ISCTE Business School
University Institute of Lisbon

# KICK-STARTING INNOVATION:

# A FAST-TRACK VERSION OF INNOVATION SCORING FOR START-UPS

Miriam Iris Mendes Rivotti

Dissertation submitted as partial requirement for the degree of
Master of Science in Management

Supervisor:
Isabel Caetano
Guest Professor, INDEG/ISTCE-IUL, COTEC Portugal

Co-Supervisor:
Sandro Mendonça
Assistant Professor, Department of Economics, ISCTE Business School

September 2015

**Acknowledgements**

Thank you for the infinite patience, for the reviews, for your support in times of despair, and all your love, Tiago Oliveira.

To my parents, for always believing in me and that things we dream possible can become true.

To my brother Pedro, for picking me up at the airport at 3am after a disrupted flight, while returning from my thesis' interviews.

To Isabel Caetano and Sandro Mendonça, for your irreplaceable guidance in this journey.

To Pandora, Zizita and Zeta, for eternal companionship.

**Abstract**

This study seeks to build a diagnostic tool for start-up innovation. It does that by adapting the framework of the *Innovation Scoring*, which is an instrument developed by COTEC Portugal – the country's leading business association for the promotion of innovation. To the author's knowledge there are no academic works to be found that have followed this approach. The relevance of this work is further enhanced by the present context of change in the business panorama, as well as the growing importance of knowledge economy. A basic question that prompts this investigation is as follows: how can an innovation assessment tool be made useful to the specific characteristics of start-up companies? This project proposes the initial steps and clues for further investigation on how to extend the approach of *Innovation Scoring* to start-ups. A new instrument – *a Fast-track Approach for Start-ups* (IS FASt) – *i*s advanced with the purpose of diagnosing innovation capabilities in an objective and measurable manner in order to support start-ups' innovative performance.

**Keywords:** Innovation management; Start-ups; Diagnostic tool; Innovation Scoring.

**JEL Classification:** M13; O32

**Resumo**

Este estudo procura construir uma ferramenta de diagnóstico de inovação para *start-ups*. Isto é feito a partir da adaptação enquadramento do *Innovation Scoring*, que é um instrumento desenvolvido pela COTEC Portugal – Associação Empresarial líder na promoção da inovação no país. Não existindo, no que diz respeito ao conhecimento dos autores, ainda trabalhos académicos que tenham realizado esta abordagem. A pertinência da presente dissertação é reforçada pelo presente contexto de mudança no panorama do tecido empresarial, bem como da crescente importância da economia do conhecimento. Uma pergunta-base que anima a presente investigação é a seguinte: de que forma é que um instrumento de avaliação da inovação pode ser tornado útil às características específicas das empresas *start-ups*? Este projeto propõe os primeiros passos e pistas para investigação futura sobre como estender a abordagem do *Innovation Scoring* às *start-ups.* Um novo instrumento – *a Fast-track Approach for Start-ups* (IS FASt), é avançado com a finalidade de diagnosticar as capacidades de inovação de forma objetiva e mensurável, afim de apoiar o desempenho inovador das *start-ups*.

**Palavras-chave:** Gestão da inovação; *Start-ups*; Instrumento de diagnóstico; Innovation Scoring.

**Códigos JEL:** M13; O32

## Table of Contents

## List of Figures

## List of Tables

**List of Appendixes**

## List of Abbreviations

| | |
|---|---|
| A+A | Approach + Application |
| APL | Application |
| APR | Approach |
| COO | Chief Operating Officer |
| FASt | Fast-track Approach for Start-ups |
| GPS | Global Positioning System |
| IS | Innovation Scoring |
| IT | Information Technology |
| NPD | New Product Development |
| NTV | New Technology Ventures |
| OECD | Organisation for Economic Co-operation and Development |
| R&D | Research and Development |
| RDI | Research, Development and Innovation |
| SME | Small and Medium-sized Enterprises |

## 1. Introduction

Today's world economy is characterized by constant change. Technological development has been accelerating. Innovation is the true condition of enterprises and economies. Therefore, we must continue to better understand the changing economic structure and the evolving learning patterns of organisations and territories. This is an important task for the social sciences and the applied economic studies.

Start-ups have many times a fleeting existence, they have rapidly to succeed in that untidy place between the past and the future where rarely everything happens according to the plan. Today's companies must defy a never-ending concern of deciding between 'persevere' and 'pivot,' in the complex and dynamic world of entrepreneurship (Moore, 2006).

This research takes as its starting point the Innovation Scoring (IS), a tool designed to guide and support the organisations' innovation strategies by providing a quantified and comparable outcome measure of innovation. The current work ultimately seeks to adjust this instrument to the reality of start-up companies by designing IS FASt (*a Fast-track Approach for Start-ups*), as a means to understand and assess innovation management principles, addressing their particular environment. The novelty and originality of this work is enhanced by the development and testing of this new instrument in real cases, providing new evidence to our knowledge of start-ups and their dynamics. This study is centred on a basic set of questions: *a*) how should the IS FASt be applied? *b*) how should the IS FASt address the particular challenges of start-ups? *c*) what distinctive elements does the diagnosis emphasise that contribute to the analysis of the role of starts-ups in the innovation ecosystem?

The thesis is structured as follows. Chapter 1 introduces the topic and defines the scope of the work; chapter 2 and 3 articulate the theoretical framework supported by a literature review. Chapter 4 presents the methodology. Chapter 5 focuses on the original IS and the IS FASt version. Chapter 6 presents the case studies. Chapter 7 summarizes the discussion of outcomes, limitations and challenges of this approach. Finally, chapter 8 presents the conclusions from the study and highlights avenues for further investigation.

## 2. Theoretical framework

### 2.1. Introduction

Portugal invests around € 2.5 billion per year in scientific and technological research (Godinho, 2013). For more than a decade, the word "innovation" has become present in both the business discourse and in public policies. In order to better understand innovation a literature review is required. This provides a background for assessing the major dimensions of innovative dynamics at the organisation level.

### 2.2. Innovation in the economy

Economics was the source of much early insight into innovation (Phillips, 2014). Authors such as Schumpeter (1934, cited in Schumpeter, 1997) provided the foundation for the theoretical understanding of the role of innovation in industrial evolution, as well as in economic growth. This stream of work remains an influential perspective on innovation. Economists continue to work in this area, providing important insights into a broad range of innovation topics. The previous research that has been carried out on the field of innovation involves attempts to identify, evaluate and refine our understanding of how novelty is introduced into and impacts upon the economic system. This field has grown beyond a small group of researchers at the margins of economics and sociology, to become one of the main topics of interest for management and the social sciences, with the contribution of authors such as Hofstede, proposing a framework for comparing national cultures, or Schine, exploring layers that express culture in organisations (see Phillips, 2014). Our understanding of innovation has become richer, more detailed and refined (Alexy and Salter, 2014, citing Martin, 2012).

As a dynamic field, the study of innovation is open to a "creative destruction" of its hard-core of stylized facts (Alexy and Salter, 2014). With the advent of new, richer and more powerful information sources about the nature of innovation efforts by public and private actors, lies a great opportunity to transform what is known about innovation, to support its management.

### 2.3. Innovation in organisations

Organisations see their key resources as part of the institution - an accumulation of decisions, behaviours and beliefs, reflecting the history of the organisation and its founders (Barton and Leonard, 2014). If the competitive, social and technological environment in which

organisations function remained stable, these essential capabilities would sustain success indefinitely, and path dependence (the strong influence of previous decisions and actions on current ones) would have much less importance. However, as conditions change - changes in market, technology, demographics, social or political environments - these fundamental capabilities act as central factors of rigidity. Excellence and expertise in one area inevitably means less caution and knowledge of other markets, technologies and processes. The ability to adapt, to learn and innovate are basic skills in establishing a dynamic basis of competitiveness between companies (Moore, 2002). According to Hamel and Prahalad (1990), core competencies should constitute the focus of the strategy at a corporate level. These capabilities are dynamic and enable an organisation to adapt adequately to changes that can have an impact on its functioning, i.e., the capacity of an organisation to purposefully create, extend, or modify its resource base (Hamel and Prahalad, 1990).

According to Alexy and Salter (2014), innovation is a major driver of growth, due to its ability to increase the productivity in the economy. The authors argue that the development of the study of innovation was in part driven by measurement. The main measuring instruments – surveys of Research and Development (R&D), patents and academic publications – tended to focus on the generation and use of new scientific and technological knowledge. The availability of indicators led researchers and governments to focus on innovation in "measurable" sectors where there was considerable R&D, patenting and publications. This input-output approach to empirics has created numerous blind spots for research tradition and created opportunities for researchers to develop new ideas in areas that are distant from the conventional focus on the generation and use of scientific and technological knowledge. The conviction that business innovation requires a systematic action, organised and sustainable over time constituted the driving element of the COTEC initiative for the development of the classic version of Innovation Scoring (COTEC, 2007).

There have been some changes at the heart of the patterns of the innovation process (Alexy and Salter, 2014). Chesbrough (2003a) has been one of the promotors of a major shift in thinking on the role of R&D in the innovation process. Meanwhile, many companies marched beyond a R&D-driven innovation process, focusing on more open and distributed models, while capturing value of different types of intangibles. Managers and researchers began to increasingly prioritize other types of innovation and not only technological innovation. Moreover, with the development of more collaborative and networked schemes, innovation has

been increasingly regarded as the result of interaction and collaboration between a range of actors (users, universities, governments ...). Additionally, organisations have been tending to use more third parties to help them innovate (crowdsourcing, innovation intermediaries and co-creation with customers). Another area of change has been on the nature of public and private knowledge. Studies of innovation no longer ascribe the exclusive development of private knowledge to private companies (instead of to universities, which in a traditional view only developed public knowledge). Universities increasingly patent their discoveries and profit from licensing to established companies or university spin-offs.

These changes suggest that today, a company rarely controls its own destiny when it comes to innovation, and that the innovation potential is not exclusively determined by its knowledge assets, but also by its ability to mobilise knowledge and skills from others (Alexy and Salter, 2014; Chesbrough, 2003a), As a result, the landscape of knowledge for innovation has become complex and layered.

Authors argue that to cope with the effects of innovation, organisations have to develop a set of routines, processes and skills that enable it to adapt and learn (Moore, 2006). From the perspective of Anthony et al. (2004), an organisation achieves this through the configuration of three factors that determine the capabilities of organisations: their resources, processes and values: (1) Resources – things or assets that organisations can buy or sell, build or destroy - include people, equipment, technology, product designs, brands, information, cash and relationships with suppliers, distributors and consumers. Access to abundant and high quality resources enhances the ability of an organisation to cope with change; (2) Processes – established ways companies turn resources into products or services - this includes patterns of interaction, coordination, communication and decision-making, manufacturing processes, product development, procurement, market research, budgeting, planning, employee development and compensation, and resource allocation and (3) Values – principles by which prioritization decisions are made – includes the judgment whether an order is attractive or unattractive, whether a consumer is more important or less important, or if an idea for a new product is attractive. The resources, processes and values theory (Anthony et al., 2004) explains why existing companies tend to have such difficulty grappling with disruptive innovations. This theory holds that resources (what a firm has), processes (how a firm does its work), and values (what a firm wants to to) collectively define an organisation’s strengths as well as its weaknesses and blind spots.

Phillips (2014) takes another approach and compiled three particularly important dimensions of the organisation, for innovation: culture, leadership and the role of teams (Table 1).

| *Dimension of Organizing* | *Key Insights* | *Exemplary Citations* |
|---|---|---|
| *Culture* | Both organisational and national cultures are important and need to be considered when managing innovation. Culture shapes both the motivation to innovate and the impact of prescriptions for improving innovation. An "innovation culture" in organisations has been linked to success in innovation. | Kaasa and Vadi (2010)<br>Naranjo-Valencia et al. (2011)<br>Van Everdingen and Waarts (2003) |
| *Leadership* | Leades directly affect the innovation process. Leadership behaviour may encourage or discourage risk taking and innovation. Transformational leadership is most closely associated with innovation in the existing literature. At the same time, there are many other areas of leadership research that hold potential and should be explored further. | Jung et al. (2003)<br>Oke et al. (2009) |
| *Teams* | Innovation is largely carried out by teams. Therefore, the large literature on team effictiveness is an important potential source of insight into innovation management. Work to date has shown that team cognitive styles and the nature of team interaction are both strong predictors of innovation effectiveness. | Miron-Spektor et al. (2011)<br>Hogel and Gemuenden (2001) |

**Table 1–** Summary of the organisational management theories related to innovation (based on Philllips, 2014)

The same author further identified a number of areas that are potentially beneficial to our understanding of innovation, where however little has been done to relate innovation and the institutional theory, the role of best practices in innovation, or the connection of innovation with organisational identity (Table 2).

| *Dimension of Organizing* | *Key Insights* | *Exemplary Citations* |
|---|---|---|
| *Institutional Context* | Organisations are embedded in organisational fields characterized by sets of institutions and an institutional logic. This institutional context shapes expectations and actions and is therefore important in understanding innovation process at the organisational level. | DiMaggio and Powel (1983)<br>Greenwood et al. (2011) |
| *Practice Adoption* | Organisations differ greatly in their readiness to adopt new innovation practices. Also, new practises may lack potential, technical or cultural fit making adoption unlikely without adaptation of the practise. The adoption of new innovation practises may therefore require a careful analysis of the "fit" of the new practises and srategy for managing misfit to ensure extensive and high fidelity adoption that results in the maximum benefit. | Ansari et al (2010) |
| *Organisational Identity* | Organisational members' understanding of an organisation's identity will shape their understanding of the type and rate of innovation that "we do around here". Managing innovation may therefore require the effective and timely management of organisational identity. | Albert and Whetten (1985)<br>Dutton and Dukerich (1991) |

**Table 2 –** Summary of the organisational management theories with potential to improving our understanding of innovation (based on Philllips, 2014)

Finally, Barton and Leonard (2004) highlights knowledge as both the force that can lead to the success of an organisation, but at the same time it may also hinder two important innovative activities: exploration and renewal. For groups, as well as for entire organisations, knowledge both helps and withholds creativity (Barton and Leonard, 2014). Indeed, Anthony et al. (2004:177) wrote: "*most often the very skills that propel an organisation to success by maintaining conditions systematically drop the best ideas for disruptive growth*." One of the

bittersweet rewards of success is that as companies become large, they lose the ability to enter small emerging markets, due to value changes. Huge size constitutes a very real *disability* in managing innovation (Anthony et al., 2004). According to Barton and Leonard (2014), due to its superior adaptation in emerging markets, "disruptive" innovations favour new entrants instead of historical leaders in an industry. Moreover, the failure of the old guard in the competition is due not so much to the lack of technical knowledge, but to strong ties with customers using the old technology and the inability to grasp new market needs. As further stated by Barton and Leonard (2014), the best defence against the dangers and inhibitions of knowledge is constantly defying any assumptions. The best positive contribution to improve creativity at all levels is to recognize the value and power of divergent sources of knowledge.

### 2.4. Operational concepts

For Schumpeter, early in 1934, innovation meant the "creative-destructive process" of the economy. In the Oslo Manual (2005), innovation is regarded as the implementation of a new or significantly improved solution for the company, in terms of: product, process, organisational methods or marketing methods, with the purpose of strengthening its competitive position, improving its performance or its knowledge levels. The basic requirement to be considered an innovation is that the product, process, marketing method or organisational method is new or significantly improved from the company's point of view. This includes products, processes and methods implemented for the first time by the company or adopted from other companies. To note that the concept of innovation is related to the market, which implies the development of an idea – invention – which therefore is applied on the market – innovation - flowing through the four described types of innovations.

Innovation is both a process and an outcome (Dodgson et al., 2014). According to Dodgson, an innovative result can involve the successful application of new ideas, which results from the organisational processes that combine various resources. The author states that innovation aims to produce positive outcomes, such as growth, profit, sustainability and safety, for organisations and their employees, customers, consumers and partners, with better and cheaper products and services and satisfaction for employees. It can also strengthen the company's competitive position, improve its performance or its levels of knowledge (Oslo Manual, OECD, 2005). Achieving this requires a process that creates, delivers and captures results by combining and coordinating resources and capabilities - a company's range of skills.

Innovation can be incremental (minor improvements and adaptations in a product) or radical, (if it changes most of it). It may represent an innovation for the company, the industry, for the country, or at a larger scale, it can be global if it is new to the world (Dodgson et al., 2008).

There is a set of organisational routines that supports the innovation process (Alexy and Salter, 2014). Organic and fluid organisational structures support various forms of innovation (radical and incremental), making the processes and products replicated and scalable (Lam, 2006). Example of routines that support creativity are: the development of stage-gate systems, conceding autonomy to innovators, the fault tolerance and the culture of forgiveness for individuals or teams who try to achieve innovation, but are not successful, multidisciplinary and complementary product development teams, encouraging participation and the openness to external ideas. In the course of this study, it was verified that the characteristics of an organisation that support creativity, especially in small companies, form the basis for a more open and sustainable innovation culture.

For Dodgson et al. (2014), innovation is driven by new technological and market opportunities and has many potential sources, with a multitude of influences. Innovation can be encouraged by new regulations, technical standards or competition, which forces companies to develop new solutions, funding prospects, collaboration partners, small entrepreneurial companies, or ideas of employees throughout the organisation. These represent a complex network of relationships among the contributors to the innovation process (Fig.1).

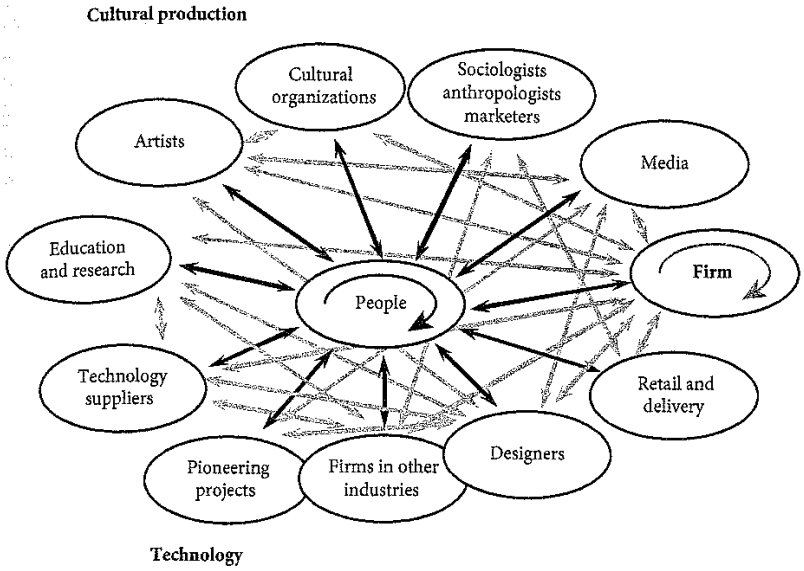



**Fig. 1 –** The Interpreters in design-driven innovation (Dell'Era and Verganti, 2014)

Friesike et al. (2014) citing Barton and Leonard, see new product development (NPD), processes and services as the company's response to environmental and market changes. Firms engage in R&D to create new insights, technologies, processes and platforms as the basis for new products. NPD includes the conception, generation, analysis, development, prototyping and testing of new products. R&D and NPD are thus the engine of all innovating firms (Friesike

et al., 2014). R&D and NPD management is a cross-functional activity involving input and output for marketing, strategy, business development, finance, human resources, sales, legal, information and communication technologies and many others. Given the importance of technology for competitiveness, R&D and NPD have become crucial for most companies. NPD projects commonly display a high degree of novelty, complexity and dynamism.

