tools which had a high chance to generate value for entrepreneurs based on the insights from interviews.

3.3.3. Final Stage of Data Collection

Based on the final list of tools developed during the later stage of data collection a workshop with master students of the Lappeenranta University of Technology was organized. The students of the Inventive Product Design and Advanced TRIZ course participated as a form to complement their capabilities in TRIZ for intangibles deployments, as well as, a test of the viability of the usage of TRIZ tools for new business idea generation. In order to introduce the partial findings of the previous stages of data collection a practical case of new business idea generation was prepared by the author covering the possibilities of the future evolution of the global higher education system. A PowerPoint presentation containing 40 slides and four on-line videos were presented to the public of seven students and faculty staff. The workshop had this researcher as its moderator. During the workshop, useful and valuable feedback was shared via open questions and participants' opinion and point of view related to TRIZ deployment. It generated new perspectives and the possibility for new

deployments of TRIZ tools for the objective of this research. At the end of the final stage, the plurality of information sources such as 24 interviews, general on-line information of companies and the developed workshop increased the complexity of the data analysis. However, it allows more holistic understanding of the target phenomenon. Also, it enriches the empirical findings of this research.

3.4. Data Analysis

Yin (2009) presents four general analytical strategies that can be deployed in case studies: "Relying on theoretical propositions", "Working the data from the 'ground up'", "Developing a case description", and "Examining plausible rival explanations". In order to achieve research objectives, the strategy of "following theoretical propositions" was selected. It may be defined as "*Use the theoretical propositions that led to your case study. The original objectives and design of the case study were based on theoretical propositions, which reflected a set of research questions, literature review, and new hypotheses or propositions.*" (Nelson and Martin, 2013, p. 22). The data analysis claimed by Yin (2009) as the most challenging process a researcher faces during the case study research. All data collected via primary and secondary sources are qualitative which partially reduces the complexity to analyze it. All data can be considered as one ecosystem within the previous analytical strategy.

This research can be considered a mix of deductive and inductive research approaches. On the one hand, it has deductive reasoning based on the theories related to entrepreneurship and opportunity recognition, which allows this research to predict some of the data analysis outputs. On the other hand, it has a larger inductive reasoning based on specific observations of people behavior and answers were used to discern a pattern and suggest generalizations infer a possible explanation for a particular phenomenon.

The dimensions of qualitative methods are important to understand the context, the people, and interaction between involved actors. In order to understand them, different data analysis techniques were adopted, such as structuring, categorization and summarizing. Considering the large database collected during this research, more than 15 hours of records and 100

pages of transcriptions, a critical selection of the relevant answers was applied based on time restriction to focus on the data to achieve the research objectives.

3.5. Data Quality

Data quality is discussed in a holistic perspective in this subsection. Threats to data quality may be related to internal validity (credibility), external validity (transferability), reliability (dependability), or objectivity (conformability). In an introductory perspective, internal validity is connected with the veracity of research data and analysis. External validity is connected with the applicability of the research results and its potential generalization. Reliability is related to the consistency of the measures realized during this research. Objectivity is related to the neutrality of the researcher and possible external interests in research results that could influences research findings (Yin, 2009).

The issue of the internal validity of research findings is influenced significantly by the selected research design, mainly by the process of data collection and analysis. A case study is a research strategy that has some academic skepticism related to biased findings, lack of data accuracy, lack of statistical support, and personal interpretation of collected data. This criticism of case study credibility falls short when stated research questions and objectives can be reached only via case study strategy. Such as the presented research, where academia has not yet developed a strong theoretical background to ground possible hypotheses. One may argue that this research finding might not be considered in a general perspective. However, the plurality of interviews from different cultural backgrounds and stages of startup development mitigate any criticism related to the internal validity of this research.

The issue of external validity in current research design is mitigated by multiple sources of data during the data collection process. This plurality of data sources allows this research to apply one of the important components of a robust case study research strategy – a qualitative triangulation. Both primary and secondary data are from different sources and involve more than one method to gather the research data. Yin (2009) argues that triangulation as the usage of many sources of data is a particular proof of case study strength. In order to increase the external research validity, both data and methodological triangulation were applied in this research.

In order to mitigate threats related to the reliability of the research a traceable chain of evidence among the collected data exists. The structure of the interview guide, the process of transcription of interviews and the participation of an experienced researcher in the field of systematic creativity in the workshop, are some examples of the consistency of the measurements. In addition, the semi-structured interviews had a minimum length of 20 minutes and discounting two outliers the sampling respected the planned 30 minutes period for interviews. As a matter of fact, to increase the credibility of research findings is needed more than just a good organization of the collected data, but also transparent and objective analytical procedures, and explanation of the roots of research results. All elements might be considered as part of this research design.

To support validity, reliability and the objectiveness of this research the interview guide was elaborated with the support of four potential interviewees and the supervision of both research advisors. The design of the guide aimed to reduce interviewer bias and to make interviewees' answers more independent and easier to compare. All questions were presented in the same order, and the list of questions was sent in advance to all participants. The researcher developed an extensive literature review to be prepared for a whole variety of potential answers of interviewees. Also, for each interview, a paper version of the interview guide was available for the author to follow the correct sequence of questions. During the majority of the interviews, at least for one moment the interviewee delivered a positive feedback of the interview flow and accuracy of questions or comments. Few additional notes and thoughts of the author were also collected as supplementary data for further analysis during the interviews. In addition, the workshop presentation was developed with the support of a TRIZ specialist to assure the quality of the context.

In order to ensure the objectivity of the research, all the Brazilian interviews were conducted in the Portuguese language by a Brazilian interviewer that might be considered as a strength regarding the quality of results, as well as, all the international interviews were conducted in the English language. Considering the risk of biases related to language and cultural background, only the international interviews could lead to partial misinterpretation of the questions or answers. In order to mitigate this bias, as it was presented before, all questions were sent to the interviewees in a minimum advance of 48 hours. In addition, all the

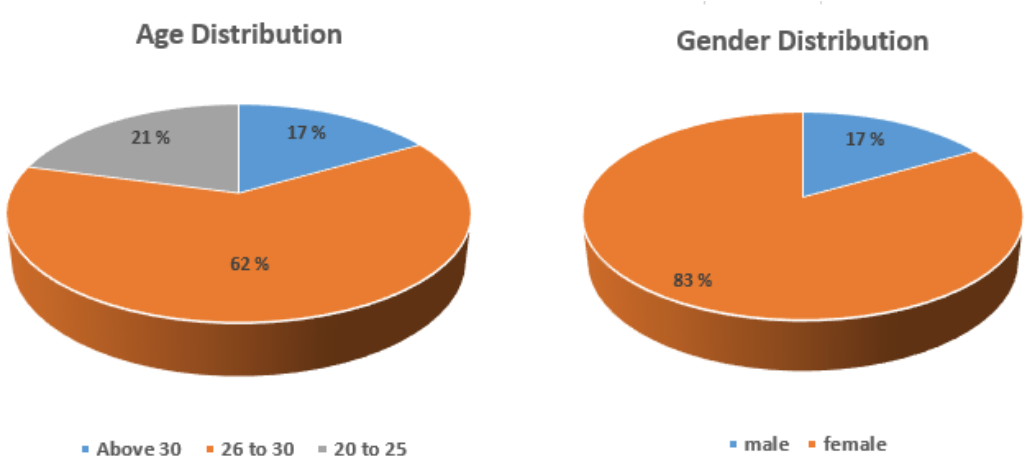
interviews were video or audio-recorded and transcribed by the researcher of this thesis. The partial transcription and translation to English of the Brazilian interviews were conducted by the author. Even though this process might provide some threats to the credibility of research findings, the impartiality of the researcher was rigid and can be reviewed by all the recorded material. In fact, this research was completely independent and without any financial support which allowed the author to focus only on the quality, academic relevance, and accuracy of the research data and results.

4. RESULTS

This chapter includes two sections in the same order as the data collection was elaborated. The first section, "Interview Analysis", presents the results of all interviews. For better readability, this section has five subsections. The second section, "Workshop Application", covers the results of the workshop with students. Also, to facilitate the interpretation of the data, part of the material collected during the interviews is not presented in this chapter.

4.1. Interview Analysis

The structure of the interview aimed to answer stated research questions. For this reason, the semi-structured interview was developed with five blocks: the reason to become an entrepreneur; business idea opportunity recognition; entrepreneurial behavior (causal versus effectual); awareness of TRIZ; entrepreneurs' plans. For all interviews, personal information such as age, gender, previous work experience, the number of ventures, and the number of entrepreneurs in their families was asked. A comparison of founders' age and gender is presented in Figure 12. Also, company specific information such as the number of personnel, annual sales, initial funding strategy, and years in the market was asked. The majority of interviewees answered all questions. The only question that had been avoided to share by the few interviewees was related to annual sales and their funding strategy.



Source: The author

Figure 12. Age and gender distribution of interviewees

4.1.1. Reasons to become an entrepreneur

Entrepreneurs of both regions presented a width variety of reasons to create their ventures. Common words such as “freedom”, “dream”, “create something meaningful” and “life objective” were present in many interviews. The passion each and every entrepreneur presented during their interviews is a perfect demonstration of ownership. The author organized this subsection by first presenting the most remarkable reasons for interviewees to become an entrepreneur, then a categorization of all reasons into four groups.

One of the biggest reasons why entrepreneurs decided to open their venture is related to their previous work experience. The frustration with this experience is clear in the founder of company P “*After my corporate live experience, I felt it was not for me, so I decided to invest in my idea and build up a team for it*” and for the entrepreneur of company X “*I did not want to work for anyone else anymore*”. The strongest opinions against the traditional corporate life came from the founder Q “*I just do not like the idea of always having someone on top of you like a Lord. When I was working for a company as a typical employee, it was difficult to innovate or change things. My manager would always say that things were impossible or that things like that were only possible for American companies*”. In fact, all cited entrepreneurs had a very short corporate career, and they already found the need to pursue their ventures.

The previous paragraph presents only entrepreneurs of the developed country block of this research. The same driver to become an entrepreneur was found in entrepreneurs from Brazil. In the words of the founder B “*I was tired to pursue someone else’s dreams, and I wanted to take care of my life*”. For the entrepreneur I, the problem is more related to the way management teams work inside companies “*The motivation for me was to live meritocracy in the real form, something I always wanted from all the companies I worked for. Many companies say they work based on meritocracy, but the reality is not exactly like that. It takes a lot of time to receive a professional or financial reward.*” Inside the same perspective of lack of satisfaction with the corporate life experience, two entrepreneurs mixed this reason with needs of freedom. First, entrepreneur E shared his need to do things the way he wanted, the possibility to decide his professional and personal life. In the same line of thought, entrepreneur L said that he was looking for something to build his personal project, after a career inside a multinational enterprise.

Two founders shared a particular reason for their frustration with the corporate life. The founder C explained his reason as "*I was a consultant in a global consultancy firm and there I had the impression that many projects would not deliver the planned results. I had good ideas, but I did not see a chance for these ideas to "leave the paper". Based on that, I wanted to create a place where people could put their ideas to work, and we would win against this traditional companies (…) one thing I always say here is that I wanted to create a place where clever people could work. Today, we can attract these talents.*" A strong critique of the traditional system that he considers slow and without the talent needed to create new things. On the other hand, entrepreneur D shared his frustration with the corporate life and added a personal reason "*My motivation, in the beginning, was money. Today, it is not. I used to work for an investment bank. I did not believe in the company anymore. I am not a whore. I decided to do something that I believed I would earn money in a different way*" Even though the entrepreneur uses strong words to describe his relationship with the previous company, he was the only one to honestly consider money as an initial reason to leave a company and starts his business.

The majority of entrepreneurs stated their reasons to be related to the dream or the personal goal of becoming an entrepreneur. From simple statements, such as the one of founder U "*Let's say that I just want to live a meaningful life*" or founder K "*It was something from inside. I always wanted this life. I never thought the risk related to being an entrepreneur*" to more elaborate reasons such as the one of founder J "*I wanted to have my own business, something that I could share my values and principles into a product. Be able to work for me*". This vision was shared by other founders such as entrepreneur V and entrepreneur F. All of them were defending that it was something from their interiors. Motivation to guide a company and have the freedom to be independent. The only entrepreneur that shared a pure passion for their industry was founder S. In his words "*We started the company because of our passion for games*". This reason could be part of other founders' motivation to start their ventures, but probably they learned to adore their industry during the startup journey as said by entrepreneurs J, R, X, K and L, just to cited a few of them.

A particular group of entrepreneurs combined their wiliness to become an entrepreneur with family roots. The common sense many times relates entrepreneurial behavior with a family

environment that supports this activity. The four founders that stated the importance of their family can be subdivided into two: inspiration and family business. Inspiration was the motivation for founder G as he said: "*I came from a family of entrepreneurs, my father, my mother, and both of my sisters have their businesses*". The same reason is stated by founder W "*I was born an entrepreneur. I have always lived in a family of merchants, and inside me I always want it*". For founders, E and A, their business started because of an existent family business. As said by founder A "*It came from my father. He was already on the market. With his support, the entrepreneurial journey would be easier. It was the merger of my desire to have my own business with the opportunity my father could give to me inside this particular market.*" The family could influence the option if family's network or existent business could accelerate the entrepreneurial process.