## 2.5. Models of Innovation

In Chesbrough's (2003b) Open Innovation model (Fig. 2), instead of the traditional view of a company as self-reliant in the production of knowledge, a company commercializes both its own ideas as well as innovations from other firms and seeks ways to bring its in-house ideas to market by deploying pathways outside its current business. The boundary between the company and its surrounding environment is porous (represented by a dash line), enabling innovations to move more easily between the two.

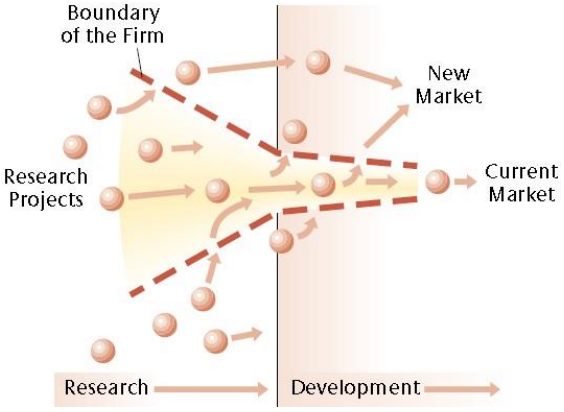



**Fig. 2** – The Open Innovation model (Chesbrough, 2003b)

The links between the elements in a company's environment influence the predisposition to innovate, verifying that innovation leads to stronger competitive advantages when the elements of the macro-environment of the activities of the companies are well articulated in the form of a system instead of each element working mainly isolated. When this is verified, innovation is also more frequent and better managed (Dodgson et al., 2008). This is especially important in small countries and small companies whose resources are scarce to nurture R&D.

Following several studies to systematize the innovation process, ensuing the work of several authors as Kline and Rosenberg (1986), Caraça et al. (2008) developed a model (Fig. 2) that seeks to present a more updated contribution to the existent models of innovation to the present business context. This led to the Multi-Channel Interactive Learning Model. This model is a reference to the innovation management and it was designed to be useful to companies transversely to any business and should be used as a guide to management, adapted to the specificity of each project. The innovative company is embedded in a dynamic context with micro (sectoral and regional systems) and macro components (national system innovation).

According to Caraça (2010), innovation is the result of a chain of interactions between an innovative company's nuclear skills and the skills of the agents in their economic environment. Suppliers, financiers, consultants, partners, customers and competitors are actors in the system with which the core competences of the company interact and learn (through interfaces) and which provide the essential framework of relationships for the company's innovative activities and networks of cooperation and competition, in the global economy of knowledge (Caraça et al., 2008). As a result, innovation does not follow a linear path. There is sharing, transfer and feedback of information between complementary stages throughout the process. Innovation can emerge from three fields of knowledge: scientific and technological research; business methods research; market research and design. The company assumes a central position, with its core departments arranged in a similar hierarchical position, so innovation can be originated anywhere. Between the centre and the existing areas of knowledge are interfaces for knowledge interpretation, emphasising that the inventiveness of the company rests at the centre. Finally, as an output, the model assumes that innovation flows through four types of innovation: product; process; marketing; and organisational (Caraça et al., 2008).

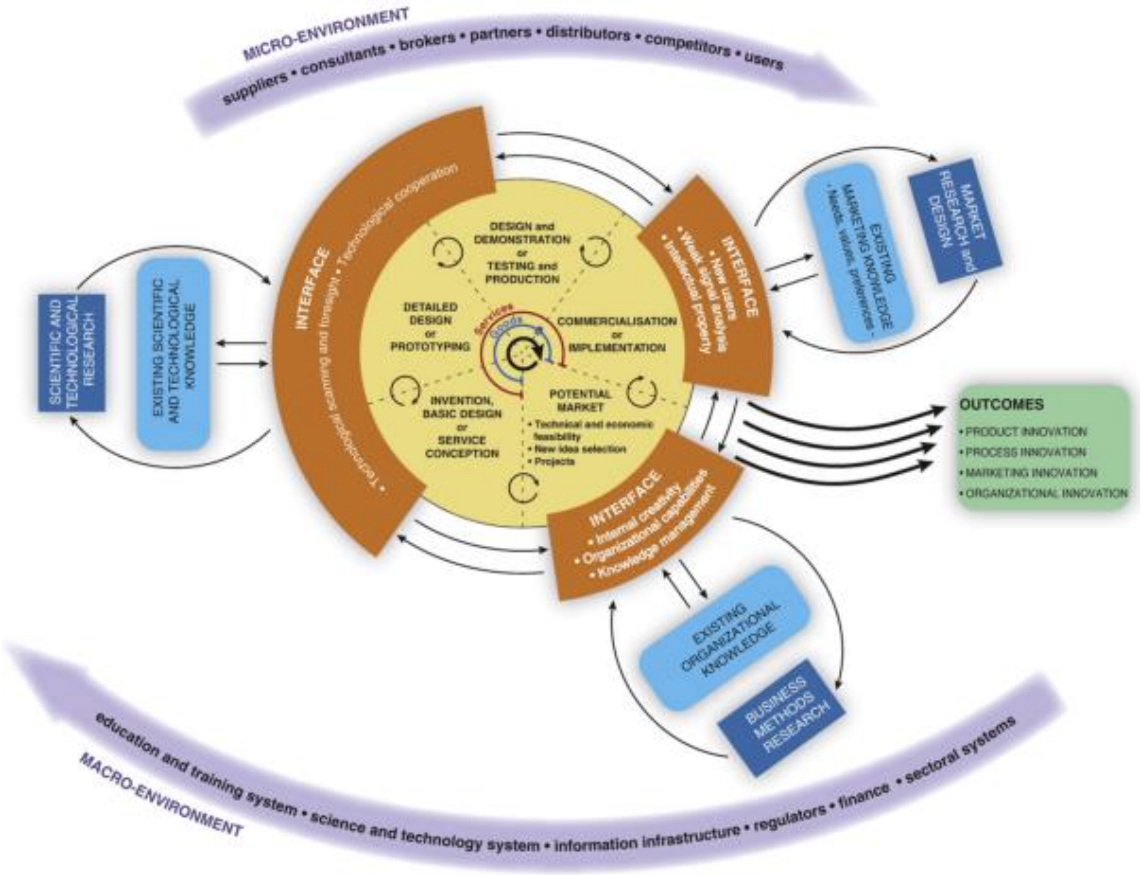



**Fig. 3** – The Multi-channel Interactive Learning model (Caraça et al., 2008)

## 2.6. Preliminary conclusions

The above literature review highlighted the importance of innovation for the economy, societies and organisations. As conditions change (market, technology, demographics, social or political environments), companies need to enhance their ability to adapt, to learn and innovate in order to become relevant players in contexts of increasingly rousing competitiveness.

Several studies attempted to systematize the innovation process. In the present business context, innovation is more frequent and better managed, leading to stronger competitive advantages when companies avoid working isolated and articulate their activities with the elements of the micro and macro-environment in the form of a system.

Our understanding of innovation in an organisational context can be more complete with a diagnosis, based on a systematic assessment of the major dimensions that support this dynamic, in order to identify the aspects of the business reality that impact on future sustainability. In the framework of this thesis, through the IS FASt design, the author attempted to create an adaptation of the Innovation Scoring instrument to the particular reality of start-ups and small companies, considering their unique characteristics that deserve special attention. The purpose of this study is to develop an instrument that can be versatile across different industries and business models.

## 3. Entrepreneurship and Innovation

### 3.1. Entrepreneurship in a modern dynamic economy

Entrepreneurs exist in all societies and entrepreneurship is part of the fabric of all economies. Young enterprises drive productivity through innovation and creative destruction (OECD, 2014). Entrepreneurship exists whether environments promote it or not and regardless of the specific government policies (Stevenson and Lundström, 2007).

Entrepreneurship, according to Stevenson and Lundström (2007) is a multi-dimensional concept that suffers from a plurality of meanings. The definition of entrepreneurship depends on its source. In business management literature it has been defined as something that entrepreneurs "do" or in relation to an individual's behavioural aspects (Carree and Thurik, 2003). The European Commission (2004) defines entrepreneurship as the mental attitude and the process required to create and develop economic activity within a new or an existing organisation. Furthermore, according to Camp et al. (1999) entrepreneurship is any attempt at a new business or the creation of new companies, such as self-employment, a new business organisation or the expansion of an existing business by an individual or team.

In the mid-1990s the rising unemployment levels in many European and OECD countries led to interest in policies to foster entrepreneurship as a way to create jobs. (Stevenson and Lundström, 2007). The authors discuss a link between new businesses, innovation and economic growth during the latter part of the 1990s, drawing more and more attention to the entrepreneurial activity levels and, ultimately, to the importance of encouraging entrepreneurs. Audretsch and Thurik (2001) suggest that the interest in the entrepreneurship policy is a response to a change from a "managerial" economy to an "entrepreneurship" economy, the latest characterized by the transition from an industrial economy to a knowledge-based economy, from an industrial base to the services sector, from large companies to small businesses, and from small businesses to start-ups. Stevenson and Lundström (2007) argue that technological advances and globalization trends are imposing. Developed and developing countries are increasingly driven by knowledge. The average size of companies continues to shrink, the average age of the companies to shorten and turbulence rate (further described) in the number of companies to accelerate.

Economic development cannot be fully understood without giving attention to the context within which individual companies are embedded. Consistent with the reasoning above, Acs et

al. (2015:17) propose the following definition of National Systems of Entrepreneurship: *"A National System of Entrepreneurship is the dynamic, institutionally embedded interaction by individuals between entrepreneurial attitudes, abilities, and aspirations, which drives the allocation of resources through the creation and operation of new ventures."*

Stevenson and Lundström (2007) define the annual rate of business start-ups as one of the main outcome measures of entrepreneurship, indicating the level of incumbent firms. The annual rate of business start-ups (or companies' entry rate) is often related to the annual rate of company closures. Together, these rates are used to measure the level of 'turbulence' within the ecosystem of companies, which is one of the indicators or measures of innovation and renewal of an economy. According to the OECD's latest *Entrepreneurship at a Glance* report (2014), rates in the OECD countries have generally risen since the crisis - particularly in Australia and the United Kingdom - but they remain below pre-2008 levels in many Euro area economies. As stated in the report, services sector continues to drive the creation of new businesses overall (OECD, 2014).

Entrepreneurs play many economic and social roles. They create opportunities for entrepreneurial action in their business environment and are crucial actors to determine the outcomes of that action (Acs et al. 2015). Through the process of creating new companies, some of which survive and grow and others that fail, entrepreneurs create jobs, contributing to the gross domestic product, increase competition and generate innovation. Entrepreneurship is critical for the innovation activity, contributes to the industry and productivity improvements at company level, and has a positive effect on the employment growth rate. It also offers an option for people who do not fit the status quo of the economic society or who prefer self-employment. Hart (2003) states that the level and quality of entrepreneurship makes a difference in the economic vitality of communities, regions, industries and nations as a whole and argues that policies can improve the economy, enhancing entrepreneurship

Often start-ups and small businesses do not have the individual resources and capabilities to address the innovation challenges in global markets. Lazzarini and Mesquita (2010) suggest that the collective efficiencies resulting from the proper coordination of joint action among SMEs (small and medium sized enterprises) allows the companies to overcome such obstacles and to strengthen their ability to compete globally. Thus, productivity emanating from the relational coordination of activities is likely to bring competitive advantages based on costs for SMEs in global markets.

### 3.2. Start-ups: challenges and success factors

In the social and technological environment in which organisations function, the ability to adapt, to learn and innovate are basic skills in establishing a dynamic basis of competitiveness between companies (Moore, 2006). Start-ups are created and built upon assumptions that do not come true every time and their future success depends on decisions that they do not always have guidelines for, just like navigating without a roadmap or even a GPS and coming across blocked roads. The interactions between the elements in a company's environment influences the predisposition to innovate, which is essential for small companies and starting businesses to share resources, in a collaborative a system. In this context, start-ups strive for competitiveness, facing a constant pressure to grow or disappear in an increasingly competitive market. They need to be able to answer demands from customers with unique and differentiated products, environment and regulations, articulate efforts with suppliers and partners, exchange ideas and skills with a large network of external relationships and still be alert to competition.

Most of the general management tools are not designed to flourish in the harsh soil of extreme uncertainty in which start-ups thrive (Ries 2011). But start-ups are all about unknowns. The future is unpredictable, customers face increasingly more alternatives, and the pace of change is astonishing. Yet most start-ups still are managed by standard forecasts, product milestones, and detailed business plans. Ries (2011) describes that every business plan begins with a number of assumptions. A strategy is laid out, taking those assumptions as certain and then demonstrate how to achieve the company's vision. Since the assumptions haven't been proved to be true (they are no more than assumptions, after all) and are often erroneous, each start-up should test them as quickly as possible.

As Ries (2011) argues, failure is a crucial experience for an entrepreneur. Regardless of the inevitable initial challenges and all the reasons not to start a new business, entrepreneurs overcome a series of obstacles to capitalize opportunities that others fail to discover. Often, however, a very promising start can lead to failure. According to the author, in real life scenarios, most start-ups fail, most new products are not successful and most new ventures do not grow to their full potential. Hence the importance of preceding experience.

Blank and Dorf (2012) explain that every entrepreneur is certain his or her journey is unique. What makes some start-ups successful often seems like luck. But it isn't. Ries (2011) states that the successes and failures and those of many others teach that the most "boring" things

and hard work are what matters most, at the expense of all the creativity and inventive processes usually associated with start-ups. Successful start-ups are not a consequence of good genes or of being in the right place on time. Successful start-ups can be projected through the right process, which means that it can be learned and can be taught.

Blank and Dorf (2012) argue that to build a winning start-up, entrepreneurs must recognize that their start-up is a series of untested hypotheses. They should combine agile engineering and customer development to iteratively build, test and search for a business model, turning unknowns into knowns. Still according to the authors, they should also recognize their start-up "vision" as in need of "customer proof." They should test for insights, and course-correct in days or weeks, not months or years, to preserve cash and eliminate time wasted on building features and products that customers don't want.

Start-ups that have dynamic capabilities are highly skilled to realize market change signals and act proactively before them (Deimler and Reeves, 2011). A Start-up that wants to be competitive and innovative needs adaptability, agility and ability to initiate change. Ghoshal (2005) describes that the innovation dynamics in the business model may affect individual capacities and the team's and they are associated with the development and changes in organisation. Innovative start-ups must therefore be able to start changes at the same time as they learn new capabilities and, in the long-term, building these capabilities may translate in competitive advantages and flexibility.

As McKinsey (1993) states, for start-ups to be successful, they need to compete on quality and value, through innovative technology and product design, for orders will be won via superior quality and value at a competitive price. Typically, they need to be very flexible, and move fast. Knight et al. (2005) describe that the right combination of knowledge-based organisational resources, allied with a unique entrepreneur profile (with a clear vision from the founding of the business and especially if the team has previous international experience) and optimization of both personal and inter-organisational relationships (networking) seem to be key ingredients to assure further international development and more successful performance of start-ups. Another important feature is the proximity with the customer, vital in creating the value that brings success (McKinsey, 1993).

As a confirmation for the statement above, a study by Costa (2015) supports that the best strategy for a company implies an early interaction with clients. The referred study analysed

early stage spin-offs. Their business model changed more than once in the first 12 months, so this change was considered to be normal and inevitable. One of the conclusions of this study was that these changes are due to lack of financial or human resources, growth intentions in the same market or geographic expansion, changes during the product development and test stage, feedback from potential client interactions, need of new partners for product development, production and/or distribution, unexpected events, regulation changes or competition changes, among others. According to Costa (2015), the companies that registered less changes were those whose founding teams revealed a good knowledge of management and of the market, as well as a relevant experience in entrepreneurship. These companies were also those that had a "superior performance", leading the investigators to conclude that companies with high performance tend to interact sooner and more intensively with various stakeholders to iterate their intended business models. They even interact prior to their establishment. (Moreira, 2015, citing Costa, 2015).

### 3.3. Technology-based and technology-user start-ups

Technology entrepreneurship is described by Auerswald (2007:19) as "*the subset of entrepreneurial activity that involves the conversion of basic knowledge in science and/or engineering to products and/or services ready for the market*". Product or service based on new science or technology that are commercially promising, and protectable (not necessarily by patents or copyrights). Technology entrepreneurs therefore specialize in the technical and business activities that transform 'invention' into a business plan that can attract enough investment to enter a market successfully, and through that investment become a successful innovation. This requires defining a production process for the needed technology, predicting product costs, and relating a defined market to the resulting product (Auerswald, 2007).

Halman et al. (2008) stated that technology entrepreneurship is key to economic development. New technology ventures (NTVs) can have positive effects on employment and could rejuvenate industries with disruptive technologies. However, NTVs have a limited survival rate. In an empirical study of 11,259 NTVs established between 1991 and 2000 in the United States, Halman et al. (2008) found that after four years only 36 percent, or 4,062, of companies with more than five full-time employees, had survived. After five years, the survival rate fell to 21.9 percent, leaving only 2,471 firms still in operation with more than five full-time employees. This study allowed the identification of 8 significant success factors for NTVs: (1) supply chain integration; (2) market scope; (3) firm age; (4) size of founding team; (5) financial

resources; (6) founders' marketing experience; (7) founders' industry experience; and (8) existence of patent protection.

An interview with Pedro Vilarinho, Chief Executive Officer of Technology Commercialization Accelerator and coordinator of the COHiTEC training program in technology commercialization of COTEC, was conducted to complement the findings and provide an insight on technology-based start-ups. As Vilarinho additionally emphasised (during the interview conducted in 27/08/15), the following distinctive factors that should be highlighted in an Innovation diagnostic instrument for start-ups, in order to be useful for start-up companies: (1) the quality of the management; (2) the quality of its human resources; (3) intellectual property, which enables the competitive advantages to be defensible; (4) the level of technology development and (5) the quality of a start-up's financial sources.

The first argument that could be concluded after this interview regards start-up companies as having different characteristics than companies established in the market. Relevant aspects distinguish start-ups concerning particular challenges of competitiveness they face. In any niche, only a small number of companies succeeds.

Two different types of start-ups can be pointed out: technology-based start-ups and technology-user start-ups. These two different types imply different processes and also different business models. Their success is highly unpredictable in the first type (also designated web/mobile start-ups).

In technology-based start-ups, technology is the foundation for these companies. They require investment in their intellectual property in order to justify their competitive advantage. Technologic products and services are generally proposed by their investors. Technology-user start-ups usually require a higher volume and also a different type of investment.

For a high growth rate to be expected, specifically for web/mobile start-ups, it is crucial to have a differentiated product and it is even more important to monitor the environment that surrounds the company. Efficient management is unavoidable. For technology-based companies, intellectual property is fundamental to satisfy a market need (this is one of the determinants to understand/anticipate if the company is going to be successful). Connections with universities, institutions and investigation centres can also be accounted for as possible factors for success, as well as the team.

This investigation highlighted the need to distinguish between technology-based start-ups and technology-user start-ups. These two different types imply different processes and business models. The investigation also suggested that technology-based and technology-user start-ups face different problems and therefore should not be compared. The criteria and the aspects of Innovation assessment should be different, as Vilarinho suggested.

### 3.4. The importance of seed capital

Starting a business can be a daunting task, especially if all someone has is a new product and not enough capital (Rivera, 2013). To act on a perceived opportunity, entrepreneurs must see it as feasible and desirable. Perceptions of feasibility depend on factors such as resource availability, market openness and property protection. Desirability is determined by perceived social norms, general attitudes toward entrepreneurship and culture, among others (Acs et al., 2015).