Only four entrepreneurs presented different reasons to start their businesses. Two describe their motivation related to the lack of job opportunities, in case both entrepreneurs from Finland. The entrepreneur O complemented his reason with a particular motivation "*I think the time in the university is a great time for establishing your first company. It helps you to understand the basic rules of business, but you are still economically safe during your studies.*" The opportunity to learn how to run a business at the beginning of his career shows the importance of "*learning by doing*" and "*the school of hard knocks*" terms used by founders D and X, respectively. Another two different motivations to start their business came from founders, T and H. The later said he just wanted to try something new. He said "*The idea was to try something different, something new. We had no idea what could happen, but if we succeed, we would have something much better than we have*". For entrepreneur T, she considers her venture as an accident, completely without planning. She was looking for a chance to make a positive social impact, and one of the co-founders convinced her to join the business development.

In order to summarize all the data presented in this section, Table 13 shows the division of specific motivation each and every entrepreneur describe to start their ventures. Based on a general perspective, it is possible to understand that recent entrepreneurs have two strong motivations to build a startup: the frustration with the existent corporate life and the personal driver to pursue their dreams of an own business.

Table 13. Entrepreneurial motivation

Entrepreneur	Motivation
P-X-Q-B-I-D-C	Frustration with the corporate career
R-V-S-U-K-L-F-J-N	The dream to become an entrepreneur
W-A-G-E	Family ecosystem of entrepreneurs
O-T-M-H	Difficulty to find a job; to learn how a business works; by accident; just to try something new

Source: The author

4.1.2. Business idea opportunity recognition

The sample of entrepreneurs for this research had two different situations to recognize their business opportunities. A group of entrepreneurs developed the idea from scratch. However, another group received the initial idea from their co-founders or future clients. In both cases, the development of the initial idea until the execution of the business plan as a functional startup had full participation of all interviewees. The process of opportunity recognition by all interviewees shows a mix of "*trial and error*" and constant development to fulfill customer needs. Nine startups already changed their initial solution to adapt themselves to market needs. The author organized this subsection by first presenting the process most of the entrepreneurs went through to come up with their business idea, then an analysis of each entrepreneur and their perception of the importance of personal traits, prior knowledge, and social network in their process of opportunity recognition.

Inside the group of 24 entrepreneurs, 16 created their business ideas alone or with partners. Only eight entrepreneurs declared they chose to develop someone else's ideas into business. A full description of the process each and every entrepreneur went through to come up with their business ideas could easily consume several pages to explain. In order to focus on the key elements presented in several recognitions of opportunities, this research presents complete examples of entrepreneurs' behavior and natural process of decision. Also, Table 14 shares a brief individual explanation of all descriptions of their process of opportunity recognition.

A block of entrepreneurs received the opportunity to start their ventures from their business partners. The understanding of the value of an offered opportunity is a form of opportunity recognition. Founder N explains his opportunity recognition as "*The CEO of the company was traveling by train from Helsinki to Jyväskylä and back. He always wanted to buy the lowest prices and for that, he needed to open different tabs and spend a lot of time searching on-line. This time, he went on-line to check other prices for the same ticket he bought, and he realized that he was paying more than other solutions. He got frustrated that something so simple was so complicated. We started the company because of that*" A similar experience came from entrepreneur D. He elaborated his opportunity process as "*My business partner invited me for this. One friend from South Korea told him that in South Korea many people were answering market research via mobile apps. We decided to be fake clients of these apps in South Korea to understand them. In parallel, we tried to realize a traditional market research here in Brazil. It was expensive, and it was a long process. We decided to solve this problem, and now we offer a cheaper and better solution for the market*" Both processes are examples of the ability to discover an opportunity that is already there, but no one was able to exploit it yet.

The second block of entrepreneurs describes their process of opportunity recognition completely related to their previous experiences. Since the experience guided them to see a gap or a problem and to find solutions for them. Founder T explained as "*Basically, we all have been traveling a lot and had difficult to get to know the locals. Outside the tourist hotspots is hard to interact with locals and many times your money go to other foreigners or locals that are already wealthy. We are changing this situation*." Also, founder R presents a good example of the ability of entrepreneurs to connect the dots and see opportunity where people just see unsolved problems. He explained as "*I got it from two different sources in a time span of two weeks. I got it from one person that I met randomly. We got together for a coffee, and he told me about this idea. It was not my idea, but it was a similar solution for coaches. Then, I met a group of three trainers, they asked me why there is not out there an on-line store for training whether it exists an online store for basically everything, but for training, it still works through recommendation. One guy wanted it to be a marketplace for coaches and the others an on-line platform for one agency. So, I connected both ideas.*" Both entrepreneurs showed the ability to discover an opportunity that is already there. However,

for them, the previous experience related to the market was the reason to map the business opportunity.

The third block of entrepreneurs applied the "*trial and error*" approach. Two extreme cases of entrepreneurs that created a new market niche are presenting in this paragraph. After testing and developing their initial technology, both founders created a disruptive innovation. Founder K presented his process as "*In the beginning, this was not the business we saw. We developed something for two years and a half. We wanted to measure the audience of a shop showcase. The people who were there looking at the showcase. We wanted to know their gender, age, and mood. Until we found something that had real value we did eleven different products. Many years without sales. We broke many barriers until we found an innovative solution. A solution the market would buy and understand the value.*" A similar scenario was faced by entrepreneur C. He created a new opportunity inside a traditional market by a completely new technology. On his words "*Everything started with the box we install inside cars nowadays. My partner got aware of it from his father, a professor at MIT, and told me he believed it could be an opportunity for the general public. However, it was not true; people did not care a lot about their car's maintenance or information. Then, we saw a market trend of user-based insurance. We started our company mixing both things, the UBI tendency based on input from the box. Nowadays, we are moving out the insurance sector. We want to offer a complete solution. It has been one year since we developed a service for fleets.*" The sense of creating a problem, which was not there for the users and customers, is a valuable source for entrepreneurs. They can change the whole industry such as Steve Jobs did many times with *Apple* portfolio of products. However, the solution to a problem that is not visible for customers require a lot of efforts of the founders.

Table 14. Opportunity recognition

Founder	Summarized process
A	My father had this business idea to complement the portfolio of solutions he already offers to the market. It decided it was the moment for me to invest in my own business.
B	It was born during a trip to *Disney*. I was completely amazed by the experience. Everything was organized and well-done. I wanted to offer the same experience in Brazil. So, I chose the *Harry Potter* story as the inspiration to offer a different food service.
C	Everything started with the box we install inside cars nowadays. Then, we saw a market trend of user-based insurance. We started our company mixing both things, the UBI tendency based on input from the box. It has been one year since we developed a service for fleets.
D	My business partner invited me for this. We saw the gap in the market research business in Brazil. It was expensive, and it was a long process. We decided to solve this problem.
E	Family background in the bakery business and food industry. I just found the chance to add new products to a larger traditional portfolio.
F	We were organizing a barbecue, and we needed to buy beer. After visiting four supermarkets, we realized the first one had the lowest price. This generated a lot of stress into our group and opened our eye for a problem we could solve.
G	I wanted to buy local products, but the neighborhood shops were always closed when I came back from work. The 9-17 hour was a problem, and with my co-founders, we decided to solve it.
H	I was working for a startup of drones. I saw the potential of the market, and I decided to try my own business in the same market.
I	During a family dinner, my brother-in-law and I were sharing our dissatisfaction with companies. After the dinner, we got together and based on our skills we decided to open the initial business of apartment's renovation.
J	I wanted to become an entrepreneur. A friend of my cousin wanted to open a micro-brewery. I did some market research, and I decided to develop this business.
K	We developed something for two years and a half. We wanted to measure the audience of a shop showcase. The people which were there looking at the showcase. We wanted to know their gender, age, and mood. We broke many barriers until we found an innovative solution.
L	I was living in São Paulo, and the business of gourmet popcorn was well-developed. When I moved back to Salvador, I realized that no one here had a good quality product for the local market. I studied a lot the market and took the risk to develop my popcorn.

M	We recognize this business opportunity based on this market trend that people take a lot of pictures because we all have mobile devices. The connection already exists but there is a missing part, as they are doing something creative and now they can get something out of it.
N	The CEO of the company was traveling by train from Helsinki to Jyväskylä and back. This time, he went on-line to check other prices for the same ticket he bought, and he realized that he was paying more than other solutions. He got frustrated that something so simple was so complicated.
O	Some of my partners had taken some kind, of course, to train for the examinations. These courses cost a lot in Finland. We thought it would be convenient to do an affordable solution for practicing questions.
P	I did an internship of three months with Google. I worked with them to build ads, and during this period I saw the difficult they have to hire students. I took a two months' break to provide a solution for that. We had a different initial idea that we evolve it until the business we have now.
Q	One colleague from university introduces me to this website. At the first moment, as an engineer, I thought I could not use it, but I decided to try. Then, I started to read a lot about sales topics and created my profile. Together, we created the agency.
R	I got it from two different sources in a time span of two weeks. I got it from one person that I met randomly. Then, I met a group of three trainers; they told me why there is not out there an on-line store for training. One guy wanted it to be a marketplace for coaches and the others an on-line platform for one agency. So, I connected both ideas.
S	My passion for having my game company. Also, the layoff my previous company did in 2011 was the opportunity to pursue my objectives.
T	We all have been traveling a lot and had difficult to get to know the locals. Outside the tourist hotspots is hard to interact with locals and many times your money go to other foreigners or locals that are already wealthy.
U	I found this idea because of my studies in environment engineering and my summer job at a local lake. Back there, I saw people fishing *Sarki* and just leaving them to die or decompose. The idea came from this experience to find a usage for the *Sarki* fish.
V	I was just discussing with my group of friends' different ideas. Then, this idea came, and I got inspired by it.
W	We started from a personal need, and we saw that here in Rome, in a city full of students, there is a big market for moving furniture.
X	I was doing it already but just for a private client. I have thought about offering the service on a larger scale before, but I never did something to make it happen. Then, I saw the need to move forward from my previous client because of her health.

Source: Interviewees adapted by the author

In order to have an in-depth understanding of the different drivers of the process of opportunity recognition, the author asked all founders how they believed prior knowledge, network, and personal traits helped them to recognize their business opportunities. Even though some reasons were common for different dimensions, in the majority of the cases, founders tried to connect what they believe helped them in the process. As a group of longitudinal dimensions, many entrepreneurs described how they developed personal skills, new types of network and acquired specific knowledge to run their businesses. The following paragraphs share insightful comments related to the importance of prior knowledge, network and personal traits for the group of entrepreneurs.

As stated by the founder U an entrepreneur needs to "*be willing to work for his self rather than for the money. I have the courage and craziness to go for it*". Many different traits of personality were presented by entrepreneurs as their drivers to launch a business. Being spontaneous, positive and excited about the idea were important for founders T, I, N, R, and V. The ability to deal well with uncertainty was the most important component of the personality of founder S. The ability to share confidence and trust pointed out as a supportive reason for founders A and Q. More senior entrepreneurs such as founders D, F, and J, credited to their ability to lead, be transparent, be persistent, and proactive. The variety of different traits is remarkable because it shows that different profiles might end up in potential entrepreneurs.

Considering the stated objectives of this research, it is of relevance to say that many entrepreneurs such as N, L, P, C, R, among others, consider themselves creative and with the ability to solve problems. Like founder R who said "*I am good in few things. I can pull ideas together, see padrones; I can pull of people's head ideas and simplify them.*" and founder N who said "*My creativity is important and how optimistic I am about things. I believe all entrepreneurs need to be optimistic*". Analytical skills were listed by a large group of entrepreneurs as their ability to understand the potential that business idea could have in the future. Surprisingly, few entrepreneurs, such as K and C, considered they had a lack of personal traits related to lead and manage people in the right direction. In fact, both said they have been working to solve this gap during the period they have been running their startups.

The experience was probably the most complicated term for the interviewees to develop their answers. They shared a common belief that everything we live is to a certain degree a valid experience. Cases of opportunity recognition related to founders previous working experiences, academic degree, and informal sources to acquire knowledge were listed by the entrepreneurs as components they used to recognize their opportunities. A complete example of the importance of previous experience for the recognition of an opportunity came from founder X. She compared her previous work live with the activities she offers to her clients nowadays. In her words "*I managed a very large project for corporate clients. I feel like the work that I did to my corporate clients is the same type of work that I do but in a new setting. For example, I manage the relocation of 4000 employees of a national bank. They were in 12 building, and they were going to one tower building in New York City. I empowered my clients for them to take the decisions, I facilitate the process. I was the COO, and they were the CEO of the projects. At the moment, I have a client that is relocating himself to California. They have a huge home, and my company is relocating them from this house to a new one. There are a lot of moving parts and pieces. I learned how to created simplicity for complexity. I can understand people´s complexities, you know, people's problems, and then, I create something simple for that. My experience allows me to deliver the solution my clients need*".