Several obstacles shape the environment start-ups face when turning good business ideas into new ventures: the lack of financial resources, high uncertainty due to the absence of the firm's track record, the expected high risk and the presence of information asymmetries between the business promoters and the potential financial stakeholders. Because of the stated reasons, new venture performance is extremely erratic. In any niche, most start-ups fail not because they have bad products, but because they are unable to generate enough interest in their products by consumers (Dagnino et al., 2010). Due to uncertainty, entrepreneurs mobilize resources on a "hunch", or a trial-and-error process. If this hunch proves correct, resources can be mobilized for value-adding uses. If the entrepreneurs guess wrong, it means that they will cease pursuing the opportunity (Acs et al., 2015). Dagnino et al. (2010) argue that reducing uncertainty depends mainly on the entrepreneurs' capability to attract and deploy cognitive and critical resources such as networking capability, social capital, entrepreneurial experience and specific knowledge. It is a start-up's job to rigorously measure where it is at the moment, confront the hard truths that assessment reveals, and then devise experiments to learn how to move the real numbers closer to the ideal goal set in the business plan (Ries, 2011).

Literature emphasises the role of venture capital and business angels' networks as catalysts for entrepreneurial activity, funding growth and therefore fostering new entrepreneurship. Acs et al. (2015) define venture capital as an alternative for companies that have difficulties accessing more traditional financing sources and as is a strong financial injection for early stage

companies that do not yet evidence persistent profitability. Flanking the various long-established external investors for new entrepreneurial ventures, business angels are reported in various countries as an effective source of seed and start up equity capital. Business angels are informal, non-institutional investors making up the informal venture capital market.

Deep pre-screening processes should be performed before any investment in start-up business due to the described uncertainty, in order to avoid adverse selection and moral hazard problems. Investors screen potential start-ups by collecting information about the business, its market approach, management team or entrepreneur, all in order to reduce potential problems in the future. Well performed initial scan ensures good investments. Seed capital provided then enables firms to set off (Petreski, 2006).

In Petreski's view (2006), there is much more than just capital that flows from the investors to the organisations in which they invest. Indeed, fresh capital inflow is complemented with value-adding, strategic advice and funding, including monitoring, skills, expertise and help. Venture capital financing also has a "certification" effect, making easier for firms to obtain support from third parties (Bertoni et al., 2010). Accordingly, the role of the venture capital in financing small business is remarkable. Venture capitalist can be regarded as the entrepreneurs' mentors, sharing a concern about the firm's destiny. Business angels play a more active role than venture capitalists, by occasionally assuming the role of a partner engaged in the business management. Besides their own personal skills, business angels provide the firm with their network of contacts, including commercial and financial connections. Unlike formal venture capitalists, business angels invest their own finance (Dagnino et al., 2010; Petreski, 2006; Bertoni et al., 2010).

However, venture capital financing is associated with high levels of risk resultant from the uncertainty of positive returns, which may occur only after many years or never, a transition from invention to innovation can take a decade or more (Petreski, 2006; Auerswald, 2007). As Dagnino et al. point out, the entrepreneurial capability must be turned into value for the stakeholders and wealth creation (for the entrepreneur and society at large). The gap between the entrepreneurial capability and the outcomes – value and wealth – can be crossed by an appropriate strategy of the firm and the financial provision to execute it. Strategic choices include: entering new geographical or product markets, accessing new technologies and knowledge, or reconfiguring the firm's value chain through strategic alliances and partnerships (Dagnino et al., 2010).

When the uncertainties are primarily technical, investors are ill-equipped to quantify them. For new technologies that have the potential to create new product categories, market uncertainties are even higher and more difficult to quantify. So when investors support firms that bring radically new technologies to the market – new technology-based firms – they prefer to support firms that have completed the early stage of technology development (Auerswald, 2007). The risk–reward ratio for seed stage technology-based ventures is not as attractive to venture capital firms as that for slightly later stage ventures and already proven technologies. As Auerswald (2007) supports, venture capitalists, angels and bankers prefer to wait to see the business case for a new technology rather than funding speculation. The technical content of the business proposal must provide reliable estimates of costs, product performance, reliability in the context of the market and be introduced in a reasonable length of time. The care that should be taken by investors before entering into an agreement with potential managing partners, or 'due diligence', is intrinsically difficult – and is becoming more so as both technologies and markets become increasingly complex (Auerswald, 2007).

### 3.5. The importance of measuring entrepreneurship

There is widespread policy interest in entrepreneurship. Researchers argue about the link between entrepreneurship and growth. However, many of the existing measures are currently only available for a few countries and even the precise measures are rarely identically used from country to country.

There are clear advantages of international comparisons based on standardized concepts, definitions and measurement tools. Existing data show that there are significant dissimilarities in levels of entrepreneurship between countries (OECD, 2006). By measuring the factors that may encourage or discourage entrepreneurship using common questionnaires and other measurement tools, countries can monitor and assess entrepreneurship and SME policies and how their practices and outcomes differ. Policies will always vary, but sound international data can help countries determine the costs and benefits of diverse policies and their impact on entrepreneurship. Indicators must not only be measurable but of value to measure. In this regard, the OECD Quality Framework and Statistics Strategy (2006) has established three important and useful criteria for the development of indicators: they must be relevant, analytically sound and measurable.

## 3.6. Preliminary conclusions

Literature has shown that successful start-ups can be projected through the right process, which means that it can be learned and enhanced. The path can be facilitated by the application of some rules and routines that minimize uncertainty and enable the achievement of results. In order to understand and address these characteristics, relevant, analytically sound and measurable tools are relevant to analyse the dynamics of start-ups and identify common weaknesses and areas for improvement, facilitating the adoption of evidence based entrepreneurship policies. In addition to an innovation diagnostic processes, it is necessary to monitor crucial aspects to the survival, growth, differentiation and sustainability of companies.

Even when new entrepreneurs are able to perceive viable opportunities, considerable effort and money are necessary to exploit and execute them properly. Investors such as business angels and venture capitalists fuel new business projects with money, managerial resources, network capabilities and additional services.

Innovative start-ups must be agile, flexible, move fast and learn new capabilities to translate them into competitive advantages and flexibility. Successful start-ups need to compete on quality and value, through innovative technology and product design. The right combination of knowledge-based organisational resources, allied with a clear vision from the founding of the business, optimization of relationships networks and proximity with the customer are key ingredients to assure development and more successful performance of start-ups.

# 4. Methodology

## 4.1. Introduction

This study seeks to adapt Innovation Scoring, a tested innovation assessment tool developed by COTEC, to the specific case of start-ups, which the authors designated "IS FASt", standing for "Innovation Scoring, a Fast-Track Approach for Start-ups". In order to do so the Case Study methodology was explored as this was the methodology that best suited the proposed task, using interviews as primary data source. Complementary methods such as bibliographic research and direct observation were also used by the authors, hence this can be considered a qualitative study.

## 4.2. Case study approach

Several research methods may be used for investigation in the area of management research. Different methods are appropriate for different situations and therefore the chosen method and the proposed topic of investigation must be consistent. Furthermore, how the method is developed and applied, i.e. the methodology of construction consistency, in terms of links between data and units of analysis, will be a measure of the study validity. In the present study the research method is based on the case study, driven by interview. Details of the cases are described in chapter 6.

Eisenhardt (1989) states that case studies are an appropriate method to study the application of the theoretical frameworks to real business world scenarios by answering the question of how companies really behave in a free market. Alston (2008) notes that case studies emphasise the interaction of institutions and economic performance. According to the author, the value of case studies is due in part to the fact that they enable detail and specificity of both causation and testing whilst illustrating a general proposition. Alston (2008) supports that the goals of case studies include the understanding of an issue prior to modeling it; testing of theoretical hypotheses and shedding credible light on the function of institutions and the economy.

As Yin describes (2009), the case study can be used as a method to understand a complex social phenomenon. It is particularly recommended when: (i) the research questions are of type "how" or "why"; (ii) the focus of the investigation is contemporary events and (iii) the researcher has no control over the events. On the construction of methodology, Yin (2009) and Woodside (2010) add that a peculiarity of case studies is that there are much more variables of interest

than data sources and for this reason there is a need to triangulate and converge multiple sources of evidence as: (i) documents; (ii) archival records; (iii) interviews; (iv) direct observation; (v) participant observation and (vi) physical artifacts. For most people, doing any sort of fieldwork goes hand in hand with doing qualitative research. Field-based data — whether coming from direct field observations, interviews, or videotapes, or the review of contemporary documents such as specific journals, daily logs, or even photographs — will form much of the evidence used in a qualitative study (Yin, 2011). Also, the value of most Case Study reports increases with the use of dissimilar, multiple research methods and the inclusion of multiple study objectives (Woodward, 2010).

Yin (2009) emphasises that the quality of the case study will be greater the more clear and valid the logic connecting the following five components of the study is: (i) research questions; (ii) research hypotheses (may or may not exist); (iii) units of analysis; (iv) connection between the data, the units of analysis and assumptions and (v) careful interpretation of results.

Given the purpose of this study, the authors identified the following initial question: "How can an innovation assessment tool be made useful to the specific characteristics of start-up companies?" From this question the following research questions were formulated:

a) how should the IS FASt be applied?

b) how should the IS FASt address the particular challenges of start-ups?

c) what distinctive elements does the diagnosis emphasise that contribute to the analysis of the role of starts-ups in the innovation ecosystem?

The data collected on the units of analysis (start-ups) was obtained through the application of Innovation Scoring FASt (where interviews play a major role). Even though the unit of analysis are the start-ups, the focus of this investigation is the analysis of the adequacy and the construction of IS FASt. The authors intend to use the data collected (both qualitative data from interviews and quantitative data from the IS FASt results and comparison among start-ups) as validity for the instrument. The IS and IS FATS are further discussed in chapters 5 and 6.

According to Yin (2011), collecting data for qualitative research usually implies interacting with a variety of real-world situations and the people in them, numerous important and interesting human events, so these all become part of the setting for a research study and substance of qualitative studies. As Yin (2011) further describes, working in the field and the

initiation and nurturing of field relationships are likely to be relevant regardless of the specific fieldwork methodology. At the same time, because the field settings are real-world situations, researchers need to enter and exit them with some formality, in particular obtaining the necessary permissions to do their study. Maintaining healthy field relationships then becomes a continuous challenge.

### 4.3. Interviews as sources of empirical data

One of the central methods used in this study were interviews. According to Seidman (2006), interviews are originated by an interest in understanding the lived experience of other people and the meaning they make of that experience and are hard to code with numbers. Interviewing provides access to the context of people's behaviour and, therefore, a way to understand its meaning. Still according to the author, a basic assumption in interviewing research is that the meaning people make of their experience affects the way they carry out that experience. Interviewing enables to put behaviour in a context and provides access to understanding their action. The adequacy of interviewing as a research method depends on the purpose of the research and the questions being asked.

Interviews can take many forms, but for the sake of argument it can be considered that all forms fall into either of two types: *structured interviews* and *qualitative interviews.* (Yin, 2011) All interviews involve an interaction between an interviewer and a participant (or interviewee) which is carefully scripted in structured interviews. Informants are selected for their special knowledge, experiences and insights (or ignorance) of the topic under study. The objectives include learning the thinking, feeling, and doing processes of the informants, including an understanding of their perspective of the topic under study (Woodside, 2010). Whilst in qualitative interviews, questions are asked in an open form, in structured interviews, the researcher must guarantee the use of a formal questionnaire listing every question to be asked. Then the researcher must formally adopt the role of an interviewer, and try to elicit responses from an interviewee.

Also, it is the researcher's role as an interviewer to adopt the same consistent conduct (also scripted) when interviewing every participant. This is usually the result of some earlier and study-specific training aimed at conducting the data collection as uniformly as possible. In Yin's words, aside from having a distinctive set of procedures, structured interviews also tend to favor certain kinds of questions – namely, questions where interviewees are limited to a set

of responses predefined by the researcher, otherwise known as closed ended questions, which lead to more accurate data and a more definitive analysis. The answers are probably more reliable and valid when a list is provided than when the question is asked in open form (Yin, 2011).

To gather primary (direct) data, semi-directed qualitative interviews were conducted, to the Chief Executive Officer of Technology Commercialization Accelerator and coordinator of the COHiTEC training program in technology commercialization of COTEC, Pedro Vilarinho (Appendix I), in order to complement the findings for this study, as well as to provide a perspective on technology-based start-ups. Several interviews were conducted as well, with start-up companies (table 3), in order to collect data for the construction of the final version of the instrument (Appendix X). Details of the interviews can be found in chapter 6. and Appendixes I and III to VIII.

### 4.4. Complementary methods

Yin (2011) states that data serves as the foundation for a research study. In qualitative research, the relevant data derives from four field-based activities: interviewing, observing, collecting and examining (materials). In this study, the complementary techniques used for data collection were the semi-structured exploratory interview, direct observation (through visits to the interviewed companies) and the analysis of diverse documentation, from documentation courteously provided by the companies, to specialized journals, publications, academic articles and research on the internet.

## 4.5. Preliminary conclusions

To what concerns methodology, this study is centred on a qualitative method, using the case study for theoretical support, a method that is designed to understand a complex social phenomenon, as well as semi-directed qualitative interviews. The case studies selected for this investigation contributed, with each interview, for the construction of improved versions of IS FASt to be used in the subsequent interviews (as described in chapter 6). As complementary techniques for data collection, the direct observation and the analysis of diverse documentation were explored.

On the topic of the case study methodology as a theoretical foundation for this study, the authors encountered a few limitations. As emphasised by Yin (2011), working in the field requires establishing and maintaining relationships of cooperation with other people. One of the main challenges for this study was to be able to cope with the interviewees' time constraint and availability for follow-ups.

As for the consistency of the link between the data and the analysis unit (start-ups) described in this chapter, the authors believe that the employed methodology supports this link, as most of the data comes from interviews collected in first hand with the purpose of validating the IS FASt and the questions covered the points needed to answer the research questions. The interpretation of results is described in chapters 6 and 7.

## 5. Describing and explaining the "Innovation Scoring"

### 5.1. Introduction

It is sometimes suggested that innovation is inherently impossible to quantify and to measure. While this may be true for some aspects of innovation, its overall characteristics do not preclude the measurement of key dimensions. As such, indicators emerged, focused on inputs, processes and outputs, including economy-wide measures that have some degree of international comparability (Smith, 2006).

The increase in Research, Development and Innovation activities (RDI) now represents an unquestionable value for companies and economies. The increasingly global and knowledge-based competition requires a deep differentiation that ensures global competitiveness. The need for each company to be able to recognize, report and measure their efforts is essential to establish strategies, to evaluate the results, to search for incentives and supports and, generally, for the reposition of Portugal in the international context (COTEC, 2008).

The original version of the Innovation Scoring (IS), developed by COTEC, intends to be a concrete instrument of support for Portuguese organisations to review their innovative performance in the light of a previously developed and tested *innovation scoring* system. IS is therefore a quantitative method, albeit based on internal expert opinion. Based on this system, organisations can diagnose, measure, and question their performance and their potential for innovation in a more appropriate way – a fact that is of indisputable value for the organisations that will mark the future economic development of Portugal – which is to say, the organisations that are more attentive to issues of competitiveness in a knowledge-based and globalized economy (COTEC Portugal, 2007). IS ultimately intends to enhance a systematic and sustained management of business innovation, to strengthen the competitive advantages of organisations, to contribute for a strategic reflection about innovation processes, while enabling a deeper understanding of the different dimensions of these processes and allowing the identification of potential improvements.

IS final version (Appendix II), which is now in use, resulted from a pilot conducted in Portugal by COTEC with 12 companies. This classical version of Innovation Scoring constituted the basis for this study. Meanwhile, a cooperation was advanced with the Portuguese Agency for Competitiveness and Innovation for its dissemination across the country, regardless of the membership of the companies to COTEC. This tool was developed under the initiative of

COTEC on the Sustainable Development of Business Innovation (innovationscoring.pt). Any Portuguese company can also freely access this rating system (innovationscoring.pt or .com) and do a self-assessment. By september 2015, more than 600 companies have already validated the IS (Caetano, 2010). According to Caetano (2010), innovation is a transverse topic within organisations.

COTEC (2008b) describes the four main dimensions of analysis of the IS: Conditions (I), Resources (II), Processes (III) and Results (IV). Within "Conditions", Culture, Leadership and Strategy are evaluated; the "Resources" dimension analyses the Human Capital, Organisational Skills, External Relationships and Structures; "Processes" assesses RDI Management, Systematic Learning and Improvement, and Protection and Exploitation of Results, while in "Results", Financial and Operational Results, Market and Societal Results are assessed (Figure 4).

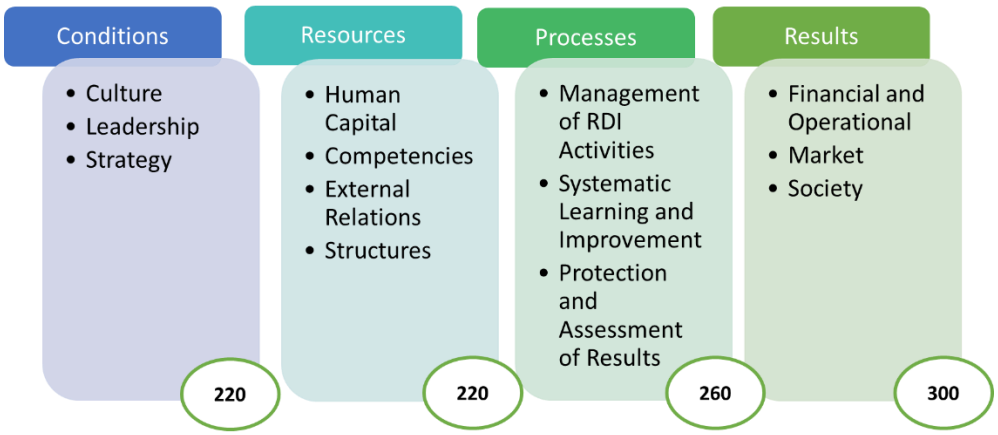



**Fig. 4** – Dimensions and pillars of Innovation Scoring and scores

This study is intended to be the first step of a remake and simplification of the Innovation Scoring, initially designed by COTEC, in order for it to be applicable for start-ups and small companies, having in consideration their particular environment, characteristics, and challenges.

## 5.2. The FASt version

Entrepreneurship requires a specific type of management. According to Ries (2011), in order to improve business results and keep the responsibility of innovators, it is essential to focus on how to measure progress, how to set goals, and how to prioritize work. This often comes as a surprise to aspiring entrepreneurs, because, conventionally, "management" and "innovation" are two diametrically opposed words that do not associate. Entrepreneurs tend to be justifiably

sceptical of the implementation of traditional management practices when launching a start-up, concerned that bureaucracy hinders creativity.

As described in chapter 3, start-ups strive for competitiveness, facing a constant pressure to grow or disappear in an increasingly competitive market. They need to be able to answer demands form customers with unique and differentiated products, environment and regulations, articulate efforts with suppliers and partners, exchange ideas and skills with a large network of external relationships and still be alert to competition. In view of the nature, characteristics and the particular challenges faced by start-ups, this study took the initiative to adapt the Innovation Scoring for start-ups and small companies, since not all the features of the diagnosis were adequate. This modification was entitled "Innovation Scoring, a Fast Track Approach for Start-ups" (IS FASt). This investigation, therefore, used qualitative methods for the construction of the instrument, which is, in turn, a quantitative assessment tool.