Prior work experience also supported entrepreneurs to develop traits of their personalities. Development of confidence, teamwork, patience, resilience, business structure view, are strengths founders considered important for their process of opportunity recognition. All of them cited by different founders as soft skills they learned by working with other individuals. In addition, several entrepreneurs point out the connection their previous job experience have with their actual business. However, cases such as the founder L and founder J show exactly the opposite. They did not have any previous experience or relationship with the product or market they created their companies. For both of them, the importance of the prior knowledge was restricted to the ability to understand a business and to plan its future. The diversity of academic backgrounds is another interesting point. The largest group of founders holds at least a bachelor degree in a field of engineering, in total 14 entrepreneurs have this profile. Seven are from business backgrounds, and just three entrepreneurs have a background related to information technology (IT).

The network was divided by many interviewees into the previous network and a needed network. The previous network was important to build the startup team. Many co-founders were university colleagues or friends. Also, for some cases as the voice of the consumer, the network was the source of ideas. People were sharing problems or specific needs. The needed network was the ties and contacts the founders acquire to launch their business successfully. Suppliers, costumers, competitors, and in many cases, external investors were the most common partners' entrepreneurs presented as part of the network they built during opportunity recognition and throughout the whole entrepreneurial journey.

As a dynamic element, a strong network supports entrepreneurs in many activities to recognize and validate their business idea. For instance, more than 70% of entrepreneurs tested its initial solution inside their network as a form of concept validation. Some of them even raise an alert against the risk of asking for feedback of existent network. People who already know you and your idea tend to be less critical than a real customer. The bias of a strong tie of your network is a risk a portion of the sample commented. When it moves to the team building perspective, startups with more than one founder normally already used their network to support the development of the business opportunity. Also, the network is considered a fruitful source of talents by the entrepreneurs to hire the best available team to develop their ventures.

A summary of key terms cited by each and every founder as presented in Table 15. Also, the same table presents in a bold letter the most influential perspective of opportunity recognition for that particular entrepreneur. The slight majority considered their personality traits as the most important element for the process of opportunity recognition, as well as, for the development of the opportunity to a viable business. In fact, the perception the majority of entrepreneurs shared is the possibility to build a network and to acquire needed knowledge. Personality was described as a sum of education, family, culture, and society interactions. Something an individual cannot influence in a similar ratio than his network or knowledge.

Table 15. Opportunity recognition dimensions

Founder	Personal traits	Prior knowledge	Network
A	friendly and talk-activity	analytical skills to solve problems	**the source of ideas**
B	**charisma and interaction**	ability to solve problems and be organized	support in business plan development
C	rational and enthusiastic	**strategic thinking, project mindset**	clients and source of improvements
D	leadership and transparency	understanding of the market complexity	**team building and clients**
E	**rational and analytical**	learn by doing, hands-on approach	family ecosystem
F	**persistent and long term vision**	previous experience with internet and startups	testers of the concept
G	dynamic and innovative	**the ability to structure ideas in a rational way**	team building
H	risk-taking and challenge oriented	**project mindset, soft skills, and tools**	customer base
I	**positive and executor**	confident to take the risk	suppliers and partners
J	**proactive and maker**	business & entrepreneurial background	only for venture founders
K	serenity, calm and analytical	problem synthesis and problem-solving	**for the development of the solution more than 1000 customers' interactions**
L	**creativity and curiosity**	Problem-solving and results oriented	customer base
M	patience and cold head	previous startup experience	**partners, suppliers, and users**
N	creativity and optimism	previous failure in the startup world	**the source of ideas, team building**
O	motivation to learn	former user experience	**team building, partners, suppliers, users**
P	risk-taking and executor	**studied in different countries & experience as a student**	partners, testers, customers and team building
Q	confident and trustful	**design and leadership experiences**	team building
R	**optimism and leadership**	little inside a nonprofit	the source of ideas
S	**calm, passionate and uncertainty neutral**	knowledge of technology and managing teams	team building

T	excited and spontaneous	foreigner affairs and business background	**team building, ideas, and partners**
U	courage and craziness	**minor in entrepreneurship and a summer job**	development of a new network of investor and supplier
V	**easily inspired by ideas**	strong academic background	team building and customer base
X	responsibility and management risks	**strong work experience in the same market**	partners
W	analytical and mature	**market understanding and problem-solving**	customer base

Source: The author

4.1.3. Entrepreneurial behavior

During all 24 interviews, the author presented the famous "*The Cook*" example of Professor Saras Sarasvathy as a brief explanation of the differences between causation and effectuation approach. Based on the previous example, entrepreneurs were asked to define themselves and to present a real situation to exemplify their entrepreneurial behavior. The range of answers was of particular surprise, and a large number of entrepreneurs said that they never thought about this difference, even though it makes a lot of sense. The author presents this subsection by showing the diversity range of answers and opinions. After that, all entrepreneurs are classified, based on their answers.

One of the strongest points defending the causal behavior of entrepreneurs came from the founder V and her personal network and experience. She stated "*I believe the most successful entrepreneurs that I know use the causation approach. I think the effectuation is a comfort zone, as you use yours own contacts and own knowledge. For me, if you have a desire, you search everything around you, probably you can achieve more success. Of course, if you already work in the environment and have a prior knowledge and your idea is working, that is nice, and it is an effectuation approach. My way is the first one, always breaking the walls and going for what I decided since the beginning.*" Her opinion raises an interesting point about the comfort and facility in relying on things under your zone of influence. In the same line of thinking, but with a different reality, entrepreneur R shows the difficult to acquire the desired means to deliver the effect he aims "*I am way more causal in the vision, and probably the vision represents 90% of what we are doing. We do not have the resources to deliver what we want, so we are doing and learning and developing on the way*."

Among a list of entrepreneurs, which declared themselves with a causal behavior, an adaptation of management activities and the natural speed of entrepreneurs can be found in the words of founder J. She said "*Causal for sure. We need to reinvent ourselves every simple minute; sometimes I get tired. It happened here in the company this week. We needed to increase volume. I scheduled a meeting, it became clear that we needed more volume and to increase the number of clients. With that in mind, we built a plan, defined clear objectives. Here, we define objectives and find the means to achieve them*". Furthermore, it is of interest the mix of both causal and effectual approach in the opinion of part of entrepreneurs. A group of them declared they keep the vision and long-term goals based on a causation approach and daily operations more in the effectuation approach. For instance, entrepreneur P explained "*I am more on the causation approach. I have a vision, based on that I define the tools to do and I go for it. Sometimes, for small tasks, I am more effectual, so I can say that I am not 100% causal.*" This difference may be related to the initial stage of few ventures.

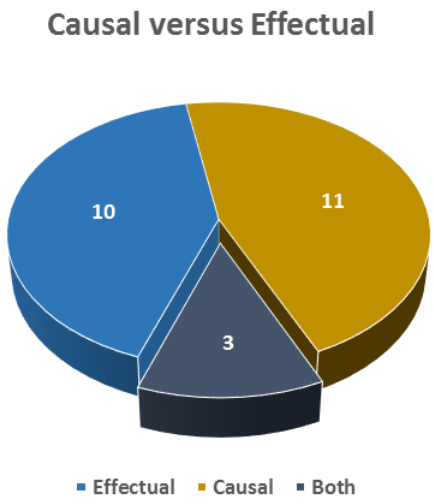
The transition from causation to effectuation approach was faced by two interviewees. In both cases, they prefer to use a causal behavior, but the circumstances asked for a fast adaptation. In words of entrepreneur M "*when we started, as a person, I always started with a causation approach because I know what I want to do, then I look for the things that I need. However, things not always go the way we planned. Then, I moved to an effectuation approach because as a business we cannot stop. Like I want to have a good dinner tonight, but if I do not have the money to have a good dinner, I still need to eat something tonight.*" With a very similar opinion founder N said "*I would like to see myself in a causation approach but at our company, we have deployed an effectuation approach. Using what we have in hands. Like to understand if we had the resources to do what we wanted.*" In fact, both startups have almost the same period in the market. So, it is interesting to see both founders facing and sharing a similar perspective.

A pure effectual answer came from the entrepreneur U and his short experience of developing his business during the previous year. He stated "*Definitely effectuation approach. I changed many things in my business already in the first year depending on what I believe I could achieve with the means that I had in hands at that moment.*" His view was

the reality shared by a group of entrepreneurs that already changed their business at least once to match market needs. Another insightful example came from founder C and his first client. He explained "*Our pilot project with our first client is an example of our effectual behavior. We bought the box from China, without any skilled programmer, so we used to take the box installed in the truck and just collected the data and presented via power point for the client. As we have grown in human resources and capabilities, we were able to deliver something better. Until today we are like "Corinthians"* (a Brazilian football team that is used to represent popular and very straight forward behavior) *with the daily truck activities. It is like 80%/20%; we need to solve the problem of the client with the resources we have in-house.*"

The tough entrepreneur reality was a common reason for many entrepreneurs to define themselves as effectual. The most honest and straight forward example of an effectual behavior came from founder D. Using a very popular language he illustrates the real challenges and routine of a startup. In his words "*I am completely effectual. When someone asks me, what is entrepreneurship for you? My answer, what I believe and do in my daily life is: entrepreneurship is the capacity to lie without the risk of fuck off. I lied, I said I had a community, time to do it and the know-how, even though I knew I had only part of what I would need to deliver the service. If the client buys it, I will find a way to deliver it.*" His example is the pure vision of the ability entrepreneurs believe they have of facing any future. Also, it is his way to overcome the restriction he has of human capital and money.

In a final analysis, the total number of entrepreneurs that declared themselves with a causal behavior is slightly higher. Only three entrepreneurs declared themselves as both. They defended this position by a situation-driven behavior. In their opinion, depending on the scenario they would act in different ways. Figure 13 summarize the scenario of all entrepreneurs. In addition, based on the plurality of market backgrounds, it was not possible to see any market-specific approach from the group of entrepreneurs. In fact, almost all founders declared that their approach might change in the future as for some of them it already changed.



Source: The author

Figure 13. Distribution of entrepreneurs based on their approach

4.1.4. Awareness of TRIZ

Even though the subsection has a name of "Awareness of TRIZ", it covers entrepreneurs' understanding and usage of general methodologies and tools already presented in the literature review. Also, informal or personal structures entrepreneurs use to solve their problems are discussed. As the less structured part of the interview guide, this subsection presents several inputs and opinions of the group of entrepreneurs.

As expected the awareness of founders of TRIZ was almost zero, only two founders, C and V, had a previous contact with the methodology. As a matter of fact, even these two founders never used TRIZ in their careers. On the other hand, the question related to a systematic approach to generating ideas the interaction of founders was completely different. The large majority, 75% of entrepreneurs, believe a systematic approach could add value to the entrepreneurial process, not only for the initial idea but the whole journey. For some entrepreneurs, the entrepreneurial process is already systematic. Founder D answer supports and clarifies this opinion "*Entrepreneurial life is not a chaos; it is a systematic thing. Every day, really every day, you are a robot there. There are a lot of people that misunderstand entrepreneurship and think that it is just wearing a short, a notebook and be happy. We are a production machine, but with people that believe in what we are doing. Then, we are able*

to be more efficient. We are systemic, here, we do not go to a meeting to discuss random ideas. (…) The non-systematic part of my startup is probably 1%". His opinion is similar to the opinion stated by other founders such as B, L, and J.

In contrast, a group of entrepreneurs considers that a systematic approach could have a negative impact on the development of ideas. One answer that covers many of the points cited by other founders is the opinion of founder P. He defends his point of view by saying "*We need to study the reasons for a person to become an entrepreneur. Generally, entrepreneurship is a chaos. Multiple ideas in a second. I do not think you can have a system to build the basic idea itself. The entrepreneur needs to be everywhere and get ideas from everyone. A systematic approach would restrict it, with target 1, target 2, and target 3. Then, if you choose one and fail, you cannot come back. In an open approach, you can adapt your ideas every day based on your needs.*" Using different words, a group of founders believes it may be positive with one contingency, the systematic method needs to keep a high degree of freedom, so individuals' creativity would not be diminished.

The majority of entrepreneurs knew at least one of the most common methodologies to develop a startup. The highest awareness is with the business model canvas, the lean startup, lateral and design thinking, and agile. However, a minority of entrepreneurs were enthusiastic about the existent methodologies. They faced extremely difficulties to share examples or reason to use one of the previous methodologies. An exception is the case of the founder C. He was able to share more than one tool from different methods. He explained "*We have some things. Inside the product management, we use "jobs to be done", measurement, and categorization, from agile. Also, we use the design sprint of Google. Furthermore, we use as many startups that I know the scrum from agile too*." However, the large majority of entrepreneurs use just informal personal approaches. To map the way entrepreneurs are driving their ventures the author asked what their way of doing things are. Steps or actions they always use inside their routine to generate new ideas and to solve problems (Table 16).