IS FASt intends to be a self-assessment tool that allows start-ups and small companies to diagnose their innovation path, through the analysis of different aspects that can influence it: Conditions, Resources, Processes and Results (described in the following section). Start-ups and small companies will be able to have access to an assessment report with a "score" that represents an objective and comparable diagnostic measure. This score can either represent a confirmation that the innovation plan of start-ups is appropriate for the sustainability of the innovative performance of start-ups, or an incentive for a better result in the following assessment. The instrument attempts to identify areas of improvement that are starting points for a reflection on the future. The self-assessment with IS FASt is intended to reveal the real state of start-ups and to what extent are they prepared to grow or to take the "next step" in their development. To be noted, however, that this instrument is part of an academic study and its validity could improve with further investigation.

### 5.2.1. Main Dimensions of analysis

Innovative start-ups must be agile, flexible, move fast and learn new capabilities to translate them into competitive advantages and flexibility. Successful start-ups need to compete on quality and value, through innovative technology and product design. The right combination of knowledge-based organisational resources, allied with a clear vision from the founding of the business, optimization of relationships networks and proximity with the customer are key

ingredients to assure development and more successful performance of start-ups. This study attempts to cover these aspects in the 4 dimensions of the IS FASt structure (Fig. 5).

As Vilarinho emphasised the following distinctive factors that should be highlighted in an Innovation diagnostic instrument for start-ups, in order to be useful for start-up companies: (1) the quality of the management; (2) the quality of its human resources; (3) intellectual property, which enables the competitive advantages to be defensible; (4) the level of technology development and (5) the quality of a start-up's financial sources.

The structure of the IS FASt addresses these aspects, in 4 dimensions (Fig. 5). The selection of the pillars within the dimensions resulted from the original IS model, literature review on characteristics of start-ups and the feedback gathered from interviews and the case studies (Appendixes III to VIII). The scoring system is explained in section 5.2.2.

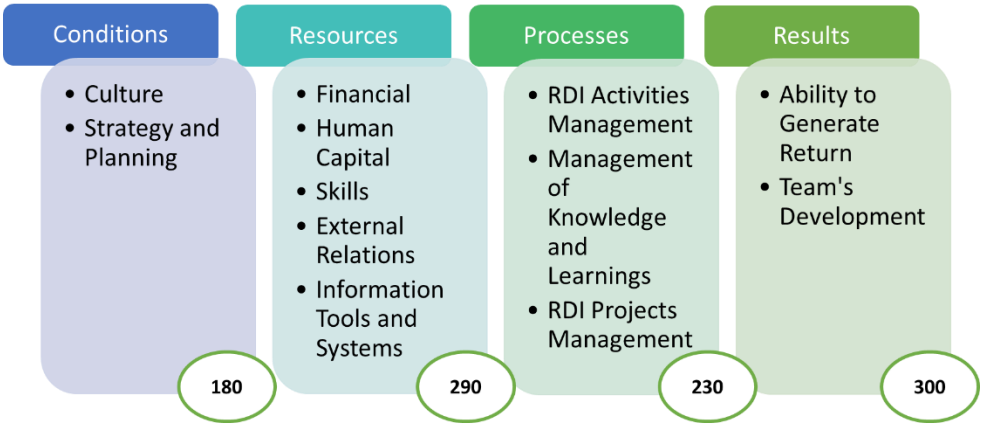



**Fig. 5** – Dimensions and pillars of IS FASt and scores

I – CONDITIONS

This dimension regards the aspects that influence the attitudes and the behaviour of the companies taking their first steps, regarding innovation. Due to the nature of small companies, it is relevant to assess the extent to which all the team members are involved in the orchestration of the various activities, the formulation of values and the strategy of the company. Two distinct areas are considered: Culture, which aims to reflect the adequacy of the company's values regarding innovation, and Strategy and Planning, concerning the team's involvement in the sketching, planning and implementation of the organisation's strategy, which seeks to assess how the characteristics of the organisation are likely to stimulate innovation.

## II – RESOURCES

As small teams, the motivation and engagement of everyone is essential for start-ups to involve their team members and resources to assure a better and more dynamic innovation performance. This analysis takes into account the importance of the integration of small businesses into networks or intermediation structures facilitating their development (e.g. business incubators, business parks, etc.). There are multiple types of organisational resources. Herein are considered five types of resources: Financial Resources, aiming to determine the autonomy of start-ups in relation to investors such as business angels or corporate venture capital. Human Capital, which aims to assess how the human resources are involved in innovation activities; Organisational Skills, corresponding to the analysis of the most relevant skills and capabilities for the organisation to enhance its innovative performance and hence its competitive assertion; External Relationships, aiming to map the main connections and collaborations established for heightening innovation, and more specifically cooperation with other entities to enhance innovation; and Tools and Information Systems, evaluating the application of these as facilitators of innovation.

## III – PROCESSES

Start-ups normally have few formal processes. These are the basis to support an innovative dynamic and contribute for the generation of innovation performance. In this dimension, it is intended to stimulate the company to reflect on the most adequate processes in order to value innovative activities and their transformation in value. It is divided in 3 pillars: RDI activities Management, which includes the importance given to Intellectual Property management; Management of Knowledge and Learnings, which seeks to assess how the team incorporates the obtained learnings and uses the knowledge generated as a source of decision and RDI Projects Management, where processes for planning, organizing and monitoring RDI projects are assessed.

## IV – RESULTS

For a start-up, the development of RDI activities forms part of the path for goal achievement and will ultimately translate as results, particularly relevant for stakeholders and the sustainability of the company. This dimension intends to consider if an alignment can be verified between conditions, resources and processes, oriented for innovation to translate into results. Even considering that measuring these results can be challenging due to the short

lifetime of a young start-up, this dimension seeks to be an exercise of reflection considering the metrics available at the moment of assessment. This part of IS FASt was particularly challenging to address due to star-up's characteristics, as it was commonly found that results were not yet obtained and therefore the assessment of this dimension would have to rely on expectations. However, some factors were identified that constitute clues for the answers to this dimension, such as, for example: the premium added to the price of products resulting from innovative image; awards won for business innovation; peer recognition as a reference company and news and articles on the Internet, media and magazines/specialty journals recognizing the innovative performance of the team. Therefore, results were considered from two points of view: Ability to Generate Return for shareholders, business angels, venture capital companies or other stakeholders and ability to leverage the Team's Development (percentage of growth and productivity obtained or expected).

Each of these dimensions and pillars represent a different weighing on the final score (the sum of the weighing of each question contained in the respective pillar and dimension).

### 5.2.2. Scoring system

The Scoring System of the IS FASt, was developed using the same scale as the original version of Innovation Scoring (0-1000) in order to allow a reference for comparison with companies already established on the market, which could possibly contribute for an additional incentive (however the questions are different). The weighed value of the questions was determined based on the original scoring system of the IS (Fig. 4 and Appendix II), however, more importance was given to the "Resources" dimension (290/1000) than "Conditions" (180/1000) or "Processes" (230/1000), and as for "Results", the score was maintained (300/1000) (Fig. 5 and Appendix X). The reason for this is related to the characteristics of start-ups (adaptability, agility and ability to initiate change) and considering the fact that their practices may not yet be consolidated as systematized processes. Still, the "Processes" dimension was maintained with a higher score in relation to "Conditions". For each topic, the companies were asked to use a scale of 0 to 4 for self-assessment, with the following meaning:

0 - Not achieved
1 - Poorly achieved
2 - Partially achieved
3 - Well achieved
4 - Fully achieved

When viewed from a quantitative and qualitative point of view, the indicators mainly refer to intangible aspects of reality (attributes that can only be obtained indirectly through its manifestations). Because these are complex dimensions of reality they require a set of indicators which seize some of its indirect manifestations, surrounding the complexity of what it is intended to observe (Minayo, 2009). The fundamental idea behind the used scale is that an attitude can be thought of as a set of propositions about beliefs, evaluations, and actions (Bradburn et al., 2004) held by individuals and teams. To ask the respondents to agree or disagree with a sample of propositions about the attitude object, allowed to quantify the answers and get a better measure of the attitude. Therefore, the used scale attempts to "code" the data and translate it into numbers. With the conversations summarized into these coded responses, the data has been converted from purely qualitative data into quantitative data that can be summarized in charts and graphs.

In answering the questions from the first three dimensions (Conditions, Resources and Processes) a distinction was made between:

- *Approach*: how the team saw each topic and their perspective on the corresponding aspects;
- *Application*: how the organisation actually operated in respect to each topic.

Only the lowest score between approach and application was considered, as in the original version of IS. The reasoning for this is for the final score of each question to allow the identification of aspects for improvement.

In answering the questions from the last dimension (Results), a double assessment was not necessary, since the nature of this dimension required a response in accordance with the actual results for each parameter of analysis.

The total score is therefore the sum of the weighted values of each question, considering the score for each pillar and between each dimension. Each question's weighing is shown in the final version of IS FASt (Appendix X).

## 6. Application of the IS FASt

This study consisted of the construction of the IS FASt instrument. For this to be accomplished, the following application method was conducted:

The author selected 6 cases of start-ups in order to provide a significant liability to the study. Start-ups were selected from different backgrounds and different stages of development (from project phase to start-ups implemented on the market), to provide a sample with variety, in order for the IS FASt to be as versatile as possible. The selection of companies for the study was also due to geographic proximity and based on the fact that they were Portuguese start-up companies that could provide essential information to the study, as well as because the original version of the Innovation Scoring had been tested in Portugal. Also, the sample was as varied as possible to include both technology-based and technology-user start-ups. Two of the cases were within the food industry (Yonest and Rice Me); two cases dedicated their activity to the development of technology applied to the health sector (Sensing Future and Line Health); one of the cases designed technology dedicated to marine biology (Skaphandrus) and another designed technology applied to vehicle parking sensor systems (Stickables).

Each of the start-ups participated in the construction of the final version of the IS FASt, through feedback of their two interviews. The first interview was done using a version of IS FASt under development, so each start-up tested a different version of the IS FASt and its feedback, comments and suggestions were considered to be incorporated as potential changes in the question's structure, contributing for the enhancement of a subsequent version, with the purpose of constructing a final version. The second interview was done using the final version of the IS FASt.

As an example, in the first meeting, Sensing Future answered to IS FASt version 1, which was then enhanced to a version 2 for Line Health to answer, and so on. Hence, different versions were given to the 6 start-ups to answer, in meetings and Skype videoconferences with the start-ups (Fig. 6). Regrettably, it was not possible to use exactly the same application method among all the subjects of the study. Due to time constraint and limited availability of the participants, the terms for the application of IS FASt had to be negotiated and rethought, in order for the instrument to be as flexible as possible for the start-ups. The methods used are described in chapter 6. Their answers and feedback were collected and organised in Appendixes III to VIII.

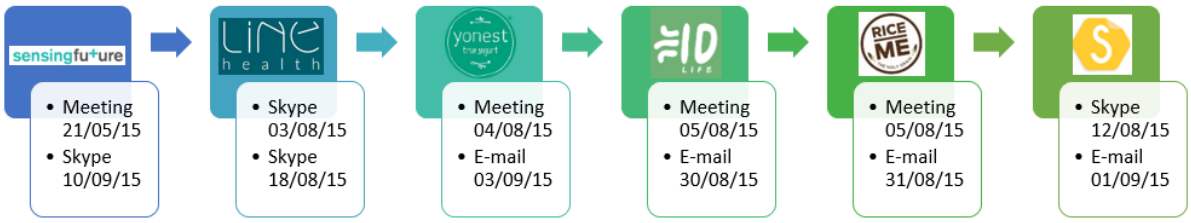



**Fig. 6** – Summary of the application of IS FASt

Regarding the application method and considering the feedback given from start-ups, the author concluded that the exercise was much more useful when it involved the team. Another input was that such activities are mostly beneficial to be shared as a group and encourage development and collective learning, which is especially important for such small teams. In the cases where only one element answered the questions in the first place, the results reflect the perspective of only one individual with a possible influence on the perspective of the rest of the team.

After all the answers were organised, a final version was gathered (Appendix X) and the companies were contacted again (Fig. 6) to confirm or change their answers in accordance to the final version of the IS FASt, in order for the results to be comparable among the sample (Appendixes XI – XVI). Therefore, this study used a qualitative methodology with the purpose of constructing and conducting a pilot for a quantitative instrument. All the start-ups were asked to confront the answers with the non-respondent members of the team, however this was not possible to verify during the course of this study, hence this is a limitation.

A booklet containing the summary of the questions was provided for each respondent start-up in the initial meeting, for the correspondent version of the IS FASt, with the purpose of better clarifying each question. The final version of this booklet can be found in Appendix XVII. In the second contact, start-ups were also asked to describe their initial pitch key points. The table below provides the list of participant start-ups and interviewees.

| Start-Up | Team | Interviewees |
|---|---|---|
| | | |
| **Sensing Future Technologies** | 5 members (2012) | Luís Ferreira, Hélder Lopes, Carlos Alcobia, João Santos and Pedro Mendes |
| **Line Health** | 7 members (2014) | Sofia Almeida and Joana Vieira |
| **Yonest** | 9 members (2012) | Filipe Botto |
| **Skaphandrus** | 10 members (2013) | João Silva |
| **Rice Me** | 4 members (2015) | Renata Militão and Leonor Fernandes |
| **Stickables** | 4 members (2014) | Pedro Barreira |

**Table 3** – List of participants and interviewees

In the course of this study, it was explained to the participating start-ups that in case the questions did not apply to their current reality (e.g., when their product was not yet on the market), the answers should be given according to all the information available at the moment and according to the values and culture of the promoters, that are intended to be imprinted into the organisation's practices.

This approach followed the structure of the innovation scoring system with four basic dimensions - Conditions, Resources, Processes and Results - and twelve pillars for a total of twenty-three questions. The results are shown in Appendixes III to VIII and XI to XVI. The table below provides a guide for Appendixes III – VIII and XI to XVI, in relation to the interviews' progress.

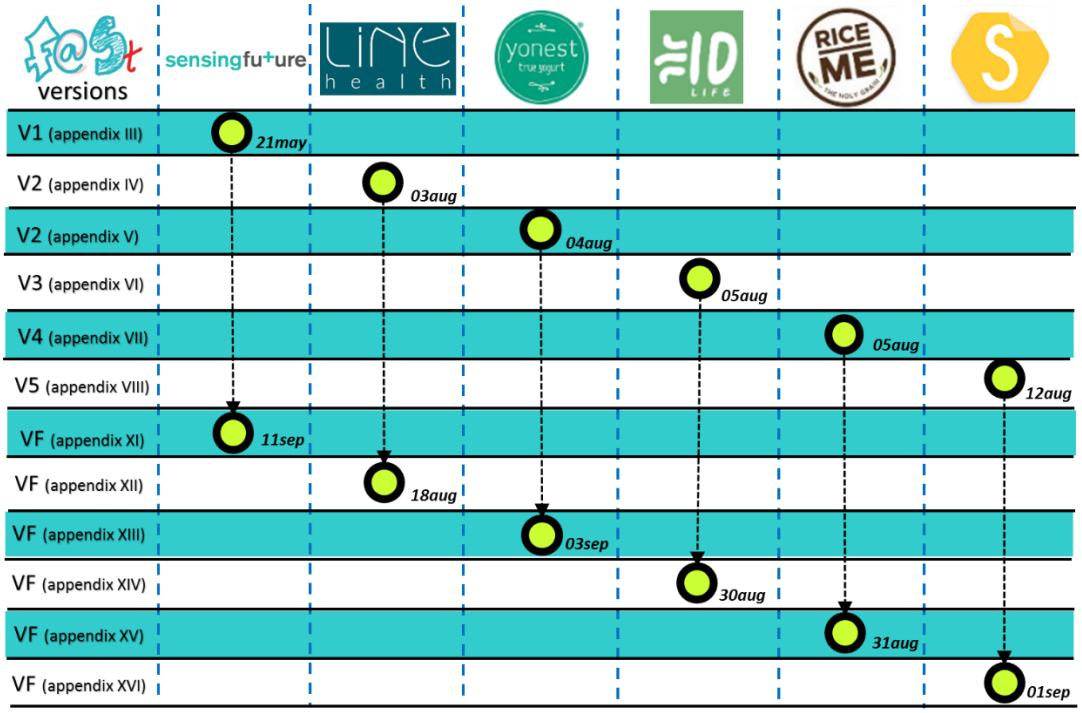



**Table 4** – Appendixes guide

This section provided a framework for the Application of IS FASt. The application experiences as well as a comparative analysis are discussed in sections 6.1. to 6.7.. The structuring process of the final version of IS FASt and the changes and adaptations as well as the contribution of start-ups will be hereby discussed, in order to explain the model development. A matrix for the changes in the structure of the questions is presented in the Appendix IX.

## 6.1. SENSING FUTURE application experiences

### 6.1.1. Introduction

Sensing Future started the project in 2012 and is now on the market, aiming for sales across the globe. Sensing Future designs, develops and implements technological medical devices in a unique synergy between Engineering and Health.

### 6.1.2. Methodology

#### *6.1.2.1. First meeting (21/05/15)*

Initially, the author has attempted to apply the IS FASt in accordance with the suggested methodology for the original version of the Innovation Scoring (the guidelines state that it should be an inclusive exercise involving a large group of people). So for the first interview,

with Sensing Future, all five members of the team were gathered during four hours. People were split into two groups, each answered half of the questions of Version 1 of IS FASt (Appendix III) and there was a discussion by the end of the session, to reach an agreement among the group regarding the answers to the questions. The conclusions of this workshop resulted in several changes to the structure of the questionnaire, which are described below.

The following questions were considered not applicable, therefore, classified with "0" in the final score of Version 1 of IS FASt:

14 - The organisation develops systematic processes for internal collaboration.

23 - The organisation's innovation activities have a positive impact on the business sector.

**Initial score (Version 1 of IS FASt): 568,25**

*6.1.2.2. Second meeting (Skype – 10/09/15)*

The second Skype conference lasted 2 hours with one of the founders and included the discussion and clarification of each question and answers to the final version of IS FASt after previous agreement among the team (Appendix XI). The comments are described in Appendix III.

To what concerns the key elements for their pitch for investors, the team distinguishes 2 moments, the initial seed capital (coincident with a partnership with a company that has the final word over strategic decisions) and a second round that included bank investment and venture capital. In the first moment, the key elements of the pitch were the dynamism of the team, their skills and expertise, previous experience, and motivation. As for the second group of investors, the product originality, a good characterization of the market, its long term turnover and the value of the company were the key factors.

**Final score (Final Version of IS FASt): 775**

6.2. LINE HEALTH application experiences

6.2.1. Introduction

Line Health was, at the moment of this study, in a prototyping phase and technology testing for international markets. Line Health created a smart pill dispenser with visual and audio alarms, and app for smartphone, aiming for patient compliance and engagement with the treatment. Line Health was offered by Bayer to take part of the Digital Health Accelerator program "Grants4Apps" in Berlin.

### 6.2.2. Methodology

#### *6.2.2.1. First Skype call (03/08/15)*

The First Skype conference with Line Health consisted of 1 hour with the Chief Operating Officer (COO) and included the project presentation, the company's introduction and the COO was asked to fill the IS FASt Version 2 (Appendix IV) with the booklet provided. The feedback was minimal during the first answers, so no changes were made in the question's structure.

**Initial score (Version 2 of IS FASt): 981,25**

#### *6.2.2.2. Second Skype call (18/08/15)*

The second Skype conference lasted 1.30 hours with the COO and Head of Design and included the discussion of each question and answers to the final version of IS FASt (Appendix XII), explaining the meaning of the questions and questioning the reason behind the high scoring results attributed in the first assessment. The comments are described in Appendix IV.

Regarding what distinctive elements were crucial for their pitch to investors, Line Health answered that the most important points were the correct description of the type and size of the problem to be solved; a unique and differentiating solution proposal; an excellent Team, demonstrating total commitment and proving that their expertise and background meets the challenges set for themselves, also a clear route and demonstrating results in short time (market validation, awards...).

So far the team has considered to be in a pre-seed round and is preparing a new seed round for investors aiming to take the product to a global market. They have described the most important steps to be the knowledge of the selected investment market (not yet publicly disclosed). According to Line Health, the key points of the pitch were described to be the same as on the pre-seed round, except in their next pitch new numbers, new data and a more advanced solution will be available. The team described to have gathered a very relevant set of advisors who have supported them on the development and credibility of the business. Their go-to-market strategy is clear and it is crucial at the current stage to know how to answer with numbers and data, since there has been the opportunity to validate the product in the market.

**Final score (Final Version of IS FASt): 978,75**

## 6.3.YONEST application experiences

### 6.3.1. Introduction

Yonest's project started in 2012 in Portugal and has been on the market for 1 year and 9 months. Yonest was born to bring back the unique flavour and freshness of the ancient homemade Greek yogurt.

### 6.3.2. Methodology

#### *6.3.2.1. First meeting (04/08/15)*

Yonest granted a meeting with the founder for the discussion of Version 2 of IS FASt (Appendix V). The method used in the meetings with Skaphandrus (Appendix VI) and Rice Me (Appendix VII) was identical, and all 3 start-ups have asked the interviewer to explain and discuss the questions with them instead of reading the booklet, which would be more time consuming. The interviews were recorded and the comments and changes to the questions were registered.

**Initial score (Version 2 of IS FASt): 740**

#### *6.3.2.2. Answers by e-mail (03/09/15)*

Yonest was later contacted to verify the answers and complete the unanswered questions in the Final version of IS FASt (Appendix XIII), in order to access a final score. Regarding the key points on the pitch for investors, this question was not applicable because investors were not necessary for Yonest.

**Final score (Final Version of IS FASt): 765**

## 6.4. SKAPHANDRUS application experiences

### 6.4.1. Introduction

The Skaphandrus project started in 2013, and was, at the moment of this study, introducing payment options to the app. The project consists of an app developed by marine biologists, scientific illustrators and divers and a platform for sharing information on marine biology.

6.4.2. Methodology

*6.4.2.1. First meeting (05/08/15)*

Skaphandrus granted a meeting with one of the founders for the discussion of Version 3 of IS FASt (Appendix VI). The interviewer was asked to explain and discuss the questions instead of the interviewee reading the booklet, due to time constraint. The interview was recorded and the comments and changes to the questions were registered.

As a result of this workshop, the scale was mentioned to be easier to apply if only numbers were used instead of expressions from "not achieved" to "fully achieved". Therefore this was changed.

**Initial score (Version 3 of IS FASt): 681,25**

*6.4.2.2. Answers by e-mail (30/08/15)*

Skaphandrus was later contacted by e-mail, verified the answers in the Final version of IS FASt (Appendix XIV) and completed the unanswered questions, in order to have access to a final score. No further comments were granted.

**Final score (Final Version of IS FASt): 695,50**

6.5. RICE ME application experiences

6.5.1. Introduction

Rice Me was at the moment of this study on a project phase – it consists of an innovative concept cuisine focused on rice; Rice Me expects to open a pilot restaurant in Lisbon in October 2015, aiming for franchising and envisioning a sustained growth.

6.5.2. Methodology

*6.5.2.1. First meeting (05/08/15)*

Rice Me granted a meeting with the two founders for the discussion of Version 4 of IS FASt (Appendix VII). The interviewer was asked to explain and discuss the questions instead of the interviewees reading the booklet, due to time constraint. The interview was recorded and the comments and changes to the questions were registered.

**Initial score (Version 4 of IS FASt): 560**

*6.5.2.2. Answers by e-mail (31/08/15)*

Rice Me was later contacted by e-mail, verified the answers in the Final version of IS FASt (Appendix XV) and completed the unanswered questions, in order to have access to a final score.

Regarding the most important points in the pitch for investors, Rice Me described an accurate analysis of the cost vs. sales prospects and noted that a plain financial analysis is what matters most in the domestic market ("show me the money"). Market data that supports the prospects was also a crucial point, as well as the history of the company and its partners and a SWOT analysis that reflects the idea as a differentiating factor.

**Final score (Final Version of IS FASt): 556,25**

6.6. STICKABLES application experiences

6.6.1. Introduction

Stickables has been developing auto projects since 2005. Parkable is a wireless parking sensor that sticks to the car and works with a smartphone, without wiring, batteries, chargers or cables. The app provides a visual representation of the car parking with the distance to the obstacles.

6.6.2. Methodology

*6.6.2.1. First Skype call (12/08/15)*

For Stickables, one Skype call was made with one of the founders and consisted of about 1 hour that included the project presentation and the company's introduction. The interviewee was asked to fill the IS FASt Version 5 (Appendix VIII) with the booklet provided. The feedback was minimal, so no changes were made in the question's structure.

**Initial score (Version 5 of IS FASt): 762,50**

*6.6.2.2. Answers by e-mail (01/09/15)*

Stickables was later contacted by e-mail, verified the answers in the Final version of IS FASt (Appendix XVI) and completed the unanswered questions, in order to have access to a final score.

As to what concerns crucial pitch points, Stickables highlighted that this varies according to the investors, but would say that the team is always a key element. In their case they have been friends for over 10 years before working together and knew their area of expertise. Most investors told them that they preferred a strong team with a weak idea over a bad team with a great idea. Another key factor was the differentiation/innovation of the product over the competition in the market and the characterization and size of that market.

**Final score (Final Version of IS FASt): 770**

An overall assessment of all the previous answers was conducted and served as a basis for the construction of the final version of IS FASt (Appendixes IX and X).

6.7. Comparative analysis

In the course of this study, all the companies answered the questions of the final version of IS FASt (Appendix XI to XVI), which enabled a possible comparison among them. The figure on the right presents a comparison between the final scores of each participant start-up.

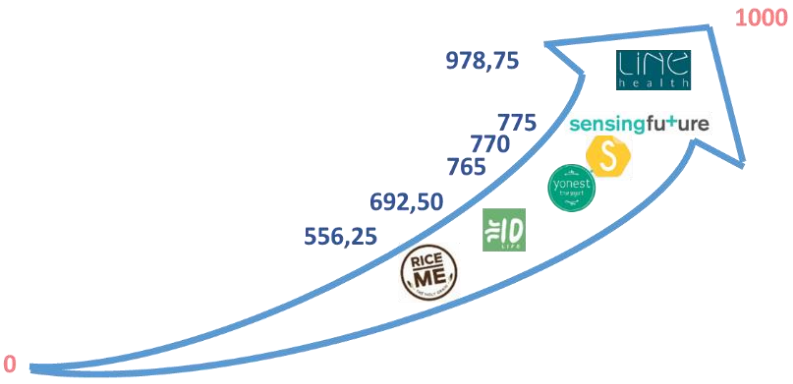



**Fig. 7 –** Comparison between the final scores of the participant start-ups

The case of Line Health is an interesting case of a start-up that is growing fast beyond their own expectations. In spite of the fact that their product is not yet on the market, it has elicited the interest of investors and is preparing for sales across the globe. In their second Skype interview, they were questioned about the reason for the high score as their result of the innovation assessment, and responded with consistent innovation practices adopted and innovation driven dynamic (Appendix IV).

As for Rice Me's lowest score could have been possibly explained by their product not being on the market yet. However, this hypothesis was contradicted by Line Health (in a pre-sales stage as well), their final score was considered to be the highest. Therefore, it was concluded that a comparison could not be established between the results of IS FASt score based only on the time start-ups have been on the market – none of these companies had their products on the market and both scored the lowest and the highest.

A hypothesis to explain this result could have been the fact that one of the companies was a technology-based start-up (Line Health) and the other was a technology-user (Rice Me). However, the obtained scores do not evidence a discrepancy between the results of technology-based and technology-user start-ups (as the example of Yonest shows, a technology-user start-up, with a very competitive score). There is a large gap between the highest and the lowest scores, but companies from different industries among the sample obtained similar scores. The author believes that this demonstrated that the scoring system is consistent. This conclusion, however could be verified with a wider sample.

Questions 7, 11, 12, 16 and 23 were highlighted by the author as contributing for the analysis of the role of starts-ups in the innovation ecosystem, respectively regarding: the team's capacity and willingness to capture talent, creating valuable job opportunities (question 7); the cooperation of the teams in innovation activities with external entities, enhancing the development of other organisations (questions 11 and 12); the team's role in innovating their value chain / system (question 16) and the impact of the start-ups on the business sector, as a positive reflex on their area of expertise (question 23). When comparing the scores for these questions in the answers of start-ups to the final version of IS FASt (Appendixes XI to XVI), it is possible to observe that Line Health presented the maximum score in all the 5 questions. Skaphandrus and Rice Me scored the lowest in questions 11 and 12, which identified the external relationships pillar as a point for improvement. This was also reflected in their interview, in which these two start-ups did not attribute enough importance to external relationships.

An interesting aspect observed was that the two companies that obtained lowest scores (Rice Me and Skaphandrus) were also the ones that, during the interviews (Appendix VI and VII) demonstrated a less flexible approach toward information sharing and involvement of employees in the company's decisions.

## 7. Discussion

This study consisted of the construction of Innovation Scoring – a Fast-track Approach for Start-ups, through a two-phased series of interviews with 6 participating start-ups from different business sectors and different stages of development (Table 3).

In the initial phase of the interviews (or the first phase of the application of the IS FASt), different questions were asked to each start-up, from Version 1 to Version 5 of the questionnaire (Appendixes III to VIII). During this first application of IS FASt, the start-ups answered the questions, validated the instrument and gave their feedback on the relevance and usefulness of each question to their business. Each of these moments represented an opportunity to enhance IS FASt and make it as versatile as possible, in order to be useful for organisations in different stages of their development.

A second stage of this study consisted of gathering all the feedback and the design of a Final version of the instrument (Appendix X). All the participating start-ups were contacted afterwards to confirm their answers and answer any new question, in order to be classified with a final score, comparable among all the participants (Appendixes XI to XVI). Table 4 summarizes this process.

The initial idea for the application (i.e., the same as for the original version of COTEC's Innovation Scoring – to organise a meeting with the inclusion of a large group of people), worked well for the first interview (Sensing Future – Appendix III), but was widely criticized by the majority of the companies. When contacted for the following interviews (Appendix IV to VIII), none of the other 5 start-ups replied to be available for 4 hours, neither did they show the possibility to dispense other members of the team to answer the questions. As an example, Line Health (Appendix IV) commented that to dispense 4 hours of most part of the team's time was impracticable. Only 2 members of the team could participate in the exercise for 1h30, and still it was a challenge to allocate that time. As a result, the terms for the application of IS FASt had to be negotiated and rethought, in order for the instrument to be as flexible as possible for start-ups. A feedback from the interview with Sensing Future was that this exercise was much more useful when it involved the team. Regarding the availability of start-ups for participation in activities that are not directly related to their core business, such as the participation in this study (given that this was one of the difficulties encountered during the application of IS FASt) Sensing Future stated that such activities are mostly beneficial to be shared as a group and

encouraging everyone's participation. This sort of environment promotes cooperation, the strengthening of relationships and it was described as a very important team bonding exercise. The interviewee from Sensing Future further stated that if only one element had answered the questions in the first place, this could have been a strong influence for the other members of the team, plus they would have been less involved in the context of the project. However, still it was recognized that time and a large number of people are not always easy to allocate for such projects.

As was described above, it was not possible to use exactly the same application method among all the subjects of the study, due to time constraint and limited availability of the participants. Three communication channels were used: meetings, Skype videoconferences and e-mail.

The first application, with Sensing Future (Appendix III), consisted of a 4 hours meeting with all 5 members of the team. People were split into two groups, each answered half of the questions Version 1 of IS FASt (Appendix III) and there was a discussion by the end of the session, to reach an agreement among the group regarding the answers to the questions. This was an excellent exercise and group reflection, with many points for feedback.

The initial Skype conferences with Line Health (Appendix IV) and Stickables (Appendix V), consisted of about 1 hour with one of the founders of each start-up, and included the IS FASt project presentation, the company's introduction and the interviewees were asked to answer the respective IS FASt Version with the booklet provided. The feedback from this method was minimal during the first answers, so no changes were made in the structure of the questions as a result of this interaction.

On the other hand, the second Skype conference with Line Health (and Sensing Future) consisted of a 1.30 hours discussion with the COO and Head of Design in the case of Line Health and with 2 hours with one of the founders of Sensing Future, after previous agreement concerning the questions among all the members of the team. This included each question and answers to the final version of IS FASt (Appendix IX), explaining the meaning of the questions and questioning the reason behind the high scoring results attributed to Line Health in the first assessment. The comments are described in Appendix III and IV. This second Skype call was considered by Line Health to be much more useful than the first (not by Sensing Future, that had a previous meeting with all team members as the first application). For Line Health, the difference between the first and second interviews was that the first application required the

COO to read the booklet provided, and the second application consisted of a live explanation and discussion of the questions, with the participation of another member of the team. The interviewees from Line Health explained that reading the booklet was much more time consuming, which also represented an obstacle for a start-up.

As for Yonest, Skaphandrus and Rice Me (Appendixes V, VI and VII respectively), the method used in the initial meetings was identical. All three start-ups granted a meeting with one of the founders (or with the two founders in the case of Rice Me), for the discussion of the respective versions of IS FASt (Appendixes V to VII). All of the above mentioned start-ups have asked the interviewer to explain and discuss the questions with them instead of reading the booklet, which would be more time consuming. The interviews were recorded and the comments and changes to the questions were registered. All the participant start-ups were advised that the answers should be confronted with the remaining members of the team as an inclusive discussion, however this did not happen during the course of this study (except for Sensing Future). This method for the application was considered by the author to be more flexible, nonetheless, there were several problems with this approach: (1) – there was a risk that the opinion of the founders might have influenced the rest of the team's answers due to fear of contradiction; (2) – without a crossed perspective with every team member (and given the small dimension of the companies) it was difficult to understand if the answers corresponded to a reality that is transversal to the organisation.

On the second phase of the interviews, excluding Sensing Future and Line Health, who granted a second Skype call, all the other participating start-ups were contacted by e-mail to confirm their answers according to the Final version of IS FASt, answer to any new questions and also to provide a perspective on the key points of their pitch for investors. Regarding this last aspect, it was also difficult to maintain the contact with all the participating companies. In particular, Skaphandrus did not provide further comments on the key points of the pitch for investors in spite of the numerous attempts of contact.

Regarding Scoring, two companies, Rice Me and Skaphandrus, (Appendixes V and VI) stated that it would be much easier to respond to the questions with a numeric scale rather than a nominal scale. However, this was not changed in the final version because the fundamental idea behind the used scale is that an attitude can be thought of as a set of propositions about beliefs, evaluations, and actions held by individuals and teams. To ask the respondents to agree or disagree with a sample of propositions about the attitude object, allowed to quantify the

answers and get a better measure of the attitude. Even if it may sound more practical to respond using only numbers, methodologically that choice loses detail and can reflect as avoidance of a more adequate reflection as start-ups would just choose one number on a scale.

Dimensions and pillars suffered a few modifications during the course of this study, in relation to the original version of the IS, which resulted from literature review on characteristics of start-ups and the feedback gathered from interviews and the case studies (Appendixes III to VIII):

- When comparing Fig. 4 to Fig. 5, there is a difference in the first Dimension, "Culture" regarding Leadership. This pillar was not considered as a separate assessment point in the final version of IS FASt due to the small number of elements that compose start-ups and the feedback gathered from interviews on group cohesion and open communication channels, as well as a good participation of all team members in the decisions and the lesser importance of hierarchy when compared to team co-operation (in most start-ups, but not in all case studies).
- In relation to the "Resources" dimension, one of the differences is related to the Financial resources pillar, and more specifically, the role of seed capital for the business, which is crucial in start-up companies. Rather than "structures", "information tools and systems" were considered as a pillar to assess Resources, as it allowed a more simplified approach, still translating crucial aspects for the reflection of innovation in the final score.
- As for "Processes", the principles beyond the changes in this dimension were also mainly related to a simplification rather than an assessment of systematized processes in the company, which wouldn't address the reality of star-ups.
- The "Results dimension was the most difficult to address, due to the difficulty of expressing in numbers what in some cases was only a very recent history of sales and return, in other cases none existent. In this dimension, start-ups were assessed based on their ability to generate return for their stakeholders and on their team's development The start-ups were asked to consider the information and metrics available at the time, such as evolution of downloads, target customer opinion, articles on the internet, magazines or social networks.

The final classification of each question represents the lowest score between "approach" and "application", as described in 5.2.2. The author noted the final scores of start-ups were much more often limited by the application (referred to in Appendixes III to VIII as "APL") than by the approach ("APR"). This could be possibly related to the fact that start-ups do not have as many systematized processes as a company that has been on the market for several years,

therefore, could mean that innovation strategies for start-ups should focus more on a systematized application rather than on the approach for each of the discussed aspects.

As a conclusion from the key points of their pitch for investors, the companies identified the following aspects in common: (1) an excellent team, dynamic, motivated, with proved expertise; (2) a unique and differentiating solution proposal, with a SWOT analysis that reflects the idea as a differentiating factor over the competition; (3) the correct description and knowledge of the type and size of the market and the problem to be solved, supported by numbers, data and a more advanced solution; (4) market data that supports an accurate analysis of the cost vs. sales prospects, its long term turnover and the value of the company; (5) a clear route and demonstrating results in short time (market validation, awards...). The start-ups also described that this varies according to the investors. These characteristics are consistent with those described in the literature as characteristics of innovative start-ups.

### 7.1. Limitations and challenges

One of the limitations was the availability for start-ups to participate in activities that are not directly linked to their main strategy – start-ups are very busy living at the present, in turbulent ecosystems – hence it was difficult to obtain their consent to apply the IS FASt in conformity with the initial method (involving a large number of people). As an alternative to having all the members of the organisation gathered for the exercise, a more flexible approach was suggested – to have a meeting or videoconference with one of the founders to fill the questionnaire. As a recommendation for future studies, the author suggests to involve not only the promoters but also employees, so that different roles can be present, with different perspectives on the topics being discussed, and ideally permitting the constitution of groups for better insights.

Regarding risk and autonomy from financial resources, start-ups highlighted that this notion could have multiple approaches, suggesting that question 6 should address “the risk tolerance / autonomy in relation to Corporate Venture Capital / Business Angels / investors”. However, and contrary to what was suggested in the interviews, multiple questions on this topic were not addressed in this study due to a resulting increase in the number of questions, which was not the purpose, as the aim was to conduct an agile approach for COTEC’s Innovation Scoring. For future studies, it is recommended that this question is further explored.

The sample of companies used was varied in terms of industries and revealed indeed different dynamics of innovation. One particular aspect highlighted in an interview with Vilarinho, was the fact that technology-based and technology-user start-ups face different challenges and therefore should not be compared. However, the scores obtained as the result of the answers of the start-ups to the final version of the IS FASt do not evidence a discrepancy between technology-based and technology-user start-ups. The author considers this an indication that even though there is a large gap between the highest and the lowest scores, the instrument is consistent enough for companies from different industries to obtain similar scores and for the structure to be used independently of the technologic intensity of the start-ups. This conclusion, however could be substantiated with a wider sample.

About the sample used, and since all the start-ups were from Portugal (though from different regions), they were integrated in an environment that is different from that of start-ups from the economies of other countries. As a suggestion for future studies, it would be interesting to apply the IS FASt to start-ups from other countries in order to obtain more enriched and universal feedback and data.