Table 16. Entrepreneurs' way of doing things

Entrepreneur	Action
A	"*take my head out of the problem" "discuss with my network.*"
B	"*I go back to my business plan; then I organize my mind.*"
C	"*I always build a PowerPoint; it helps to structure my mind.*"
D	*"I trust in my guts and my network; we just find the way."*
E	"*I talk with my partner and my team to build a solution.*"
F	"*I try to look for previous situations that are similar.*"
G	*"I always start at the macro level until the micro to map it."*
H	*"I am a visual; I like to draw, see the cause and effect of things."*
I	"*I talk with partners, and I always try to get out of the stressed situation to think about it.*"
J	"*I take a white paper, and I start to write, draw, introduce colors. I need to visualize the situation.*"
K	"*I have tons of papers in my office; I need to write, draw basic squares to start my understanding.*"
L	"*I use Excel for everything; I need to see the numbers to understand what I am facing.*"
M	*"I discuss with everybody in the company."*
N	*"I try to think if I can remember something similar that I could use, then I check on Google, then with my cofounders."*
O	*"I talk with my two co-founders, and we get things done."*
P	"*I discuss with my team if we do not find a solution I go to my closest network.*"
Q	*"I always start with observation, to look for things out there that could be similar in nature to what I need to do."*
R	"*I always start by asking the right questions; I try to think of different questions for different parts of the problem.*"
S	*"Brainstorm with my colleagues to find the right direction."*
T	*"Brainstorming and discussing with the team is the number one."*
U	*"I need to write it down to free my mind and go to sleep, then later I read it, and I can come up with ideas to solve it."*
V	*"I just think, think, think, then I catch it from the real life, sometimes before I go to sleep"*
X	*"I look for options to facilitate the right decision, see the whole picture to take decisions."*
W	*"I try to understand the market, be up to date, to have the right direction for my decisions."*

Source: Interviewees

The interviews point out two groups of entrepreneurs. One group bases their development and solutions in human interactions via one to one conversation or group brainstorming. Another group bases their decisions in a personal visual structure via writing, drawing, and using numbers to understand the big picture or the whole situation. Also, the desire to gather more information to solve a problem is a trend of this group of founders. The large majority wants to know more before the decision is taken. Furthermore, it is curious the need some founders shared to get out of the problem to solve it. A calm environment without constant pressure seems to be the place they feel more comfortable to develop their ideas and solve business problems.

The perception of the author is that entrepreneurs want a method to support them to organize and solve problems, hence, generate ideas. In a certain degree, the complexity, length, and abstraction of existent options, are barriers for them to use on a larger scale those methods. In addition, their behavior shows the wiliness to learn via brainstorming or from more experienced individuals. Also, tools with a visual presentation, which allows them to have the understanding of the whole, seem to add value to their lives.

4.1.5. Entrepreneurs' future plans

One of the beauties of entrepreneurship is the opportunity to create wealth and share it with society. This might happen through new jobs, tax payments, investments, among other forms. The impact of a new venture for its stakeholders is amazing. The numbers this group of entrepreneurs has are already impressive. Together they generated 400 job positions, and when we combine their plans, this number has a potential growth of 50% until the end of 2017. In this subsection, entrepreneurs share their plans for their venture, as well as, their personal career plans to become a serial entrepreneur or to live a long life within the same startup.

Out of the group of entrepreneurs, three of them declared they are looking for a new business idea at the moment. After trying their business for more than a year, they realize the existent business has no further potential for growth. Considering the rest of the sample, 21 entrepreneurs, two different visions for the future emerge. The large majority wants to become a serial entrepreneur. They want to open new ventures after the actual business

achieves a certain level of success. From this group of entrepreneurs, two already have external offers of investors to buy their entire companies. A second group wants to pursue different life objectives after their entrepreneurial career. They want to move to a safer environment without the actual level of pressure and risk. Some of them are already teaching, as a hobby, in local colleges, topics related to entrepreneurship or having responsibilities at local chambers of commerce.

The short-term plans are very similar in objectives. All entrepreneurs want to grow their business and to be successful. However, the ambitious of each entrepreneur is completely different. The large majority wants their business to achieve a value in the million-dollar range, some of them are already there, but few have extremely more aggressive objectives. They want to create billion dollar companies and become the "Google" or "Facebook" of their specific market. On the other hand, a group of entrepreneurs declared they just want to survive. For them, the business can sustain growth in a normal speed, and it is doing fine if the founders can live based on the earnings they have received.

A final interesting point shared by the majority of founders is the preparedness they have now to open a new venture. Unanimously, they believe the entrepreneur process was the best source of knowledge. The "*learn by doing*" concept was presented in all interviews. The gaps between practitioners and existent theory may be a reason for entrepreneurs to declare that entrepreneurship you learn being an entrepreneur and not by reading books or going to lectures.

4.2. Workshop Application

Based on the rich data collect throughout the interview and the extensive literature review, this author prepared the material to present a workshop for a group of students of the Lappeenranta University of Technology. The idea of the workshop was to share with students of TRIZ the inputs this research mapped from the behavior and business idea generation story of all founders. This subchapter is divided into three parts. Firstly, how the material for the workshop was elaborated. Secondly, the presentation and the case study developed with the students inside the classroom. Finally, the valuable inputs a Q&A section with the students generated.

4.2.1. Preparation of the material

The goal of the workshop was to run a pilot with students that already have a certain degree of knowledge and practice with TRIZ, to adapt their skills to generate a new business idea. In order to select the right tools of TRIZ methodology to apply in the workshop, the author merged interviewees' answers of Table 14 and Table 16. The analysis of the process of opportunity recognition and problem-solving techniques of founders were compared with TRIZ set of tools. This matching process generated Table 17. It brings a consolidated version which classifies the data collected from businesses into the language of TRIZ methodology. The interpretation of entrepreneurs' actions and mindset is a fruitful source of input to define a pool of tools that might be useful for many other individuals.

Considering the range of tools that exist into TRIZ this researcher preselected tools with a higher chance of being used in business. The criterion for this selection was the presented literature review. The considered tools are Su-field (trimming), contradictions, 9-windows, separation principles, function analysis, trends of system evolution, IFR, and an adaptation of patent research. In this particular case, patent research is considered market research to apply solutions for other markets into the target market.

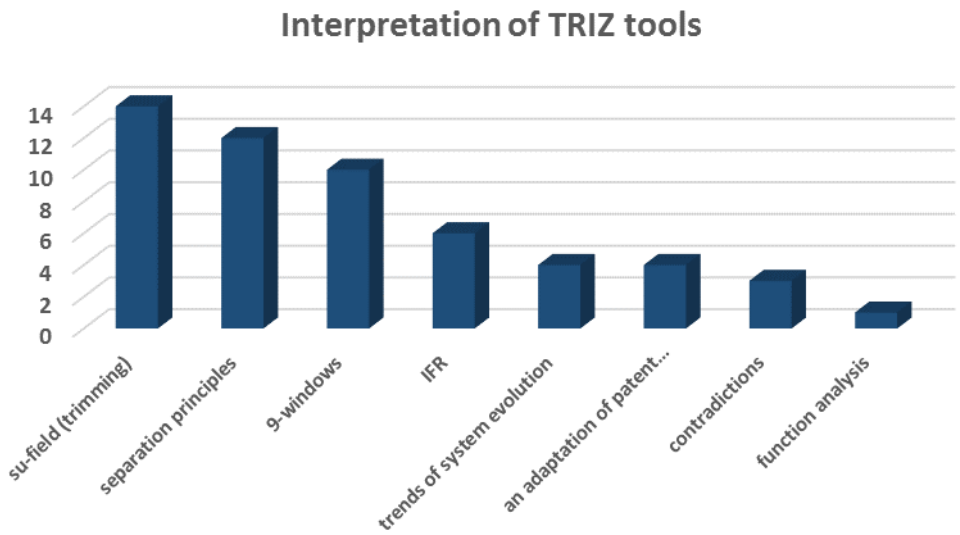
Table 17. Analysis of new business idea generation

Company	TRIZ tool
A	9 windows
B	Su-field(trimming), adaptation of other solutions (market research)
C	trends of system evolution, IFR, function analysis, separation principles
D	Su-field(trimming), separation principles, function analysis
E	IFR
F	separation principles, contradictions
G	separation principles, Su-field(trimming)
H	trends of system evolution, 9 windows
I	no tool could be applied
J	IFR, 9 windows
K	separation principles, Su-field(trimming), 9 windows
L	separation principles, Su-field(trimming), adaptation of other solutions (market research)
M	Su-field(trimming), separation principles, IFR
N	separation principles, IFR, Su-field(trimming), trends of system evolution, contradictions

O	9 windows, IFR, Su-field(trimming), contradictions
P	Adaptation of other solutions (market research), 9 windows, Su-field(trimming)
Q	separation principles, Su-field(trimming)
R	trends of system evolution, separation principles, Su-field(trimming)
S	no tool could be applied
T	separation principles, Su-field(trimming), 9 windows
U	9 windows, adaptation of other solutions (market research)
V	separation principles, Su-field(trimming), 9 windows
W	separation principles, Su-field(trimming), 9 windows
X	no tool could be applied

Source: The author

The analysis generates the possibility to rank the tools in a new business idea perspective. Figure 14 presents the list of tools and the number of cases each tool could be applied by the entrepreneur. Based on this ranking, the author selected the first four tools for the workshop. The tool that seems to have the highest potential, Su-field (trimming), was adapted to several well-known cases of successful startups to support the discussion of the workshop. The other three tools, separation principles, 9-windows, and IFR, were selected to the presented for the students and to be used in the workshop case study.



Source: The author

Figure 14. New business ideas translated by TRIZ tools

The total material elaborated for the workshop had 40 slides and four videos, and it included a simple representation of the three tools that could be used in the case. One might find the visual presentation of the tool into Appendix G. The rest of the PowerPoint material is partially used in the next subsection and a substantial part of it is not presented in this research paper, but it is available by the author in case of request.

4.2.2. Presentation

The workshop was presented on April 28, 2017, from 14:30 until 18:00. The participants were students of the course of Inventive Product Design and Advanced TRIZ, as well as, Professor Leonid Chechurin and one of his Ph.D. students. The first hour of the workshop covered concepts already presented in this research paper such as entrepreneurship theory, effectuation approach, lean startup/design thinking. The aim for this introduction was to have all participants with a basic knowledge of entrepreneurship. This was necessary as students of this particular course have a tendency to come from a technical and not from a business background. Even though with a technical background, all participants responded they would like to have their own business in the future. So, the experience was valid and useful for the presented crowd.

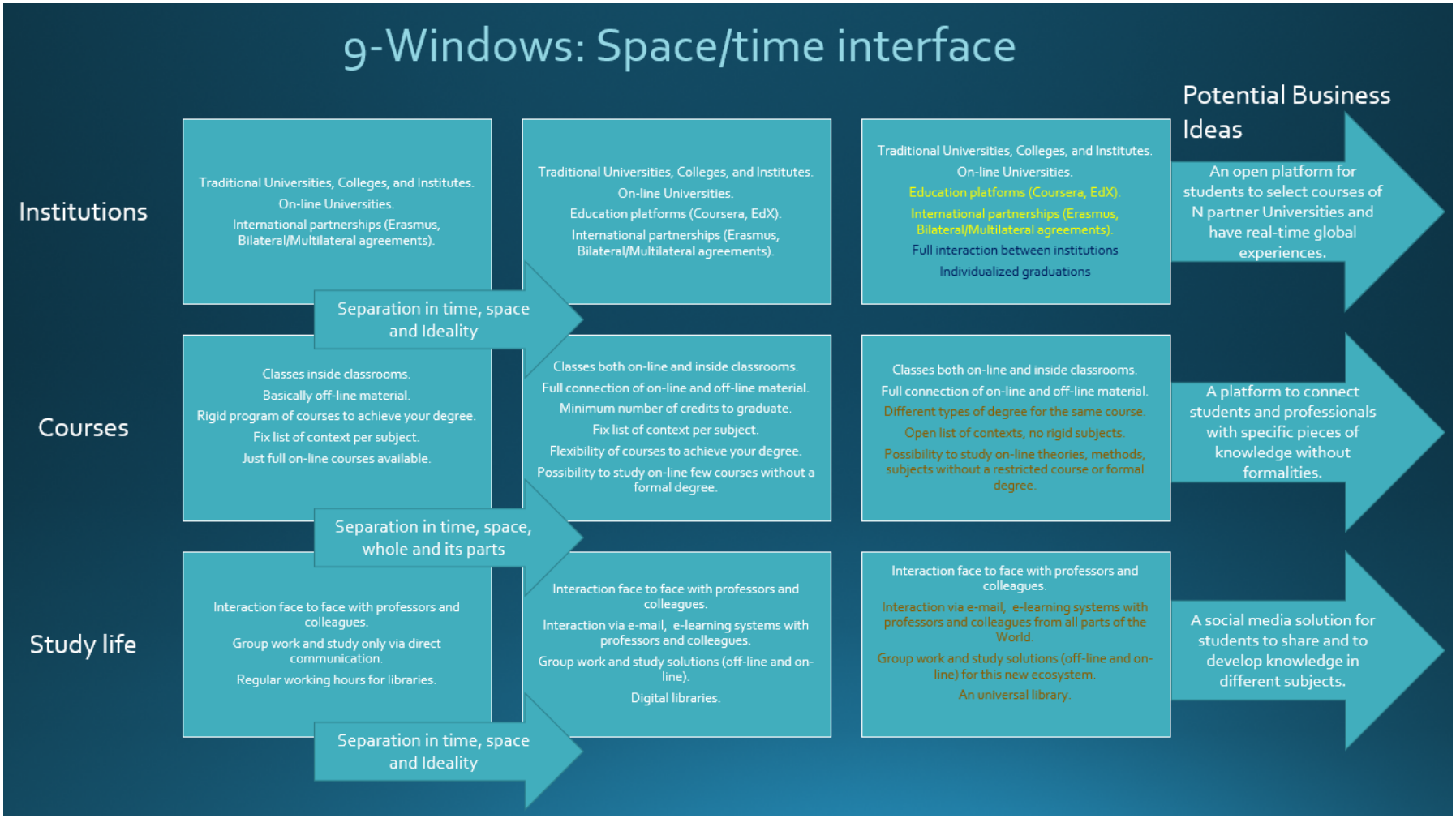
After the introduction, the author presented some comments of interviewees to start the discussion of TRIZ for entrepreneurship. A group of six ventures presented in this research was briefly discussed with the participants. Then, the speaker introduced the three tools of TRIZ that could be useful to generate new business ideas (9-windows, separation principles, IFR). As explained before, the potential of Su-field (trimming) was reserved for the discussion part of the workshop. Based on these three tools the students were challenged to solve a practical case. The practical case was to develop new business opportunities into the higher education system. The author shared the following information about the system:

*"**Higher education has 20 million students in EU-28 and 21 million students in the USA**.*
***Challenges of the system**: Increasing costs; Students' debt; Lack of students' motivation; Globalization; New careers; Constant change in work market needs.*
***Recent innovations**: Platform for on-line courses (Coursera/EdX); Full on-line courses of international institutions (Bachelor/Master/Ph.D.); E-learning and on-line interaction channel for students and professors; Global video streaming of lectures in real-time."* (The author)

The participants received half an hour to build their 9-windows for the system considering the institutions as the super-system, courses as the main system, and study life as the subsystem. To build the 9-windows diagram, the suggestion was to consider the input of ideality (IFR) and all types of separation principles such as separation in time, separation in space, and whole and its parts. After a short break, the speaker presented the system as it is today. Then, it shared his vision of how the system was in the past. At this moment, all participants were invited to share their inputs to enrich the analysis. In fact, similar points came from the participants.

As a second part of the 9-windows, the author presented his vision for the future of the system and its super and subsystem. Again, all participants were challenged to share their opinions and perspectives. Based on the considered future scenario, three business ideas were presented, one for each level of the system. The whole 9-windows diagram and its outputs are presented in Figure 15. In order to develop further the idea, a list of questions was answered to select which idea could be developed further. As TRIZ methodology does not provide any possibility to ranking ideas, this simple list of questions was selected by the author based on the most important drivers an entrepreneur should consider at the moment to choose an idea. Figure 16 presents this analysis. The output of the case was the possibility of new business by merging two different value streams "*A platform to connect students and professionals with specific pieces of knowledge without formalities.*" and "*A social media solution for students to share and to develop knowledge in different subjects.*" The solution represents both the trends of the main system and the subsystem.

A number of systems could be considered in the analysis such as private companies, classroom functionalities, and society, among others. The objective of the practical case might be considered achieved as many participants were interested in the discussion and constructive feedback was shared. As a source of motivation, the author distributed to all participants extra 9-windows pages for them to free elaborate other analysis for the topics of their interest at home. Furthermore, one of the participants contacted the author after the workshop for further discussion of the topic, based on her personal and academic interest in the topic.



Source: The author

Figure 15. 9-windows diagram of the workshop

Analysis of Ideas

Potential business ideas	Who are the users, costumers and suppliers?	Is it possible to cluster some of the ideas?	Is it simple to understand the value preposition?	What is the problem that you found and want to solve?	Do you see a profitable market for this idea?
An open platform for students to select courses of N partner Universities and have real-time global experiences.	Students Universities Universities/outsource	No. Even though it has impact on courses and students it doesn't fit with the other business ideas.	Yes. It increases the quality of education system	High costs for student to move from one country to another. Low quality of some courses/lectures	It looks like a non profit solution.
A platform to connect students and professionals with specific pieces of knowledge without formalities.	Professors/Students Students Professors/Students/outsource	Yes. It has a fit with the sub system idea. The functionality could be free student to student and charged for more specific needs.	Yes. It connects people who needs a piece of new knowledge with people who already have a level of expertise.	Many times people need a specific piece of knowledge. Nowadays, they might study alone, ask for help of colleagues or search on-line for videos or Wikipedia material. There is no on-demand high education training.	It has a cash flow from clients to suppliers. Similar market solutions are profitable in other fields.
A social media solution for students to share and to develop knowledge in different subjects.	Students Students Students/outsource	Yes. It has fit with the system idea. More services via de social media would add visitor and web traffic.	Yes. It allows students of many places to share and develop knowledge, as well as, network.	Students are living in a global environment but only with local connections. A poor network reduces their chance to find a job, as well as, restrict their opportunities of learning.	Depends on the number of users and active visitors. Ads could be possible. Huge number of users could make it the higher education *"LinkedIn"*.

Source: The author

Figure 16. Selection of ideas

4.2.3. Discussion and Q&A

The last part of the workshop was an informal presentation of a large number of successful startups that used concepts of Su-field (trimming). The most famous ventures of the last few years inside the shared economy such as *Netflix*, *Uber*, *Airbnb*, and *Booking.com* (Table 18), are examples of new business ideas that could deploy TRIZ tools. All these solutions have in common the ability to transfer the value only the previous system could generate into an element of the existent super system. Many participants never thought about this usage for TRIZ but all left the workshop with a new perspective of the value TRIZ may create for new business idea generation.

Table 18. Application of Su-field and Trimming into the shared economy

Firm	**The impact in the traditional relation of system and super system**
Netflix	The function of watching movies. The traditional solution was to rent it from a "Blockbuster", download it to your computer (normally illegal), and wait it is available on your TV channel, among others. Now, it is available at any place, anytime, and the user has complete freedom. Separation principles are very strong in this case as well.
Uber	The function of transporting people from the point A to point B. The traditional solution is a taxi service. The new solution allows drivers, which are already components of the supersystem transport to offer the same service. As you increase the offer, the price of the service decrease, hence, more value for users.
Airbnb	The function of allocating people during the period of trips. This function can have several vectors and designs for its solution, such as hotels, motels, and hostels. The new solution allows apartments, which are already components of the supersystem of habitation to offer the same service. As you increase the offer, the price of the service decrease, hence, more value for users
Booking	The function of booking trips for anywhere in the world. The traditional solution was to go into travel agencies and simulate some options. Now, it is available at any place, anytime and people have the opportunity to check ranking and reviews. Separation principles are very strong in this case too.

Source: The author

The next chapter, "Discussion", compares all the results of this research to the theoretical background presented into the literature review. Also, the findings presented here are used to answer stated research questions. As a summary of the whole "Results" chapter, the data

collected and analyzed here may be valid for other research. The complexity to analyze 24 interviews, almost 100 pages of transcriptions, and the development of a workshop, enhances the importance of this case study and its findings. Such an empirical analysis thrives many propositions and shares enough data for a delightful discussion chapter.

5. DISCUSSION

Within this case study research, the challenges and processes entrepreneurs are facing during their entrepreneurial journey were analyzed. The executed holistic analysis of several interviews and the elaborated workshop have provided answers to all research questions, as well as, reached research objectives. Hence, it might be considered that the research goal was met to full extent. As a result, the performed study has revealed several issues to be discussed in this chapter.

The chapter is organized in four subsections. Firstly, "Entrepreneurs' motivation and behavior" presents the empirical and theoretical perspectives of who is the recent entrepreneur. Secondly, "Opportunity recognition" discusses the process and dimensions which affect the recognition of a new venture. Thirdly, "Systematic Approach" performs the comparison of academic perspective and empirical reality of the usage of methods by entrepreneurs. Finally, "TRIZ deployment" presents a new direction for TRIZ research into the business field.

5.1. Entrepreneurs' motivation and behavior

The interviewees confirmed many previous findings of academic research into the reasons for an entrepreneur to pursue self-employment. The findings of Segal Borgia and Schoenfeld (2005), are confirmed by the interviews. Tolerance for risk, perceived feasibility, and net desirability, were presented in more than 50% for the answers of founders. In addition, a new driver common for many entrepreneurs is resilience. More than tolerance for risk, entrepreneurs have a desire and energy to keep going even in the worst situations. Terms like "never give up", "crashing walls", "keep going no matter what happened" might be considered signs of resilience. Also, two entrepreneurs that already reached a turnover of more than one million euros per year stated resilience as a key necessity for their success. Furthermore, the majority of the interviewees confirmed previous research findings, which already stated that freedom as the most important reason to become an entrepreneur (Cassar, 2007)

The case presented four groups of reasons for individuals to start their ventures. The frustration with the corporate career is supported by previous research (Toren, 2015).

However, this research might bring new insights as many entrepreneurs declared specific reasons to leave the corporate career. The frustration might be related to the traditional managerial culture. Founders stated reasons such as lack of meritocracy, slow path of promotions, and bureaucracy as reasons for their corporate career frustration. The dream to become an entrepreneur and the influence of a family ecosystem of entrepreneurs are also correlated to the dimension of personal satisfaction already discussed by different authors (Cassar, 2007; Blachflower and Oswald, 1998). The finds confirmed the different lifestyle this new generation of entrepreneurs is looking for their lives. They are looking for more than economic and career freedom, they want to create ventures with a social value and purpose. Some individual reasons, such as unemployment, by accident, and to learn how a business works, might be considered exceptions. They just confirm the plurality of reasons an individual may have to start their venture.

Different from the finding of Sarasvathy (2001) and Read et al. (2009), only half of the entrepreneurs considered themselves with an effectuation approach within their ventures. A representative group defines their behavior as more causal than effectual (Figure 13, p.73). This division might be explained by the industry specifics of each entrepreneur. The majority of entrepreneurs who declared themselves causal came from more traditional market segments, such as beverage industry, food industry, consultancy, and cables. On the other hand, entrepreneurs more related to high-tech industries declared themselves as more effectual than causal. This industry specific reason was not a focus of this research, but it might explain the division of entrepreneurs in two different groups. Another possibility could be for cultural reasons, as part of the sample is from developed countries and the second part from developing countries. The number of entrepreneurs which declared themselves effectual in developing countries is twice the number of the developed countries. This different makes sense by the cultural differences already discussed in academia (Hofstede, 2001). The need and speed of adaptation are considered higher in developing countries because of their sense of survival. In fact, if annual revenue might be considered a criterion of success, effectual entrepreneurs of this research are more successful than causal entrepreneurs.

5.2. Opportunity recognition

Entrepreneurs might be considered as the masters in the opportunity recognition dimension. As their career success is completely correlated with the selection of the right opportunity. The importance of personality traits, social networks and prior knowledge in the process of opportunity recognition is confirmed by this research findings. As Ardichvili, Cardozo and Ray (2003) suggested these three dimensions are vital for the entrepreneurial alertness to business opportunities. This research found an equal importance of the three dimensions, as one-third of the sample of entrepreneurs selected each of them.

In order to further understand this process, it is important to analyze the division the group of entrepreneurs had. One group developed the idea from scratch, they discovered or created their opportunities. For this group, might be considered a lower influence of their network. They tend to use more their prior experience and their personal traits. On the other hand, the group that received the opportunity from co-founders or future clients used their social network as the key source of opportunity recognition. Also, for this second group, their prior knowledge and personal traits were more the fuel to move forward after the opportunity was already clear. As described by many interviewees, their lives are not linear. They see the development of a startup as a nonlinear process full of uncertainties and the need to use the same set of dimensions of opportunity recognition for the entire entrepreneurial journey.

Entrepreneurs are extremely good in connecting the dots. They have a different view of the same situation as compared to other individuals. This ability to recognize patterns is already considered in academia as a key component of the opportunity recognition process (Baron, 2006). This ability to link objects, conversations, innovations from different industries, and changes in technology, were the source of many ideas of the studied group of founders. They really have the talent to correlate unrelated events as already discussed in academia by Baron and Ensley (2006). In fact, this ability is something they declared as underdevelopment. They believe they are becoming better entrepreneurs during their entrepreneurial journey. This is supported by the reason many entrepreneurs want to become serial entrepreneurs as they trust the next venture will be easier to run based on their new experiences. This supports previous research that already suggests that senior entrepreneurs could identify new opportunities better than novice ones (Baron, 2006; Ardichvili, Cardozo, Ray, 2003; Corbett, 2005). In fact, this research might also be considered a support for the assumption that

opportunity identification and exploitation is something that can be taught and learned by individuals (Corbett, 2005). Many interviewees declared they are already thinking about new ventures because of the number of opportunities they see at the moment.

This increase of opportunities might also be related to the diminishing perception of risk, less fear of failure, and an increase of their network. After the first startup, they acquire the understanding of the real complexity of the process. As three serial entrepreneurs said, after the first time, the others are easier, this might be explained by the similarities related to bureaucracy, team management, and the process to convince investors. In addition, a cultural difference might be considered as well for the process of opportunity recognition. In developing countries, the larger majority of entrepreneurs had at least a short period of corporate experience of two years. In contrast, half of the entrepreneurs in developed countries had their first relevant professional experience within their startups. Also, the later presents an average age of the founders lower than developing countries. This might be explained by social structures and local government support. The complexity to start a business in Brazil versus in Finland might be considered the reason academic students take the risk earlier in their careers in Finland. In fact, Brazil lacks a governmental policy to backup entrepreneurs. However, Finland and Europe have a structured process and specific budget to support novice companies to thrive.

In a nutshell, the entrepreneurs of this study presented in their majority, personal traits such as courage, resilience, enthusiasm, and they are risk-takers. Their prior knowledge, both corporate and formal education, had a positive influence on many of them. Their social network was used to discover the opportunity, as well as, to build the founders' team and their supply chain (supplier, external partners, and future users). In conclusion, all three dimensions are presenting during the opportunity recognition process. The alertness of an entrepreneur is probably the most important capability they have. This ability should be the focus of future entrepreneurs of self-development. As a matter of fact, a systematic approach might support and increase the alertness of individuals. Many entrepreneurs already develop their replicable methods to analyze opportunities and select ideas.

5.3. Systematic Approach

The benefits of a process have been confirmed by researchers in different fields. One of the most interesting cases is the impact of the introduction of the *Stage-Gate* process into the new product development (Cooper, 2008). The impact it generates in the mortality curve of new product ideas helped many companies to reduce their spending on innovation (Barczak et al., 2009). The same concept might the used to support the implementation of a systematic approach for entrepreneurs and their future ventures. At the idea generation and idea screen stage, the investment needed is lower than at late stages of any business or product development, such as test or initial commercialization. The majority of interviewees stated they do not use any formal or theory backed method at the moment into their ventures. This gap means a real opportunity for further development of the actual benchmark methods, such as *Lean Startup, Agile*, and *Design Thinking*. Moreover, it creates the possibility for new methods to be deployed.

The definition of systematic creativity by Ackermann and Gauntlett (2009, p. 4) fits perfectly with the answers of entrepreneurs during their interviews. They use logic to understand the market and existent problems. Their imagination allows for new and unusual solutions. They have a special way of reasoning, which makes possible to see problems no one is seeing and to find the solution for them. Without their comprehension, entrepreneurs are using partially the creative process introduced by Csikszentmihalyi (1996). As they respect steps such as preparation, incubation, and illumination. For instance, they translate these steps as "*I need to write down the problem*" and "*I need to draw to visualize the situation*" for the preparation step; "*I need to leave the problem to find a solution for it*" and "*I write it down, then later I will go back to it with a potential solutions*" for the incubation step. Also, "*Sometimes I got the solutions before going to bed*" and "*I find a solution when I am relaxed going something else*" for the illumination step. In fact, their way of solving problems and developing solutions is supported by the previous academic literature.

This reasoning has been proved it can be taught by researchers (Ogot and Okudan, 2007). The majority of entrepreneurs considered that a systematic method could generate positive effects for future entrepreneurs. They consider the entrepreneurial journey a nonlinear process that might be supported by a systematic approach. Considering the later stages of a business development, for instance, its business plan and execution, a well-developed theory

and strong frameworks, are already available for entrepreneurs (McGrath and MacMillan, 2000). Out of them, the *Business Model Canvas* by Osterwalder and Pigneur (2010) is the most well-known both in academia and by interviewees. However, the applicability of this framework and others by entrepreneurs is still uncommon in their routines. In fact, the stage of idea generation is not supported by any of the most usages methods and might be considered as one of the most valuable ones as already presented in this discussion by its impact on the development costs.

This gap at the stage of idea generation might be bridged by a systematic method. This assumption is supported by the input of entrepreneurs and their informal process to generate solutions. Even though some entrepreneurs shared the same concern of Ward, Patterson, and Sifonis (2004) that a systematic method might create threats to the ability of individuals to balance abstraction and specificity in their creative process. The positive outcomes of a process that balance a well-developed structure with a high degree of freedom cannot be discarded. The enthusiasm of entrepreneurs with the possibility of a useful method to support them in future business idea generation process was impressive. This feedback increases the importance of this research and its attempt to deploy a systematic approach, such as TRIZ, for future business idea initiatives. It might be considered relevant the number of similarities 24 different entrepreneurs that never had contact with each other presented in this research.

5.4. TRIZ deployment

Within the scope of this research, the developed workshop was performed in order to get insights into the level of deployment viability TRIZ might have for new business idea generation. The facility to simulate the deployment of TRIZ into existent business might be considered as a supporting argument for the usage of TRIZ for new business ideas in the future. Moreover, the range of tools TRIZ methodology supplies their users increase the probability of success. The workshop and the analysis of 24 ventures represent an example of the potential value of 9-windows, ideality, separation principles, and Su-field (trimming) might have for savvy and novice entrepreneurs. In addition, as already discussed by Moehrle (2005), the combination of TRIZ tools may result in even more innovative solutions. The ventures of this research, whose new solutions could be described by two or more tools might be considered within a higher degree of innovation. Hence, the combination of tools already

presented in this paragraph might be considered useful for future entrepreneurs. The facility of training individuals in all these four tools might be proved by the developed workshop of 4 hours, a fast solution that may facilitate the new business idea process of future entrepreneurs.

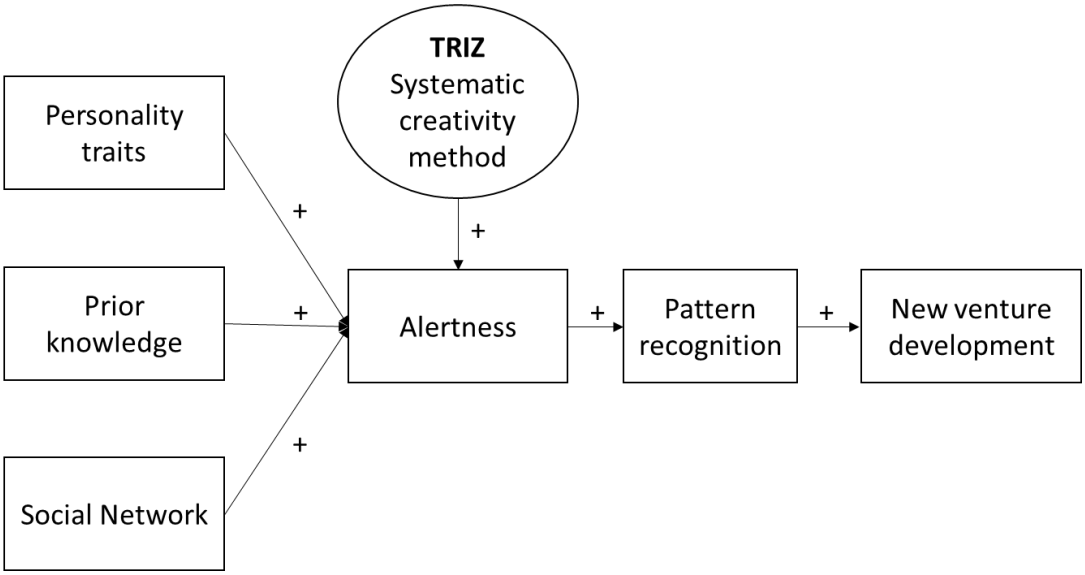
In contrast to previous theoretical research, this empirical analysis did not present a strong need for the application of the most popular TRIZ tool, the contradiction analysis (Domb and Mann, 1999; Ruchti and Livotov, 2011). It might be related to the complexity and variety of business elements. In addition, the usage of function analysis and inventive principles might be considered as a support tool of the four tools that seems to have a higher potential applicability. In fact, traditional TRIZ tools, which one might consider with less technical elements and more philosophical ones, seems to generate more value for business activities. Hence, the deployment of those tools should be of further interest to the academic world. They seem to have all elements the group of interviewed entrepreneurs presented as important for them, such as visual representation, a certain degree of freedom and flexibility, a whole perspective of the situation, as well as, elements to foster the reasoning to solve problems.

This study also differs from previous research in the deployment of TRIZ in SMEs and startups, by positioning TRIZ as a supportive methodology to enhance the alertness of entrepreneurs. TRIZ tools might be considered a power way to improve the ability of individuals to connect the dots and to link unrelated facts. The previous research of Chandia et al. (2017) and Russo, Regazzoni, and Rizzi (2015) did not consider the benefits TRIZ might generate for entrepreneurs' reasoning and alertness. Their approach, as a similar one of Brad and Brad (2015), just wanted to deploy TRIZ within the SME problem-solving process, by adapting it to management strategies, such as SWOT analysis, and decision-making tools, such as analytic hierarchy process (AHP).

The findings of this empirical research point out another direction for TRIZ deployment into startups and businesses in general. They might be considered as strong evidence of the potential value of TRIZ to foster the process of opportunity recognition, by leveraging the alertness of individuals, as well as, a possible influence on the search process of pattern recognition. Both theories, opportunity recognition and pattern recognition, might receive

valuable insights of TRIZ methodology. In addition, more than one research has already shown the positive influence training on TRIZ methodology might have into individuals' creativity (Burrought et al., 2011; Groanuer and Naehler, 2016). The opportunity for further deployment of TRIZ into business fields seems of high potential. In fact, the value of TRIZ for entrepreneurs might be considered as a valuable insight of this research in several dimensions.

As a final result, the previously presented research framework (Figure 11, p.40) might be considered feasible and a proposition for future quantitative research to validate it might be one of this research outputs. A review version of the research framework is presented in Figure 17. The final version excludes the components of the effectuation approach that were presented in the initial version. This change is based on the results of interviews and the large among of entrepreneurs that consider themselves with a more traditional managerial approach. Also, a simplification in the positive impact of a systematic approach is present in the final version. The empirical data only generated support to consider the benefit into the alertness of individuals and not into the ability of individuals to search for new information.



Source: The author

Figure 17. Theoretical framework final version based on empirical inputs

6. CONCLUSIONS

The entrepreneurial journey is currently attracting an increasing among of attention of academia and society. The last global crises and the reduction of employment opportunities from large corporations are reasons for governments and researchers to find new forms to engage people to generate new sources of employment. This issue is part of the strategic agenda of many countries around the World, both developed and developing countries. In this perspective, entrepreneurs are the resource for new business generation, hence, employment and wealth opportunities for nations worldwide. All stages of the entrepreneurial process, from its idea generation to the execution of the developed business plan, are equally important to assure a sustainable future for each and every venture.

This research focused on the early stages of the entrepreneurial process. The aim was to fulfill a mapped gap in the process of business idea generation by startup founders. The author's curiosity to understand how the mind of an entrepreneur works and to examine the possibilities that could be generated by the deployment of a systematic methodology could generate for the solution of business problems were also main reasons for this research. Therefore, this study stated two objectives: to analyze the real process entrepreneurs' face generating their business ideas and to understand which components of TRIZ, a systematic creativity method, may be integrated into the new business development process.

This study seeks to analyze the challenges entrepreneurs have in the process of idea generation of new business opportunities. Hence, the main research question of this study was: "*How to generate value for entrepreneurs via a systematic approach for new business idea generation?*"

In order to fulfill both research objectives, three research questions were formulated. The questions were the following ones:

- RQ1: *How are new entrepreneurs generating their businesses ideas?*
- RQ2: *Which implications could a systematic approach have for entrepreneurs?*
- RQ3: *How to deploy TRIZ for new business idea generation?*

These questions guided the whole research, and their answers satisfy the stated research objectives and the main research question. In order to answer stated research questions, a complete analysis of academic literature and open sources of data was presented. It revealed theoretical findings from this research field and supported the further development of the research questions and the definition of research strategy. This research implemented a multi-case study research strategy with a focus on both developing and developed countries. By a multi-method qualitative research technique, this study collected data from 24 interviews and a workshop using the structure of a focus group, as well as, few methods of secondary data collection. This plurality of methods supports research findings credibility. In order to improve research transferability and reliability, an equal number of entrepreneurs were selected by each region. Based on the author background and existent network, the majority of interviewees were from Brazil, 12 participants, and from Finland, 9 participants.

The performed empirical research includes three defined stages. The elaboration of the interview guide in both languages, Portuguese and English, and the analysis of TRIZ deployment into business. Then, the main stage of the empirical research was the interview of 24 founders of startup and the transcription of the material generated by those interviews. Finally, the last stage consists of a 4 hours' workshop with students of the Lappeenranta University of Technology, from the course of Inventive Product Design and Advanced TRIZ.

In order to answer the first research question (RQ1), the process of business idea generation becomes with the entrepreneur motivation to start a business. The interviews revealed that the recent motivation entrepreneurs have had to start their own business can be concluded to be based on their frustration with the corporate life, the dream to become an entrepreneur and a family ecosystem of entrepreneurs. All these motivations were partially discussed in previous academic research. In addition to them, this empirical research adds the specific reasons for entrepreneurs' frustration within their corporate lives such as lack of meritocracy, slow path of promotions, and companies' bureaucracy.