It is a possibility that scores could have been reduced if, after auditing the companies, it would be found that the self-assessment scores could reflect "wishful thinking" and that their self-assessment did not meet the required parameters, such as written and defined processes, existing formal protocols, or even practical application of innovation values among all the employees. This audit was not conducted during the course of this study, as it was not aligned with the central goals of the investigation.

Time limit was another constraint for this study – although one year was a long period to write this thesis, many circumstances affected the investigation, including several barriers encountered that led to completely change the topic and methodology.

Also, it was not an objective of this study to extrapolate conclusions to a larger universe of reference – or it might not have been so due to the limited amount and depth of the observations – this study aimed only to observe start-ups in the light of an innovation diagnostic system, to understand what challenges pose to their management, so the conclusions are valid only in the context of a small sample of start-ups. The author suggests as a next step for this investigation to apply the IS FASt to a larger sample, in order to more accurately validate conclusions.

This study is far to be considered concluded, for further research is required to continue to extract lessons for the broader organisational reality and particularities of the nature of innovation processes. As a recommendation for future studies, the author suggests further research on innovation to reinforce organisational innovation competences as a driver for competitiveness.

## 7.2. Preliminary conclusions

The feedback from all companies was overall very positive and constructive. Especially in meetings and skype discussions, it was possible to understand and structure the questions according to the start-ups particular challenges. As an outcome of this study, the overall comments demonstrated that this was a useful exercise for start-ups to identify limitations and points for improvement.

About the main challenges for start-ups, it was concluded that one of those challenges was to have a formal matrix of processes, which is regarded as a necessary step for growth: to achieve systematization and decision capacity, as well as quality management as the company grows larger.

IS FASt is an innovation assessment tool that contributes to identify the gaps in order to facilitate the definition of innovation strategies for start-ups. A high score should indicate a systematic innovation portfolio, with set routines that evidence and support processes approach. Does the assessment reflect an anticipation of life cycle change and growth? Is there a plan for the "next step"? It is important for companies to consider these questions and if the final score truly reflects their readiness to face global competition, based on their innovation competences.

Ultimately, is the innovation potential of a start-up company measurable? *How can an innovation assessment tool be made useful to the specific characteristics of start-up companies?* In order to facilitate the answers, this question was divided into 3 sub-questions:

*a) how should the Innovation Scoring FASt be applied?*

This question has proven to be more complex than the author initially considered. The guidelines for the original version of IS suggested the inclusion of a large group of people in the discussion. However this has proven to be difficult for the majority of the participant start-

ups due to time constraint and limited availability of the participants. As a result, it was not possible to use the same application method among all the subjects of the study. The conclusion, however, was that the exercise was much more useful when it involved the team. Regarding the availability of start-ups for participation in activities that are not directly related to their core business, a feedback gathered was that such activities are mostly beneficial to be shared as a group and encourage development and collective learning, which is especially important for such small teams. In the cases where only one element answered the questions in the first place, the results are questionably reflecting the perspective of only one individual.

*b) how should the Innovation Scoring FASt address the particular challenges of start-ups?*

To answer this question in consideration of the demonstrated analysis, several aspects were found essential. To begin with, start-ups face important challenges that are not the same as those of established companies. They still need to prove themselves in a world of ruthless competitiveness, they face a constant pressure to grow or disappear. And growing is the only answer, however this has to be done now and there is no time to waste. An innovation diagnostic instrument must address this particular need to be able to answer demands from customers with unique and differentiated products, environment and regulations, articulate efforts with suppliers and partners, exchange ideas and skills with a large network of external relationships and still be alert to competition. An innovation diagnostic instrument for start-ups must be deprived of exaggerated complexity, consider the much simpler structure and dimension of start-ups, value networking strategies and it must be agile and easy to implement.

The structure of the dimensions and pillars used for this study reflects that lack of complexity without disregarding the important aspects for the understanding of all the key aspects of innovation for a start-up. As an adaptation from the structure of the original version of the IS, the IS FASt regards the role of leadership as more integrated as start-ups show a very close collaboration within the members of the team; the role of financial resources is seen in the "Resources" dimension instead of in "Conditions"; the "Processes" dimension has suffered a structural change which reflects the nature and special conditions of start-up companies; "Results" was the most challenging adaptation given the high degree of uncertainty concerning start-ups.

Also, a diagnostic instrument must highlight the quality of the management, of its human resources, intellectual property, the level of technology development and the quality of a start-up's financial sources. Another important input is that technology-based and technology-user start-ups face different challenges, however, the quantitative data obtained in the final version of IS FASt contributed for the verification of the adequacy of the obtained instrument through the coherence of the results between the scores of start-ups independently of their technological intensity.

*c) what distinctive elements does the diagnosis emphasise that contribute to the analysis of the role of starts-ups in the innovation ecosystem?*

It is the role of entrepreneurs to create jobs, contributing to increase productivity, enhance competition and to generate innovation. Entrepreneurship is critical for the innovation activity and makes a difference in the economic vitality of communities, regions, industries and nations as a whole. The IS FASt diagnostic contributes to the analysis of the role of start-ups by: (1) exploring the team's capacity and willingness to capture talent (creating valuable job opportunities), addressed in question 7, in the pillar of "Human Resources" within the "Resources" dimension; (2) by analysing the cooperation of the teams in innovation activities with external entities (enhancing the development of other organisations), in questions 11 and 12, within the pillar "External Relationships" of the "Resources" dimension; (3) providing an insight on the team's role in innovating their value chain / system, which is evident in question 16 of the "RDI Activities Management" pillar, in "Processes" dimension and (4) questioning the impact of the start-ups on the business sector (as a positive reflex on their area of expertise), which in turn is addressed in question 23 (in the "Team's Development" pillar of "Results").

In order for the Innovation Scoring FASt be applied to a start-up, it is useful to have the team involved. It must as well address to their particular characteristics and challenges. Even though start-ups are busy, its application is much more useful and encourages development and collective learning when it involves a large number or the majority of the elements of the team, given the small dimension of the companies. During the course of this study the best results and feedback were gathered in the cases where the exercise involved group discussion.

## 8. Conclusions

Innovation generates advantages and scores differences in a world where the development of new businesses, access to new markets and the need to anticipate the "future", while understanding technological dynamics, represent emerging challenges. RDI activities represent an unquestionable value for the competiveness of organisations and economies. In order to establish strategies that recognize innovation as a major driver of economic growth and the well-being of societies, it is important to evaluate the innovative efforts of organisations. Our understanding of innovation in an organisational context can be more complete with a diagnosis, based on a systematic assessment of the major dimensions that support this dynamic.

In the present business context, innovation management becomes more relevant when companies articulate their activities with their stakeholders and the elements of the micro and macro-environment in the form of a system, which is especially important for start-ups. University spin-offs contribute for Universities to patent their discoveries and profit from licensing to established companies. Many start-ups are generated from that environment that fostered technology and the inventions that originated it.

Entrepreneurship is critical for the innovation activity and makes a difference in the economic vitality of communities, regions, industries and nations as a whole. Investors such as business angels and venture capitalists play a relevant part in the process of taking ideas to the market because they provide money, managerial resources, network capabilities and additional services for starting businesses.

Innovative start-ups must be agile, flexible, move fast and learn new capabilities to translate them into competitive advantages and flexibility. Successful start-ups need to compete on quality and value, through innovative technology and product design. The right combination of knowledge-based organisational resources, allied with a clear vision from the founding of the business, optimization of relationships networks and proximity with the customer are key ingredients to assure development and more successful performance of start-ups.

The Innovation Scoring system for start-ups that this study attempted to construct, designated Innovation Scoring – a Fast-track Approach for Start-ups (IS FASt), represents a contribution for start-ups to identify limitations and points for improvement regarding an innovative culture, innovation strategies, capturing talent, skills related to RDI activities and RDI projects management, the importance of integration in systems of external relationships, the importance

of systematized innovation processes, and thus contributing for the team's role in innovating their value chain / system and a positive impact on their area of expertise.

This work highlighted the importance of contributing for the understanding and development of start-up companies, identifying the determinant characteristics of their innovative dynamic, such as adaptability, agility and ability to initiate change, through the main dimensions and pillars considered in the IS FASt: (1) "Conditions", regarding the aspects that influence the attitudes and the behaviour of start-ups, through Culture (reflecting the adequacy of the company's values regarding innovation), and Strategy and Planning, (which seeks to assess how the characteristics of the organisation stimulate innovation); (2) "Resources", that ensure innovation dynamics of start-ups, through Financial Resources (assessing the autonomy of start-ups in relation to investors), Human Capital (assessing their involvement in innovation activities), Organisational Skills (relevant skills and capabilities for the team's innovative performance), External Relationships (mapping the main connections with other entities to enhance innovation) and Tools and Information Systems (assessing these as facilitators of innovation); (3) "Processes", as the basis for the generation of innovation performance, through RDI activities Management (including the importance given to Intellectual Property management), Management of Knowledge and Learnings (incorporation of obtained learnings) and RDI Projects Management (assessing processes for planning, organizing and monitoring RDI projects) and (4) "Results", assessing the contribution of RDI activities for goal achievement and results and considering the alignment of the previous dimensions, through the Ability to Generate Return for shareholders (business angels, venture capital companies or other stakeholders) and ability to leverage the Team's Development (percentage of growth and productivity obtained or expected).

In order for the IS FASt be applied to a start-up, it is useful to have the team involved. It must as well address to their particular characteristics and challenges. Even though start-ups are busy, its application is much more useful and encourages development and collective learning when it involves a large number or the majority of the elements of the team, given the small dimension of the companies. During the course of this study the best results and feedback were gathered in the cases where the exercise involved group discussion.

For the IS FASt to address the particular challenges of start-ups, it must consider the much simpler structure and dimension of start-ups, value networking strategies and it must be agile and easy to implement. It must as well address their particular challenges and characteristics:

adaptability, agility and ability to initiate change, to be able to answer demands from customers with unique and differentiated products, respond to the pressure of the environment and regulations, to articulate efforts with suppliers and partners, exchange ideas and skills with a large network of external relationships and still be alert to competition. The dimensions and pillars should consider the much simpler structure and dimension of start-ups, value networking strategies and still must be agile and easy to implement and reflect lack of complexity without disregarding the important aspects for the understanding of all the key aspects of innovation for a start-up. Also, a diagnostic instrument must highlight the quality of the management, of its human resources, intellectual property, the level of technology development and the quality of a start-up's financial sources.

The diagnosis instrument that was constructed in this study contributes to the analysis of the role of starts-ups in the innovation ecosystem in the enhancement of the development of other organisations, in the creation of valuable job opportunities and the impact of their innovative performance in their business sector.

A broader application of the IS FASt could provide an important input to public policies as it would identify common weaknesses and areas for improvement, facilitating the adoption of evidence based policies. The Portuguese economy could make use of policies to unravel competitiveness, capital, human resources and innovation. The path can be facilitated by the application of some rules and routines that minimize uncertainty and enable the achievement of results. In addition to an innovation diagnostic process, it is necessary to monitor crucial aspects to the survival, growth, differentiation and sustainability of companies.

This study presented another step to bridge the gaps of our knowledge about entrepreneurship and innovation. Many challenges will remain for further investigation, as it is essential to continue to better understand innovation in order to reinforce organisational innovation competences as a driver for competitiveness.

## 9. References


Acs, Z; Autio, E. & Szerb, L. 2015. ***Global Entrepreneurship Development Index 2014***, Springer

Alexy, O. & Salter, A. 2014. The Nature of Innovation, In Dodgson, M.; Gann, D.; Phillips, N. 2014. ***The Oxford Handbook of Innovation Management***. New York: Oxford University Press (p. 26-46).

Alston, L. 2008. The "Case" for Case Studies in New Institutional Economics, ***New Institutional Economics: A Guidebook*** 103-121. Cambridge: Cambridge University Press.

Anthony, S., Christensen, C. & Roth, E. 2004. ***Seeing What's Next***. U.S.A.: Harvard Business School Press.

Audretsch, D. & Thurik, R. 2001. What is New About the New Economy? Sources of Growth in the Managed and Entrepreneurial Economies', Industrial and Corporate Change In Audretsch, D.; Grilo, I. & Thurik, A. 2007. ***Handbook of Research on Entrepreneurship Policy***, Edward Elgar.

Auerswald, E. 2007. The simple economics of technology entrepreneurship: market failure reconsidered In Audretsch, D.; Grilo, I. & Thurik, A. 2007. ***Handbook of Research on Entrepreneurship Policy***, Edward Elgar.

Barton, M. & Leonard, D. 2014. Knowledge and the Management of Creativity and Innovation, In Dodgson, M.; Gann, D.; Phillips, N. 2014. ***The Oxford Handbook of Innovation Management***, New York: Oxford University Press (p. 124-135).

Bertoni, F.; Colombo, M.; D'Adda, D. & Grilli, L. 2010. Venture Capital Financing and the Growth of New Technology-Based Firms: Correcting for Sample Self-Selection In Audretsch, D. et al. 2010. New Frontiers in Entrepreneurship – Recognizing, Seizing, and Executing Opportunities ***International Studies in Entrepreneurship,*** series 6149, Springer.

Bradburn, N.; Sudman, S & Wansink, B. 2004. ***Asking Questions - The Definitive Guide to Questionnaire Design for Market Research, Political Polls and Social and Health Questionnaires***, San Francisco, Jossey-Bass.

Blank, S.; Dorf, B. 2012. ***Startup Owner's Manual***, K&S Ranch Inc.

Carree, M. & Thurik, A. 2003. The Impact of Entrepreneurship on Economic Growth, In Audretsch, D.; Grilo, I. & Thurik, A. 2007. ***Handbook of Research on Entrepreneurship Policy***, Edward Elgar.

Caetano, I. 2010. Voltar ao Mar. In ***A Magazine***, 10 (July 2010), 18–22. Lisboa: Ana Aeroportos de Portugal.

Camp, S.; Hay, M. & Reynolds, P. 1999. Global Entrepreneurship Monitor, 1999 Executive Report In Audretsch, D.; Grilo, I. & Thurik, A. 2007. ***Handbook of Research on Entrepreneurship Policy***, Edward Elgar.

Caraça, J. 2010. In COTEC Portugal. 2010. ***Guia de Boas Práticas de Gestão de Inovação***. Lisboa: COTEC.

Caraça, J., Lundvall, B. & Mendonça, S. 2008. The Changing Role of Science in the Innovation Process: From Queen to Cinderella?. ***Technological Forecasting & Social Change***.

(a) – Chesbrough, H. 2003. ***Open Innovation.*** U.S.A.: Harvard Business School Press.

(b) – Chesbrough, H. 2003. The Era of Open Innovation. ***MIT Sloan Management Review,*** Vol 44 nº3, 4435: 36.

Christensen, C. 1997. ***The Innovator's Dilemma***, U.S.A.: Harvard Business School Press.

Costa, S. 2015. Business Model Change in Early-Stage University Spin-Offs, In Moreira, S. 2015. ***Spin-offs Devem Interagir O Mais Cedo Possível com Clientes***, http://informacao .canalsuperior.pt/noticia/19954, consulted in 30-08-2015

COTEC Portugal. 2008. ***Manual de Identificação e Classificação das Atividades de IDI***, Lisboa: COTEC.

(b) COTEC Portugal. 2008. ***Innovation Scoring – Manual de Apoio ao Preenchimento***, Lisboa: COTEC.

COTEC Portugal. 2007. In http://www.cotecportugal.pt/index.php?option=com_content&task = view&id=1340&Itemid=206, consulted in 07-10-2014.

Dagnino, G.; Faraci, R. and Sorrentino, M. 2010. Mobilizing Capital for Fostering the Early Growth of Firms: The Role of Business Angels in Nascent European Entrepreneurship In Audretsch, D. et al. 2010. ***New Frontiers in Entrepreneurship – Recognizing, Seizing, and Executing Opportunities International Studies in Entrepreneurship***, series 6149, Springer.

Dell'Era, C. & Verganti, R. 2014. Design-Driven Innovation**,** In Dodgson, M., Gann, D. & Phillips, N. 2014. ***The Oxford Handbook of Innovation Management***, New York: Oxford Univerity Press.

Deimler, M. & Reeves, M. 2011. ***Adaptability: the New Competitive Advantage***. Harvard Business Review, July-August: 135-141

Dodgson, M., Gann, D. & Salter, A. 2008. ***The Management of Technological Innovation: Strategy and Practice***. Oxford University Press.

Dodgson, M., Gann, D. & Phillips, N. 2014. ***The Oxford Handbook of Innovation Management***, New York: Oxford Univerity Press (p.5).

Eisenhardt, K. 1989. ***Building Theories from Case Study Research***. Academy of Management Review.

European Commission. 2004. Action Plan: The European Agenda for Entrepreneurship, COM(2004) 70 final, Communication from the Commission to the Council, the European Parliament, the European Economic and Social Committee and the Committee of the Regions, In Audretsch, D.; Grilo, I. & Thurik, A. 2007. ***Handbook of Research on Entrepreneurship Policy***, Edward Elgar.

Friesike, S., Gassmann, O. & Zedtwitz, M. V. 2014. Managing R&D and New Product Development, In Dodgson, M.; Gann, D.; Phillips, N. 2014. ***The Oxford Handbook of Innovation Management***, New York: Oxford Univerity Press (p. 530-557).

Fundação para a Ciência e a Tecnologia. 2013. ***Diagnóstico do Sistema de Investigação e Inovação: Desafios, Forças e Fraquezas rumo a 2020***. Fundação para a Ciência e a Tecnologia, Ministério da Educação e da Ciência.

Godinho, M. 2013. ***Inovação em Portugal***, Lisboa: Fundação Francisco Manuel dos Santos, Rents and Resources.

Ghoshal, S. 2005. ***Bad Management Theories are Destroying Good Management Practices***. Academy of Management, Learning and Education, 4(1): 75-91

Halman, J.; Podoynitsyna, K.; Song, M.; & van der Bij, H. 2008. Success Factors in New Ventures: A Meta-analysis, ***The Journal of Product Innovation Management,*** 25:7–27

Hamel, G & Prahalad, C., 1990. The Core Competence of the Corporation, ***Harvard Business Review***, 90311

Hart, D. 2003. The Emergence of Entrepreneurship Policy, In Audretsch, D.; Grilo, I. & Thurik, A. 2007. ***Handbook of Research on Entrepreneurship Policy***, Edward Elgar.

Knight, G.; Rialp, A. & Rialp, J.2005. The Phenomenon of Early Internationalizing Firms: What do We Know After a Decade (1993-2003) of Scientific Inquiry? ***International Business Review***, 14(2).

Lam, A. 2006. Organisational Innovation In Fagerberg, J., Mowery, D. & Nelson, R. 2006. ***The Oxford Handbook of Innovation,*** New York: Oxford University Press.

Lazzarini, S. & Mesquita, L. 2010. Horizontal and Vertical Relationships in Developing Economies: Implications for SMEs' Access to Global Markets, In Audretsch, D. et al. 2010. New Frontiers in Entrepreneurship – Recognizing, Seizing, and Executing Opportunities. ***International Studies in Entrepreneurship,*** series 6149, Springer.

Lundström, A. & Stevenson, L. 2007. Dressing the Emperor: the Fabric of Entrepreneurship Policy, In Audretsch, D.; Grilo, I. & Thurik, A. 2007. ***Handbook of Research on Entrepreneurship Policy***, Edward Elgar.

Lusch, R.F.; Vargo, S.L. & Tanniru, M. 2010. Service, Value Networks and Learning***, Journal of the Academy of Marketing Science***, vol. 38 no. 1 (p. 19-31).

Martin, B. 2012. The Evolution of Science Policy and Innovative Studies In Alexy, O. & Salter, A. 2014. The Nature of Innovation, In Dodgson, M.; Gann, D.; Phillips, N. 2014. ***The Oxford Handbook of Innovation Management***. New York: Oxford University Press.

McKinsey & Co. 1993. ***Emerging Exporters. Australia's High Value-Added Manufacturing Exporters***, Melbourne: McKinsey & Company and the Australian Manufacturing Council.

Minayo, M. 2009. Construção de Indicadores Qualitativos para Avaliação de Mudanças. ***Revista Brasileira da Educação Médica***, 33: 83-91.

Moore, G. 2002. Crossing the Chasm In Ries, E. 2011. ***The Lean Startup***. New York: Crown Business.

Moore, G. 2006. ***Dealing With Darwin – How Great Companies Innovate at Every Stage of Their Evolution***, Capstone.

Organisation for Economic Co-operation and Development. 2014. ***Entrepreneurship at a Glance 2014***, OECD Publishing.

Organisation for Economic Co-operation and Development. 2006. ***Understanding Entrepreneurship: Developing Indicators for International Comparisons and Assessments - Report on the OECD's Entrepreneurship Indicators Project and Action Plan***, OECD.

Organisation for Economic Co-operation and Development. 2005. **Oslo Manual: Guidelines for Collecting and Interpreting Innovation Data** 3rd ed. OECD.

Petreski, M. 2006. The Role of Venture Capital in Financing Small Businesses, ***Journal of Entrepreneurship and Finance***

Phillips, N. 2014. Organizing Innovation, In Dodgson, M.; Gann, D. & Phillips, N. 2014. ***The Oxford Handbook of Innovation Management***, New York: Oxford University Press (p. 482-492).

Ries, E. 2011. ***The Lean Startup***. New York: Crown Business.

Rivera, M. 2013. ***9 Free Business Productivity Tools For Startups*** http://tweakyourbiz.com/technology/2013/04/08/9-free-business-productivity-tools-for-startups/?utm_source=outbrain&utm_medium=promo&utm_content=outbrain&utm_campaign=Outbrain, consulted in 18-07-2015.

Schumpeter, J. 1934. The Theory of Economic Development, In Schumpeter, J., 1997. ***Teoria do Desenvolvimento Económico***, Cambridge, Massachusetts: Harvard University Press.

Seidman, I. 2006 ***Interviewing as Qualitative Research***, New York and London: Teachers College Press

Smith, K. 2006. Measuring Innovation In Fagerberg, J., Mowery, D. & Nelson, R. 2006. ***The Oxford Handbook of Innovation***, New York: Oxford University Press.

Woodward, A. 2010. ***Case Study Research – Theory, Methods, Practice***, U.S.A., Emerald.

Yin, R. 2009. ***Case Study Research: Design and Methods,*** 4th ed. SAGE Publications, Inc.

Yin, R. 2011. ***Qualitative Research From Start to Finish***, The Guilford Press, New York

**Relevant web references:**

http://www.innovationscoring.pt/, consulted in 07-10-2014.

# 10. Appendixes

## **Appendix I –** Interview with Pedro Vilarinho

| | |
|---|---|
| 1 - To analyse innovation in start-ups, trying to express and quantify innovation in a scoring system, is a task that implies a good understanding of the reality of satrt-ups. What particular topics should an innovation diagnosis emphasise, in order to be relevant and useful for start-ups? | In order to be useful for start-up companies, the following distinctive factors should be highlighted in an Innovation diagnostic instrument for start-ups,: (1) the quality of the management; (2) the quality of its human resources; (3) intellectual property, which enables the competitive advantages to be defensible; (4) the level of technology development and (5) the quality of a start-up's financial sources. |
| 2 - Some of the start-ups I have interviewed I have considered to have a high growth potential. I would like to ask how are those characteristics determined and, in your oppinion, which are the crucial aspects for that to be verified in the future of a company? | For a high growth rate to be expected, specifically for web/mobile start-ups, it is crucial to have a differentiated product and it is even more important to monitor the environment that surrounds the company. Efficient management is unavoidable. For start-ups, intellectual property is fundamental to satisfy a market need (this is one of the determinants to understand/anticipate if the company is going to be successful). Connections with universities, institutions and investigation centres can also be accounted for as possible factors for success, as well as the team. |
| 3 - Considering your experience, what factors can you name as contributing for the success of start-ups? | Most of the answers for this question were already given in question 2, as the factors for success were as well responsible for a higher growth rate of start-ups. Vilarinho added the following: (1) the team's expertise; (2) a differentiating solution proposal; (3) a correct market and costs analysis. |
| 4 - A start-up is a company with different characteristics than an established company. What do you consider to be more relevant in those companies that differenciates them from others and therefore deserves a special attention in the analysis of innovation of those companies? | Relevant aspects distinguish start-ups concerning particular challenges of competitiveness they face. In any niche, only a small number of companies succeeds. Two different types of start-ups can be pointed out: technology-based start-ups and technology-user start-ups. These two different types imply different processes and also different business models. Their success is highly unpredictable in the first type (also designated web/mobile start-ups). In technology-based start-ups, technology is the foundation for these companies. They require investment in their intellectual property in order to justify their competitive advantage. Technologic products and services are generally proposed by their investors. Technology-user start-ups usually require a higher volume and also a different type of investment. |
| 5 - Do you consider that the analysis instrument should benefit certain types of companies, like technology-based companies? Or do you consider that the instrument should compare companies from different fields of expertise? | Technology-based and technology-user start-ups face different problems and therefore should not be compared. The criteria and the aspects of Innovation assessment should be different. |

## **Appendix II –** Innovation Scoring (COTEC, 2007)

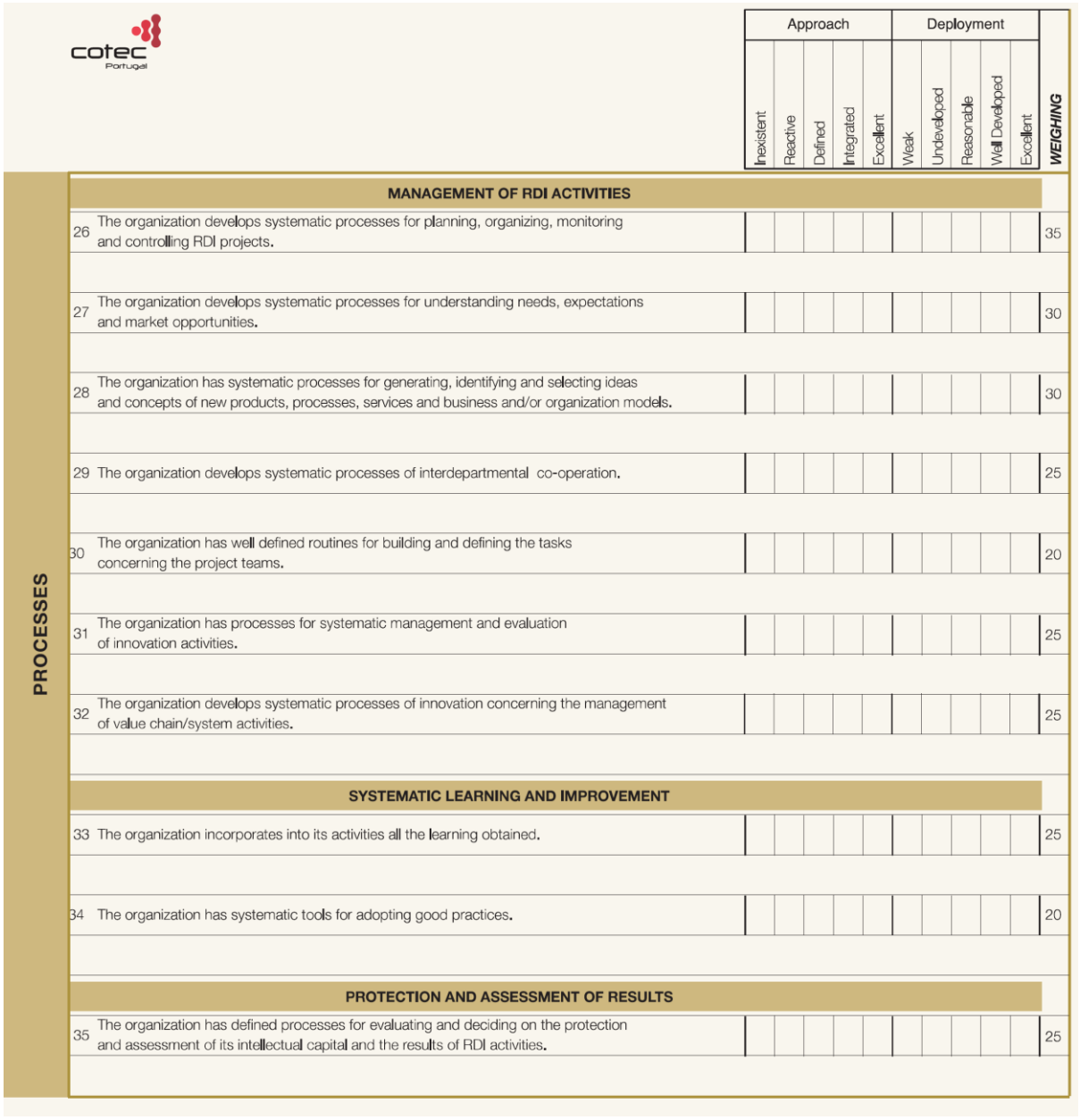
**ATTACHMENT A – INNOVATION SCORING FORM (1/4)**

cotec Portugal

| | | Approach | | | | | Deployment | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | Inexistent | Reactive | Defined | Integrated | Excellent | Weak | Undeveloped | Reasonable | Well Developed | Excellent | WEIGHING |
| CONDITIONS | **CULTURE** | | | | | | | | | | | |
| | 1 The values of the organization promote adaptability, experiment, learning and continuous change. | | | | | | | | | | | 20 |
| | 2 The values of the organization promote international opening. | | | | | | | | | | | 15 |
| | 3 The internal communication of the organization integrates various perspectives, resorting to formal and informal mechanisms of circulation of information and sharing knowledge. | | | | | | | | | | | 20 |
| | 4 The organization's culture stimulates entrepreneurship and the capacity to take risks, without weakness penalty. | | | | | | | | | | | 20 |
| | **LEADERSHIP** | | | | | | | | | | | |
| | 5 Top management transmits an innovative vision that orients the definition of purposes and the strategy of the organization. | | | | | | | | | | | 20 |
| | 6 Top management systematically promotes the adaptation of leadership structures, in order to deal with change. | | | | | | | | | | | 15 |
| | 7 Leadership structures promote the appearance of leaders for developing innovative activities through the responsibility and autonomy of its staff. | | | | | | | | | | | 15 |
| | 8 Top management makes an effort and takes responsibilities in the management of innovation. | | | | | | | | | | | 20 |
| | **STRATEGY** | | | | | | | | | | | |
| | 9 The organization has a clear and shared innovation strategy, getting the staff involved in its definition. | | | | | | | | | | | 20 |
| | 10 Innovation strategy appears as a plan of action with quantitative purposes and targets on a medium and long term. | | | | | | | | | | | 20 |
| | 11 The organization has a marketing strategy that supports and values the activity of innovation, consistent with the business model and processes. | | | | | | | | | | | 20 |
| | 12 The organization has a monitoring system for its external surroundings, which it uses on the definition and implementation of strategy. | | | | | | | | | | | 15 |

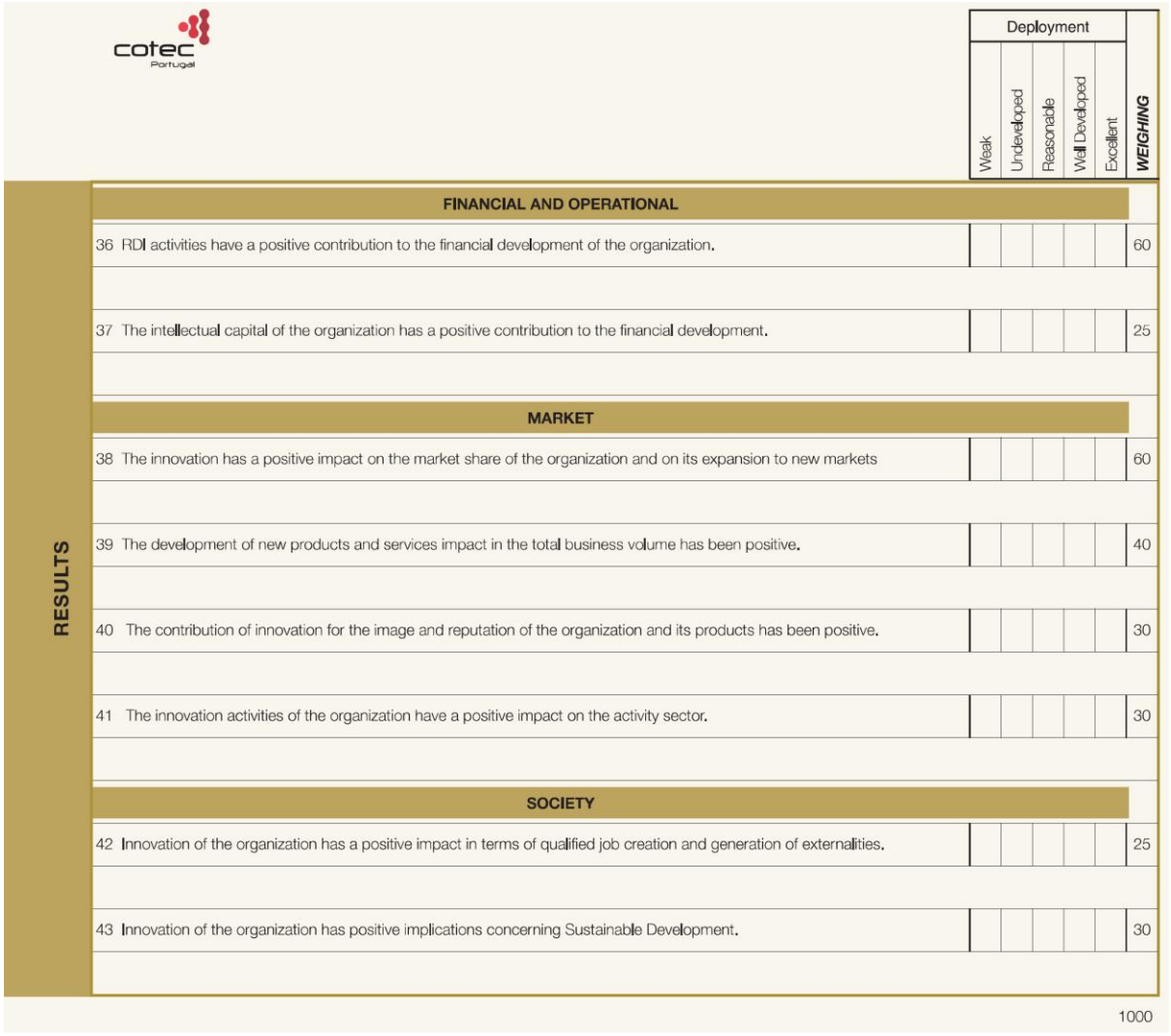
cotec Portugal

| RESOURCES | | Approach | | | | | Deployment | | | | | WEIGHING |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | Inexistent | Reactive | Defined | Integrated | Excellent | Weak | Undeveloped | Reasonable | Well Developed | Excellent | |
| | **HUMAN CAPITAL** | | | | | | | | | | | |
| | 13 The organization has a policy of Human Capital oriented for innovation. | | | | | | | | | | | 20 |
| | 14 The organization has a policy of training its staff, oriented for innovation. | | | | | | | | | | | 15 |
| | 15 The organization stimulates and supports creativity and innovative initiative from its staff. | | | | | | | | | | | 20 |
| | **COMPETENCIES** | | | | | | | | | | | |
| | 16 The organization moves forward systematically to the identification, consideration and planning of the development of its organizational competencies. | | | | | | | | | | | 20 |
| | 17 The organization has specific competences in the management of RDI. | | | | | | | | | | | 20 |
| | 18 The organization has the adequate technical competences for performing RDI activities. | | | | | | | | | | | 20 |
| | 19 The organization has specific competences related to activities concerning production and/or services. | | | | | | | | | | | 15 |
| | 20 The organization has specific competences related to its marketing activities. | | | | | | | | | | | 15 |
| | **EXTERNAL RELATIONS** | | | | | | | | | | | |
| | 21 The organization develops systematic cooperation actions on innovation with external entities. | | | | | | | | | | | 20 |
| | 22 The organization boosts many ways of networking. | | | | | | | | | | | 10 |
| | **STRUCTURES** | | | | | | | | | | | |
| | 23 The organization has an organizational structure dedicated to RDI activities. | | | | | | | | | | | 20 |
| | 24 The organization has the adequate structures for managing knowledge. | | | | | | | | | | | 15 |
| | 25 The organization has systems of information and communication that allow for innovation. | | | | | | | | | | | 10 |



cotec Portugal

| PROCESSES | | Approach | | | | | Deployment | | | | | WEIGHING |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | Inexistent | Reactive | Defined | Integrated | Excellent | Weak | Undeveloped | Reasonable | Well Developed | Excellent | |
| **MANAGEMENT OF RDI ACTIVITIES** | | | | | | | | | | | | |
| 26 | The organization develops systematic processes for planning, organizing, monitoring and controlling RDI projects. | | | | | | | | | | | 35 |
| 27 | The organization develops systematic processes for understanding needs, expectations and market opportunities. | | | | | | | | | | | 30 |
| 28 | The organization has systematic processes for generating, identifying and selecting ideas and concepts of new products, processes, services and business and/or organization models. | | | | | | | | | | | 30 |
| 29 | The organization develops systematic processes of interdepartmental co-operation. | | | | | | | | | | | 25 |
| 30 | The organization has well defined routines for building and defining the tasks concerning the project teams. | | | | | | | | | | | 20 |
| 31 | The organization has processes for systematic management and evaluation of innovation activities. | | | | | | | | | | | 25 |
| 32 | The organization develops systematic processes of innovation concerning the management of value chain/system activities. | | | | | | | | | | | 25 |
| **SYSTEMATIC LEARNING AND IMPROVEMENT** | | | | | | | | | | | | |
| 33 | The organization incorporates into its activities all the learning obtained. | | | | | | | | | | | 25 |
| 34 | The organization has systematic tools for adopting good practices. | | | | | | | | | | | 20 |
| **PROTECTION AND ASSESSMENT OF RESULTS** | | | | | | | | | | | | |
| 35 | The organization has defined processes for evaluating and deciding on the protection and assessment of its intellectual capital and the results of RDI activities. | | | | | | | | | | | 25 |



| RESULTS | | Deployment | | | | | | WEIGHING |
|---|---|---|---|---|---|---|---|---|
| | | Weak | Undeveloped | Reasonable | Well Developed | Excellent | | |
| | **FINANCIAL AND OPERATIONAL** | | | | | | | |
| | 36 RDI activities have a positive contribution to the financial development of the organization. | | | | | | | 60 |
| | 37 The intellectual capital of the organization has a positive contribution to the financial development. | | | | | | | 25 |
| | **MARKET** | | | | | | | |
| | 38 The innovation has a positive impact on the market share of the organization and on its expansion to new markets | | | | | | | 60 |
| | 39 The development of new products and services impact in the total business volume has been positive. | | | | | | | 40 |
| | 40 The contribution of innovation for the image and reputation of the organization and its products has been positive. | | | | | | | 30 |
| | 41 The innovation activities of the organization have a positive impact on the activity sector. | | | | | | | 30 |
| | **SOCIETY** | | | | | | | |
| | 42 Innovation of the organization has a positive impact in terms of qualified job creation and generation of externalities. | | | | | | | 25 |
| | 43 Innovation of the organization has positive implications concerning Sustainable Development. | | | | | | | 30 |
| | | | | | | | | 1000 |