Considering the analysis of interviews, there are two forms of how entrepreneurs recognize their business opportunities. One is via their co-founders and personal network interaction. Another is via their generation of ideas based on their personal traits, prior knowledge, and

social network. In both cases, the ability founders of startups have shown to connect the dots and to correlate unrelated events, are really inspiring. It can be concluded an important contribution the level of alertness generates for entrepreneurs. An individual with a higher sense of alertness has an outstanding chance to recognize opportunities earlier than an individual with a lower sense of alertness. Furthermore, can be concluded from this research that individuals who want to success in the entrepreneurial journey need to have high levels of resilience, courage, enthusiasm, and a good management of uncertainty.

The performed research shows an equal vision of entrepreneurs related to their behavior being causal or effectual. Two potential reasons for this difference from previous research might be related to industry specific reasons and cultural differences between developed and developing countries. These research findings allow proposing that entrepreneurs from developed countries seem to have a more causation approach as they present a stronger vision to pursue since the beginning of their entrepreneurial lives. On the other hand, entrepreneurs from developing countries seem to have more effectuation approach. It might be related to their cultural background, which prepared them to be more adaptive to circumstances and changes. This survival-oriented-behavior is stronger in the group of entrepreneurs from developing countries. As a matter of fact, they seem to achieve financial success faster than entrepreneurs from developed countries.

In order to answer the second research question (RQ2), the potential value a systematic approach might have for entrepreneurs was analyzed. The majority of startup founders believe a systematic approach could be positive for the whole entrepreneurial life. Also, academic insights already proved the benefits a formal process may generate in the mortality curve of new developments. The performed research has highlighted the gap between existent methods and frameworks for entrepreneurs and their effective usage by startup founders. This specific challenge to convince entrepreneurs to deploy tools might be related to the actual complexity and length of methodologies as *Lean Startup* and *Design Thinking*. Considering one of the principal restrictions all entrepreneurs shared, their shortage of capital, one can conclude that a benefit a systematic approach might generate is to avoid unnecessary capital expenditures into ideas or concepts with a low chance of success. Also, the structure of a systematic approach implies many other benefits related to process visibility, traceability, and reasoning.

Some risks may be considered, as the systematic approach could create threats to the ability of individuals to balance abstraction and specificity, as well as, might reduce the possibility of individuals to *think outside the box*. However, the performed research shows more benefits than risks related to the use of a systematic approach by entrepreneurs. As already mentioned by several entrepreneurs in this research, the idea of chaos inside the entrepreneurial process is a myth. They really need and use their informal processes to run their businesses. The perception of chaos exists in a minor scale only for novice entrepreneurs in the early moments of their journeys.

In order to answer the third research question (RQ3), the informal process of novice entrepreneurs to solve their problems and develop new solutions were analyzed. Also, the developed workshop was a pilot test of the acceptance of a group of TRIZ tools could have from future entrepreneurs. This research can conclude that TRIZ deployment into the process of idea generation is feasible and might leverage the results of individuals to come up with new business ideas. TRIZ tools such as ideality, 9-Windows, separation principles, and Su-field (trimming) proved to be useful and able to explain many disruptive businesses of the previous years. The majority of business ideas of the interviewed founders would be solutions that an individual could develop using TRIZ. Also, several famous startups, such as Netflix, Airbnb, and Uber, might have their business explained by TRIZ methodology.

Furthermore, the performed research shows the potential leverage TRIZ might generate for the alertness of individuals. As one of the key components of the theory of opportunity recognition, alertness is the reason why entrepreneurs may see things and their links in a way other individuals are not capable. A simple and introductory training of TRIZ tools, as the one applied in this research workshop, might be enough to increase the alertness of individuals, hence, their probability of future recognition of business opportunities. In fact, this research can conclude that TRIZ tools that have less technical elements and more philosophical ones seem to adapt better for business deployment.

6.1. Theoretical Contribution

This research brings a contribution to four existent academic knowledge fields: entrepreneurship theory, opportunity recognition theory, systematic methodologies, and for the TRIZ methodology. The research has revealed a potential deployment of TRIZ into non-technical fields, as well as, valuable insights for the previous academic literature of new business opportunity recognition. Furthermore, this research introduces an empirical perspective and further validation of several propositions and previous theoretical assumptions. In fact, one may find scarce knowledge and empirical research related to entrepreneurs of developing and developed countries. The similarities and differences between them are another important contribution of this research to the academic literature.

6.2. Managerial Implication

This research provides implications for traditional corporations, entrepreneurs, and individuals that might desire to be self-employed in the near future. Part of the reasons for novice entrepreneurs to start their business is related to frustrations with their corporate lives. Traditional companies may use these inputs as insights to review their internal process and human resources policies. For both entrepreneurs and future entrepreneurs, this research adapted tools of TRIZ to support their process of idea generation, as well as, presented the benefits it might generate for their ability to recognize opportunities throughout the leverage of their alertness capabilities. Also, this study has presented a list of personal traits that are important for an entrepreneur to start and develop their ventures. Therefore, as a final result, this research offers a new set of tools to support entrepreneurs during their challenging process of new business idea generation and to solve their general problems.

6.3. Limitations

The research strategy of a multiple holistic case study enables a comprehensive analysis of the phenomenon, however, as a qualitative analysis, it cannot be statistically supported. It may be considered as a limitation regarding the generalizability of the research findings. However, a large sample of firms covering two completely different realities of the entrepreneurial world might be accepted as a mitigation factor for this limitation. The developed methodology might be applicable for other systematic approaches, as well as, to any further understanding of the process of opportunity recognition.

This cross-sectional study is limited to the perception entrepreneurs had at the moment of their interviews in the year of 2017. A longitudinal study might generate more insights of their process of new business idea generation, as well as, the challenges they face during the development process of the new business. In addition, this research used one country as a representative of the developing countries, Brazil, and basically just one representative of the developed countries, Finland. It might be considered a threat to generalizability because of countries' specifics.

A final limitation of this research may be related to the restricted available time. The author choice to run a workshop with students was a decision to deliver the research inside a specific time frame. The initial plan was to organize a workshop with a group of entrepreneurs, which participated in the interview stage of the research. Restrictions related to scarce budget of the project and conflict of agendas, made the workshop be elaborated for students of the university.

6.4. Further Research

Although the theoretical and empirical contribution of this research might be considered into several dimensions, there are many research opportunities that thrive out of this study. Firstly, a quantitative analysis to validate the positive impact a systematic creativity approach might have for the theory of opportunity recognition. Secondly, this research calls for further development and empirical research of the deployment of the TRIZ methodology into non-technical fields. It is a latent opportunity for TRIZ researchers and practitioners. Thirdly, there is a need for managerial research to support corporation into the process of talents retention. Companies have a survival reason to keep *intrapreneurs* in their teams, but traditional tools seem to fail for the new generation of individuals. Finally, a quantitative research to understand the role of entrepreneur background, such as country of origin and age, and their perception related to having or not an effectuation approach.

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APPENDICES

Appendix A

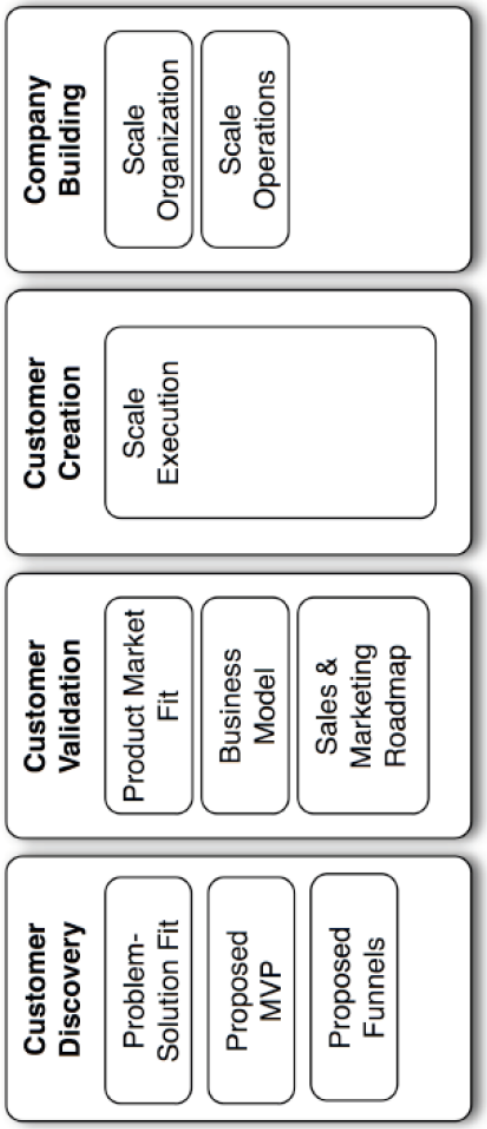
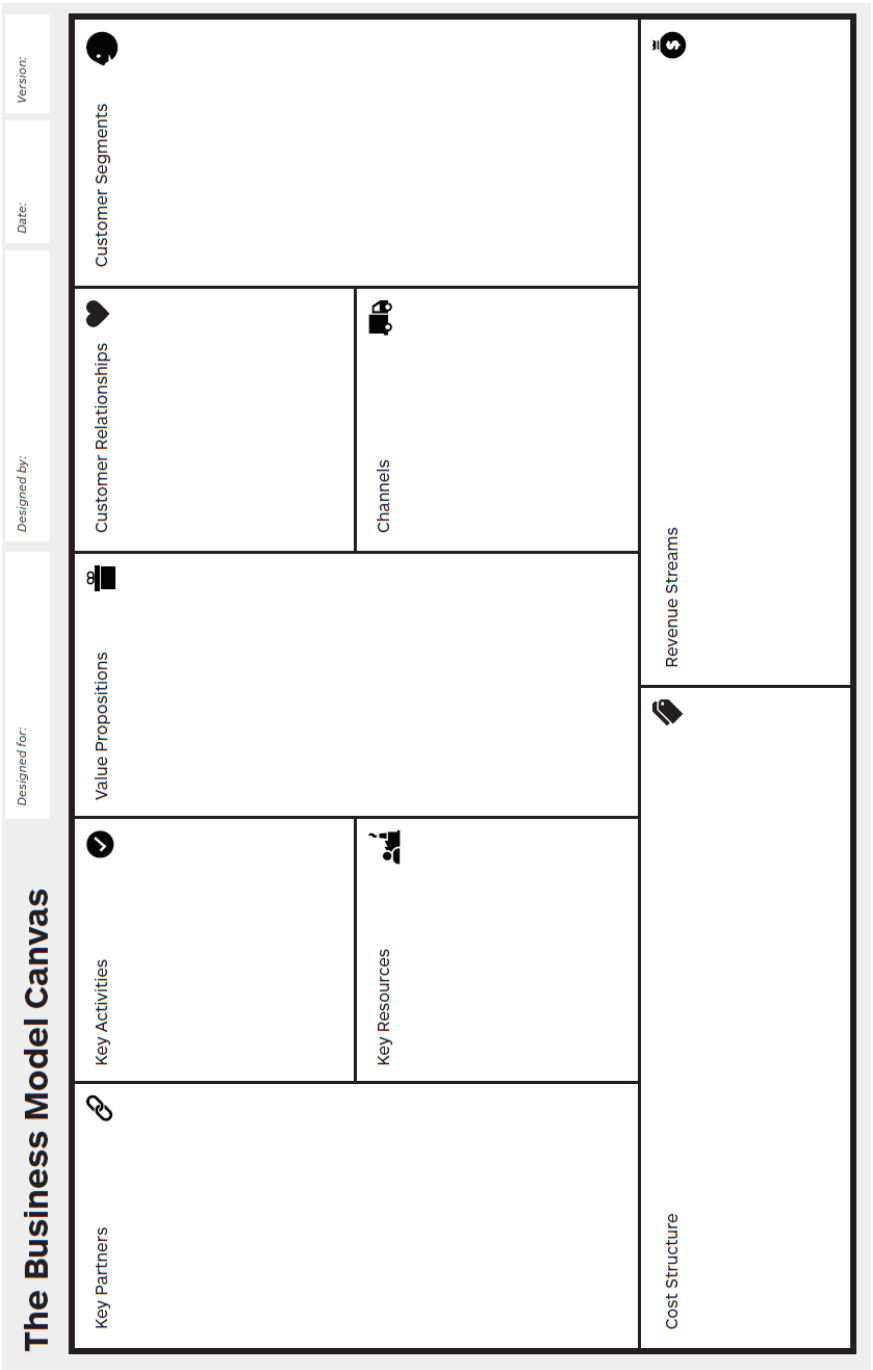


Figure 2b. Detailed process model for lean startup (Cooper & Vlaskovits, 2010).

Appendix B


The Business Model Canvas
Designed for:
Designed by:
Date:
Version:
Key Partners
Key Activities
Key Resources
Value Propositions
Customer Relationships
Channels
Customer Segments
Cost Structure
Revenue Streams

Appendix C

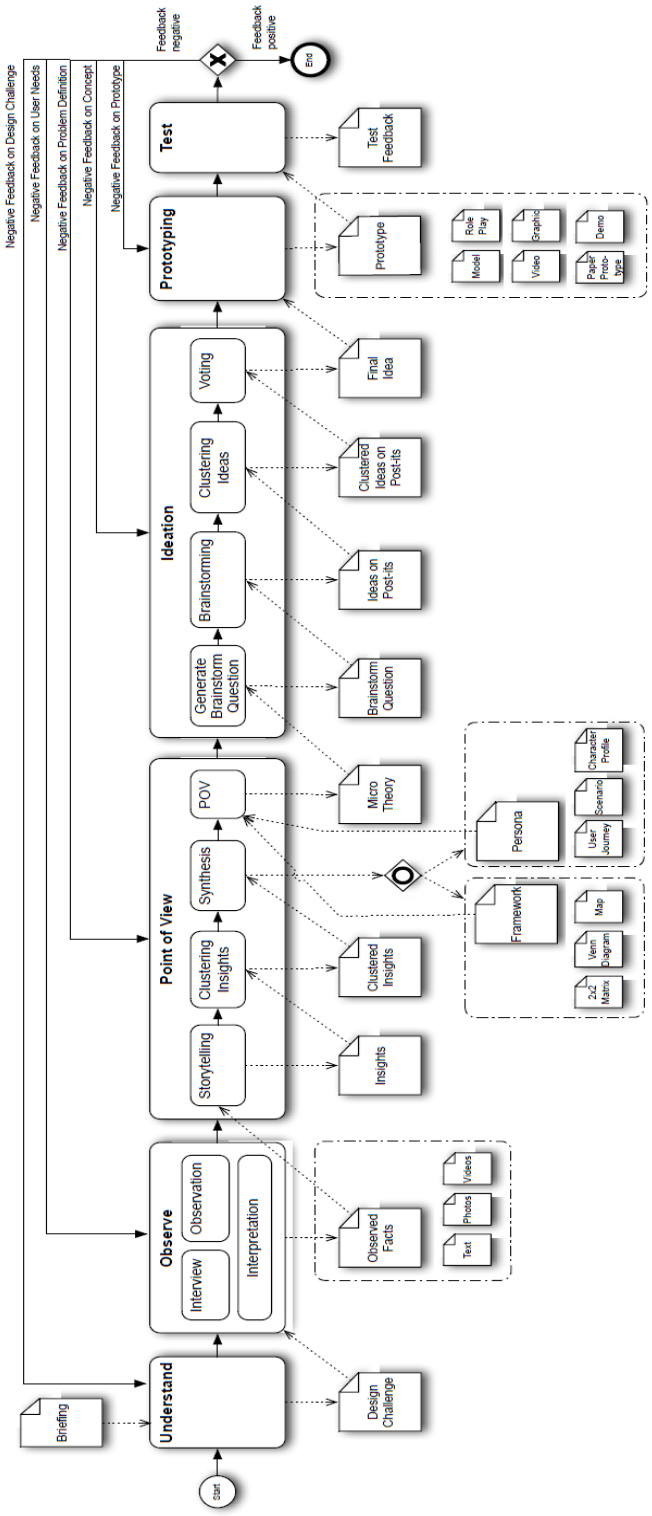


Figure 2a. Detailed process model for design thinking (Thoring & Müller, 2011b) (Cooper & Vlaskovits, 2010).

Appendix D

List of Business Principles	
Principle 1. Segmentation	Principle 21. Skipping
Principle 2. Taking out	Principle 22. "Blessing in Disguise" or "Turn Lemons into Lemonade"
Principle 3. Local quality	Principle 23. Feedback
Principle 4. Asymmetry	Principle 24. 'Intermediary'
Principle 5. Merging	Principle 25. Self-service
Principle 6. Universality	Principle 26. Copying
Principle 7. "Nested Doll"	Principle 27. Cheap Short-Living Objects
Principle 8. Anti-Weight	Principle 28 Mechanics Substitution
Principle 9. Preliminary Anti-Action	Principle 29. Pneumatics and Hydraulics
Principle 10. Preliminary Action	Principle 30. Flexible Shells and Thin Films
Principle 11. Beforehand Cushioning	Principle 31. Porous Materials
Principle 12. Equipotentiality	Principle 32. Color Changes
Principle 13. 'The Other Way Round'	Principle 33. Homogeneity
Principle 14. Spheroidality - Curvature	Principle 34. Discarding and Recovering
Principle 15. Dynamics	Principle 35. Parameter Changes
Principle 16. Partial or Excessive Actions	Principle 36. Phase Transitions
Principle 17. Another Dimension	Principle 37. Thermal Expansion
Principle 18. Mechanical vibration	Principle 38. Strong Oxidants (‘Boosted Interactions’)
Principle 19. Periodic Action	Principle 39. Inert Atmosphere
Principle 20. Continuity of Useful Action	Principle 40. Composite Structures

Appendix E

English list of questions
Personal information:
Name:
Gender: Male/Female
Age:
Years of prior work experience in the current industry:
Total years of prior work experience:
The highest level of education:
Position in the company:
Number of previous entrepreneurs in the family:
Is your first venture or you are a serial entrepreneur:
Company information:
Name:
Number of personnel:
Years in the market:
Pre-market period:
Approximately annual sales:
Funding strategy/Investment rounds:
List of question planned for the interview:
1 - What was the primary reason for you to become an entrepreneur?
2 - Could you please describe your business? Also, to which market categories it belongs. (Advertising, Accounting/Payroll, Architects/Engineering, Computer/Information, Contractors/Engineers, Financial Services/Banking, Health Services, Insurance, Legal, Management/Consulting, Maintenance, Research & Development, Restaurants & Hotels, Real Estate/Rental/Leasing, Social Media, web platforms).
3 - What kind of products or services do you provide? How often do you need to generate new product or services ideas?
4 – How did you recognize the business opportunity?
5 – Do you believe that luck helped you to a certain extent? How?
6 – Do you have a formal or informal process to generate ideas and solve problems? Could you please example it and its roots? Is it a standard process for all personnel or just for you?
7 – How do you believe your personal traits helped you to recognize the opportunity of your current business?
8 – How do you believe your prior knowledge helped you in the opportunity recognition of your business?
9 – How do you believe your social network helped you in the opportunity recognition of your business?
10 – (Briefly explanation of causation and effectuation approach) Do you define your entrepreneurial behavior as causal or effectual?
11 – Have you ever heard about TRIZ, Theory of Inventive Problem Solving, before this interview? If yes, where and what is your opinion about the toolkit.
12 – Do you believe that a systematic creativity approach could contribute to the opportunity recognition process for entrepreneurs? If yes, how do you believe it could add value?
13 - Would you be positive to apply a structured process to generate solutions for your business? If yes, what stages are “must have” for you?
14 – What are your plans for the future of the venture?
15 – Do you plan to create new ventures within the next 5 years?

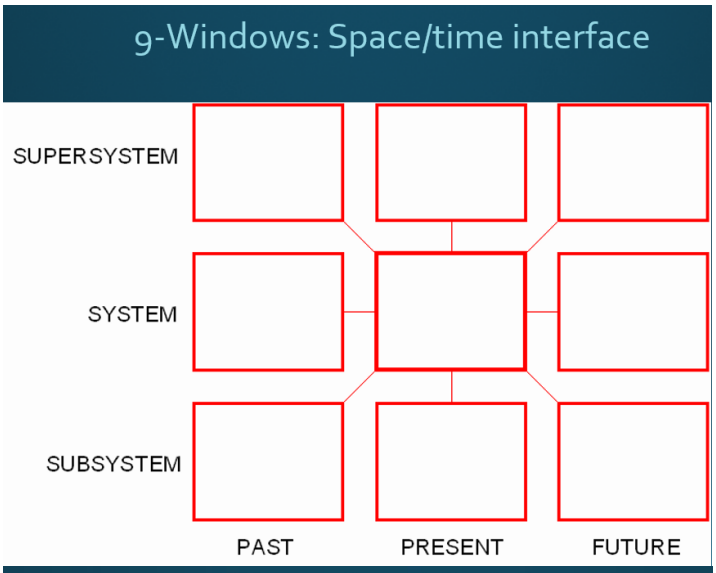
Appendix F

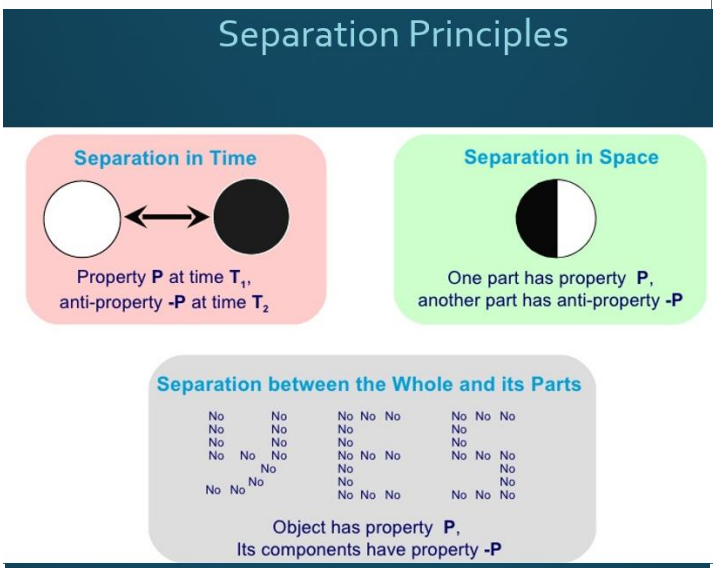
Portuguese list of questions

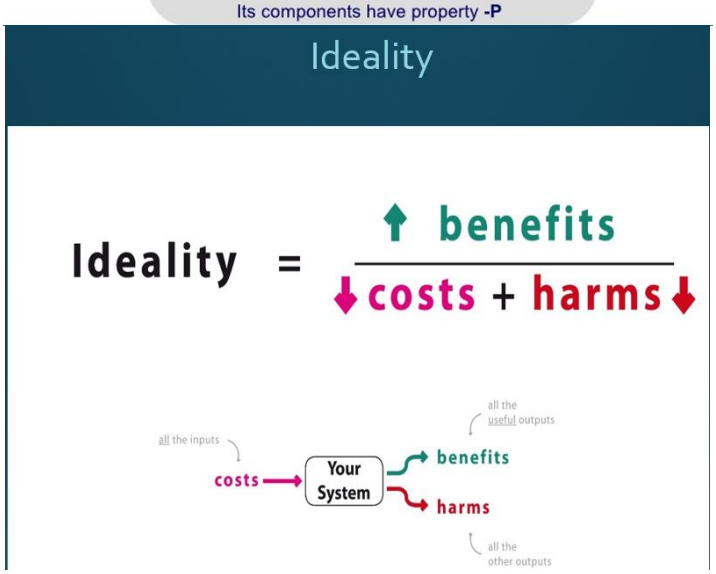
<u>Lista de perguntas que serão abordadas na entrevista</u>

1 – Qual foi a sua motivação para empreender?
2 – Como você definiria o seu negócio?
3 – Quais produtos e/ou serviços você oferece? Com que frequência você precisa gerar inovações (novas versões/atualizações/entre outros)?
4 – Como você encontrou essa oportunidade de negócio?
5 – Você segue algum processo formalizado para resolver problemas e gerar ideias para soluções? Se sim, você poderia me dar um exemplo e como você elaborou esse processo? Este processo é seu ou todo o seu time adota?
6 – Como a sua personalidade te ajudou a reconhecer essa oportunidade de negócio?
7 – Como o seu conhecimento prévio te ajudou a reconhecer essa oportunidade de negócio?
8 – Como as suas conexões (network) te ajudaram a reconhecer essa oportunidade de negócio? (Para os 3 casos, personalidade, conhecimento e conexões, você utiliza eles no seu processo de geracão de ideias?).
9 – Você entende que a sorte te ajudou de alguma maneira nesse processo? Se sim, como?
10 – Você se considera um empreendedor que traça objetivos claros e procura os meios para atingi-los (causal) ou você trabalha com o que está disponivel e desenvolve as soluções possiveis (effectual)?
11 – Você já ouviu falar de TRIZ, teoria da solução inventiva de problemas, antes dessa entrevista? Se sim, qual a sua opinião sobre ela?
12 – Você acredita que um mêtodo sistemático de criacão poderia beneficiar o reconhecimento de oportunidades por empreendedores? Se sim, como você acredita que ele poderia gerar beneficios?
13 – Você utilizaria um processo estruturado para a geração de soluções para o seu negócio? Se sim, quais etapas você considera essenciais nesse processo?
14 – Quais são os seus planos para o futuro da empresa?
15 – Você planeja começar novos negocios nos próximos 5 anos?

Appendix G


9-Windows: Space/time interface
SUPERSYSTEM
SYSTEM
SUBSYSTEM
PAST
PRESENT
FUTURE


Separation Principles
Separation in Time
Property P at time T1,
anti-property -P at time T2
Separation in Space
One part has property P,
another part has anti-property -P
Separation between the Whole and its Parts
Object has property P,
Its components have property -P


Ideality
Ideality = ↑ benefits / ↓costs + harms↓
all the useful outputs
all the inputs
costs
Your System
benefits
harms
all the other outputs