**Appendix III** – Sensing Future comments, changes in the questions' structure and scores

sensingfuture

**Version 1 - 21st of May - Sensing Future Technologies**

| Questions Asked | Comments | Actions Taken | Score |
|---|---|---|---|
| 1 - The organisation's values promote adaptability, experimentation, learning and continuous change. | It is difficult to relate to change and adaptability as a start-up. | ***reformulated*** | 3 (A+A) |
| 2 - Management transmits an innovative vision that guides the setting of goals and the organisation's strategy. | It is a small team and all members communicate and collaborate closely. | ***reformulated*** | 3 (A+A) |
| 3 - Leadership strategies promote the emergence of ideas for the development of innovative activities, considering accountability and autonomy of its employees. | It is viewed as a goal, but here is space to grow and develop. | ***reformulated*** | 3 (APL) |
| 4 - The organisation has a clear and shared innovation strategy, involving employees in its definition. | | | 1 (A+A) |
| 5 - The organisation monitors the external environment, and uses the acquired knowledge for the definition and implementation of strategy. | It is not a regular monitoring, a point for development was identified. | | 2 (A+A) |
| 6 - The organisation encourages and supports creativity and innovative initiative of its employees. | | | 3 (APL) |
| 7 - The organisation has specific skills in the management of RDI activities. | Currently, all the team members have to learn and perform numerous tasks. Envisioning a multidisciplinary team. | ***changed*** | 2 (APL) |
| 8 - The organisation has the appropriate expertise to carry out R&D activities. | | | 2 (APL) |
| 9 - The organisation has specific skills associated with the performance of its marketing activities. | It was not a concern at the beginning of the project, this question raised a reflection on this issue. | | 1 (APL) |
| 10 - The organisation plans and carries out RDI activities. | A large number of projects are not planned, but opportunities that come up. | ***changed*** | 3 (A+A) |
| 11 - The organisation plans and develops knowledge management. | Complex question for present. | ***changed*** | 2 (APL) |
| 12 - The organisation uses information and communication systems that enhance innovation. | | | 3 (APL) |
| 13 - The organisation develops systematic processes in order to understand the market's needs, expectations and opportunities. | It is difficult to discuss a systematic process. | ***changed*** | 2 (A+A) |
| 14 - The organisation develops systematic processes for internal collaboration. | All the members of the team communicate and collaborate closely, there is no need for a systematic process as the dimension of the company does not justify it yet. | ***deleted*** | N/A |

| | | | |
|---|---|---|---|
| 15 - The organisation has good results in the functioning of project teams. | Only able to observe some results, most of the projects are still being developed. Identified points for improvement. The team seeks to be more independent. | ***deleted*** | 2 (APL) |
| 16 - The organisation develops innovative processes in the management of the activities of the value chain/system. | It is not a main concern, but the team has an active participation. | | 1 (APR) |
| 17 - The organisation incorporates in its activities the obtained learnings. | | | 3 (APR) |
| 18 - The organisation has systematic mechanisms for adoption of good practices. | It is not a concern at the moment, there is no systematic approach or defined process. | ***deleted*** | 1 (APL) |
| 19 - The organisation has defined processes for the evaluation and decision on the protection and valuation of intellectual capital and the results of its RDI activities. | The team plans and evaluates, but it is not a defined process. | ***changed*** | 3 (APL) |
| 20 - The RDI activities have a positive contribution to the financial performance of the organisation. | It is difficult to say, it would be an expectation. | ***changed*** | 4 (APL) |
| 21 - The intellectual capital of the organisation has a positive contribution to its financial performance. | The results are still not measurable. | ***reformulated – currently expected financial performance*** | 3 (APL) |
| 22 - The contribution of innovation to the image and prestige of the organisation and its products has been positive. | This will be reflected on results in the future. | ***changed*** | 4 (APL) |
| 23 – The organisation's innovation activities have a positive impact on the business sector. | It is still soon to say, because there is still no reflection in the market. | ***reformulated*** | N/A |
| **TOTAL:** | | **568,25 (Version 1 of IS - FASt) 775 (Final Version of IS – FASt)** | |
| **General comments (21/05/15):**<br>The FASt application was a good exercise as a debate and group reflection, however needs some adjustments in order to be versatile for Start-up companies.<br>**Skype call (11/09/15):** When confronted with the final version of IS FASt (Appendix IX), the team agreed that questions 9, 11 and 12 were essential and lacking in Version 1 (Appendix III) and the vocabulary was also more adequate. In terms of autonomy in relation to investors, the team described that 51% of the company is owned by their initial investors, therefore the final decisions are dependent on their agreement. However, there is a good cooperation and their investors support and guide decisions rather than imposing them. Regarding question 9 of the final version (Appendix IV), this is where they review themselves as a start-up. In question 11 of the final version, cooperation with external entities such as universities, business incubators and national and international projects was considered very important for global competitiveness. In question 19 of the final version, the team highlighted and valued their quick response upon contact. However, still reported an opportunity for development regarding systematization of these processes, especially to what concerns a decision-making process to choose which opportunities to explore. Yet another aspect highlighted for this question was the importance of prospecting the expected benefits of a project – an aspect that is often missed out as the most important first step for any idea – an invention only becomes innovation if there is a real opportunity in the market. Regarding question 23 of the final version, the company's impact on the business sector is yet difficult to estimate, but expectations are to introduce innovation in patient care with very positive implications for healthcare. | | Actions Taken (21/05/15):<br>***The first application of the IS-FASt was fundamental to learn feedback from this pilot application with a start-up. This induced major structural changes in the information booklet concerning the company's dimension, changes in questions regarding leadership into a more inclusive approach, as a very close team work was verified, and the addition of more questions regarding networking. Also, there was a structural change in the dimension and pillars of Processes.*** | |

APR – Approach; APL – Application; A+A – Approach + Application

## **Appendix IV** – Line Health comments, changes in the questions' structure and scores

**Version 2 - 3rd of August; Final Version – 3rd of August – Line Health**

| Questions Asked | Comments | Actions taken | Score |
|---|---|---|---|
| 1 - The organisation's values promote experimentation and learning. | Part of the company's philosophy and practise. While discussing the final version of this question, stated that the "leadership's values" made more sense than "promoters' values" | | 4 (A+A) |
| 2 - The organisation expresses an innovative vision, involving employees in goal setting. | Small team, working collaboratively in different tasks. "Cultural fitting" is part of the hiring process. | | 4 (A+A) |
| 3 - The organisation promotes the development of innovative activities through accountability and autonomy of its employees. | | | 4 (A+A) |
| 4 - The organisation has a strategy with clear objectives, involving employees in its definition. | Regular "State of the Union" meetings about short and long term objectives | | 4 (A+A) |
| 5 - The organisation monitors the external environment, and uses the acquired knowledge for the definition and implementation of strategy. | | | 3 (APL) |
| 6 - The organisation encourages and supports creativity and innovative initiatives of its employees. | Described the company's Individual Growth Plan initiative and the inclusion of personal/ company goals. | | 4 (A+A) |
| 7 - The organisation has expertise in the management of RDI activities. | | | 4 (A+A) |
| 8 - The organisation uses prototypes and pilot projects in the design of products and services. | Described ideation workshops and multiple partnerships for pilot projets. | | 4 (A+A) |
| 9 - The organisation has competencies associated with the performance of its marketing activities. | | | 4 (A+A) |
| 10 - The organisation develops cooperation activities in innovation with external entities. | Described the "Expert in the House" initiative and Start-up Lisboa business incubator initiatives as an example. | | 4 (A+A) |
| 11 - The organisation organises multiple forms of networking. | | | 4 (A+A) |
| 12 - The organisation plans and carries out RDI activities. | | | 4 (A+A) |
| 13 - The organisation uses creativity tools in the production of ideas in innovation processes and has a knowledge management system. | Described the "Reading List" platform for information sharing as an example. | | 3 (A+A) |
| 14 - The organisation has communication systems that heighten innovation. | | | 4 (A+A) |

| | | | |
|---|---|---|---|
| 15 - The organisation develops processes to understand the market's needs, expectations and opportunities. | Line Health was offered by Bayer to take part of the Digital Health Accelerator program "Grants4Apps" in Berlin, part of the program included market research and patient testing. | | 4 (A+A) |
| 16 - The organisation develops innovative processes in the management of the activities of the value chain / system. | | | 4 (A+A) |
| 17 - The organisation plans and evaluates the protection of its intellectual capital and the results of its RDI activities. | Partners are required to sign non-disclosure agreements. | | 4 (A+A) |
| 18 - The organisation incorporates the obtained learnings and uses the knowledge generated as a source of decision. | Errors in all departments are documented and stored, for future reference. | | 4 (A+A) |
| 19 - The organisation develops processes for planning, organizing and monitoring its RDI projects. | | | 4 (A+A) |
| 20 - The organisation has set routines for the operation of its external relations networks. | Sometimes some of these relations are spontaneous. | | 2 (A+A) |
| 21 - The RDI activities and the protection and valuation of intellectual capital have a positive contribution for the current or expected financial performance of the organisation. | | | 4 (APL) |
| 22 - The organisation has, or seeks to have, the ability to generate return for its stakeholders. | Interest to integrate all the stakeholders – essential requirement to be part of the pharmaceutical industry. | | 3 (APL) |
| 23 - The percentage of growth of turnover has been / will be predictably higher in comparison to the previous year(s). | Expanding to international markets faster than expected. | | 4 (APL) |
| 24 - The organisation of innovation activities prospect a positive impact on the business sector. | | | 4 (APL) |
| **TOTAL:** | **981,25 (Version 2 of IS - FASt) 978,75 (Final Version of IS – FASt)** | | |
| **General comments (3/08/15):**<br>Did not understand the meaning of external environment.<br>**Second Skype call (18/08/15):**<br>When asked to answer question 6 of the final version of IS FASt, answered 4 in terms of autonomy, both approach and application. Stated that investors' capital was not a critical factor for starting to work on the idea, but was critical to take the idea to the market.<br>Further comments on the final version of the IS FASt were in regards to completely agreeing with the vision that talent should be part of any organisation - this company has started to attract talented people as well (question 7 of final version);<br>As a conclusion, the interviewees stated that IS FASt was an important self-reflection exercise, allowed the identification of points for improvement (for example, to develop more systematic knowledge management processes) and that the final version generally covered the majority of relevant topics in regards to innovation. When questioned about the high score attributed the interviewees answered that the score given was a true reflection of how they felt and how they function as an innovative company.<br>For the purpose of this questionnaire, Line Health considered their present assessment (i.e., their capabilities having their dimension and resources in consideration) and readiness for the next step in terms of business growth. Referred second call with discussion to be more useful. | | | Actions taken:<br>***Explained*** |

## **Appendix V** – Yonest Comments, comments, changes in the questions' structure and scores

**Version 2 - 4th of August - Yonest**

| Questions Asked | Comments | Actions Taken | Score |
|---|---|---|---|
| 1 - The organisation's values promote experimentation and learning. | The company promotes experimentation within the time limits of daily activity. There is total openness for innovation, however application can be improved so that employees are able to devote more time to improving processes versus executing tasks. | | 2 (APL) |
| 2 - The organisation expresses an innovative vision, involving employees in goal setting. | It makes more sense to talk about team instead of organisation. There is a certain openness for suggestion, but it is not always possible for everyone to question the plan. Not all employees have access to all information. People are asked to be part of the solution. | ***changed*** | 2 (APL) |
| 3 - The organisation promotes the development of innovative activities through accountability and autonomy of its employees. | Often employees do not want autonomy, or do not feel prepared. But every month people are challenged. | | 3 (A+A) |
| 4 - The organisation has a strategy with clear objectives, involving employees in its definition. | There are very clear ideas on leadership, there is still opportunity to engage people. | ***changed*** | 2 (APL) |
| 5 - The organisation monitors the external environment, and uses the acquired knowledge for the definition and implementation of strategy. | The word "alert" makes more sense than "monitoring". Identified feedback platforms, but market research as a point for further improvement. | ***changed*** | 2 (APL) |
| 6 - The organisation encourages and supports creativity and innovative initiatives of its employees. | Identified the culture as a point of improvement. | | 3 (A+A) |
| 7 - The organisation has expertise in the management of RDI activities. | | | 3 (A+A) |
| 8 - The organisation uses prototypes and pilot projects in the design of products and services. | | | 4 (A+A) |
| 9 - The organisation has competencies associated with the performance of its marketing activities. | | | 2 (A+A) |
| 10 - The organisation develops cooperation activities in innovation with external entities. | Identified as one of the organisation's strengths. | | 4 (A+A) |

| | | | |
|---|---|---|---|
| 11 - The organisation organises multiple forms of networking. | | | 4 (A+A) |
| 12 - The organisation plans and carries out RDI activities. | | | 4 (A+A) |
| 13 - The organisation uses creativity tools in the production of ideas in innovation processes and has a knowledge management system. | Can improve a lot regarding knowledge management system; two different ideas. | | 2 (A+A) |
| 14 - The organisation has communication systems that heighten innovation. | | | 2 (APL) |
| 15 - The organisation develops processes to understand the market's needs, expectations and opportunities. | New market segment. | | 3 (APL) |
| 16 - The organisation develops innovative processes in the management of the activities of the value chain / system. | | | 3 (A+A) |
| 17 - The organisation plans and evaluates the protection of its intellectual capital and the results of its RDI activities. | Trademark in Portugal - protection is not easy in the sector. | | 3 (A+A) |
| 18 - The organisation incorporates the obtained learnings and uses the knowledge generated as a source of decision. | | | 3 (APL) |
| 19 - The organisation develops processes for planning, organizing and monitoring its RDI projects. | | | 4 (A+A) |
| 20 - The organisation has set routines for the operation of its external relations networks. | Question considered in a growth perspective | | 2 (APL) |
| 21 - The RDI activities and the protection and valuation of intellectual capital have a positive contribution for the current or expected financial performance of the organisation. | | | 2 (APL) |
| 22 - The organisation has, or seeks to have, the ability to generate return for its stakeholders. | | | 3 (APL) |
| 23 - The percentage of growth of turnover has been / will be predictably higher in comparison to the previous year(s). | | | 4 (APL) |
| 24 - The organisation of innovation activities prospect a positive impact on the business sector. | | | 4 (APL) |
| **TOTAL:** | **740 (Version 2 of IS - FASt) 765 (Final Version of IS – FASt)** | | |
| **General comments:**<br>Considered the FASt not like what it would be desirable, but as reflecting what actually happens within the organisation.<br>Venture capital instruments are fundamental, however should be considered as a resource, not as conditions.<br>There are alternatives, such as the banking system and other entities that should be considered. Own funds are not always the only form of capital and money is not the only resource of a company, there are alternatives (like partnerships, state support or community support to develop products and processes). Sometimes it is just a matter of being at the right place at the right time, a mix of intuition, talent and luck.<br>FASt provided a reflection on a set of things that are advantages, and others that can be improved: involve the team more, use tools that further encourage innovation, and have systematized processes for the future. Identified strengths in project management, execution and taking them to the market. | | | Actions Taken:<br><br>Changed in the final version. |

**Appendix VI** – Skaphandrus comments, changes in the questions' structure and scores

**Version 3 - 5th of August – Skaphandrus**

| Questions Asked | Comments | | Score |
|---|---|---|---|
| 1 - The values of the founders inspire experimentation and learning. | It should be the values of the promoters. | ***changed*** | 3 (A+A) |
| 2 – The founders express an innovative business model, involving employees in setting goals. | It doesn't make sense to involve employees in the definition of the business model unless they are directly involved | ***changed to innovative vision*** | 3 (A+A) |
| 3 - The team promotes the development of innovative activities through accountability and autonomy of its employees. | Employees are free to suggest, however it is difficult to give full autonomy. New projects are time consuming, everyone is very busy and resources must be well managed according to the main strategy. | ***changed*** | 3 (A+A) |
| 4 - The team has a development plan/path with clear objectives, involving employees in its definition. | Again, employees are free to make suggestions, however it is difficult to accommodate everyone's opinion. The opinion of users is crucial as well, to be considered. | ***already considered in question 16*** | 3 (A+A) |
| 5 - The team is alert to the external environment and uses the gathered information to define the strategy. | It is truly a question of monitoring. | ***This would imply a structured process - no change was made*** | 3 (A+A) |
| 6 - What is the risk tolerance / autonomy in relation to Corporate Venture Capital / Business Angels / investors? | Complex question, could be translated into a series of questions…How was the initial capital critical for the start of the business?<br><br>Should be in Resources, not in Conditions | ***maintained (impracticability of too many questions); changed in final version*** | 3 (APL) |
| 7 - The team has the capacity to capture talent and this is reflected in its objectives. | Not a priority, it is difficult to find talent in Biology in Portugal, the investigation is centred in fishing, with a very poor knowledge of biodiversity. | | 1 (APR) |
| 8 - The team has expertise in the planning and management of RDI activities. | | | 3 (A+A) |
| 9 - The team uses prototypes and pilot projects in the design of products and services. | Difficult to prototype an app, however it is possible to allow users to try for free and then pay to upgrade. | | 3 (A+A) |
| 10 - The team has competencies associated with the performance of its marketing activities. | Identified empirical competence but no formal competence. | | 2 (APR) |
| 11 - The team develops cooperation activities in innovation with external entities. | | | 3 (A+A) |

| | | | |
|---|---|---|---|
| 12 - The team organises multiple forms of networking. | The team participates, but does not organise. | ***Changed*** | 3 (A+A) |
| 13 - The team plans and carries out RDI activities. | | | 3 (A+A) |
| 14 - The team uses creativity tools in the production of ideas in innovation processes and has a knowledge management system. | Two different questions | ***changed in the final version*** | 3 (A+A) |
| 15 - The team has communication systems that heighten innovation. | | | 3 (A+A) |
| 16 - The team develops processes in order to understand the market's needs, expectations and opportunities. | Does not develop, but integrates. | ***changed*** | 3 (A+A) |
| 17 - The team develops innovative processes in the management of the activities of the value chain / system. | | | 3 (APL) |
| 18 - The team plans and evaluates the protection of its intellectual capital and the results of its RDI activities. | Especially important to register internationally. | | 1 (APL) |
| 19 - The team incorporates the obtained learnings and uses the knowledge generated as a source of decision. | | | 3 (APL) |
| 20 - The team develops processes for planning, organizing and monitoring its RDI projects. | | | 3 (A+A) |
| 21 - The team has set routines for the operation of its external relations networks. | Repeated in questions 10 and 11. | ***changed in the final version*** | 1 (A+A) |
| 22 - The RDI activities and the protection and valuation of intellectual capital have a positive contribution for the current or expected financial performance of the team. | | | 1 (APL) |
| 23 - The team has, or seeks to have, the ability to generate return for its stakeholders. | A team always has to believe in that, it is crucial. | | 3 (APL) |
| 24 - The percentage of growth of turnover has been / will be predictably higher in comparison to the previous year(s). | | | 3 (APL) |
| 25 – The innovation features of the team prospect a positive impact on the business sector. | Creating new platforms for diving and all the associated touristic activities, public interest, job creation, science development in biology. | | 4 (APL) |
| **TOTAL:** | **681,25 (Version 3 of IS - FASt) 695,50 (Final Version of IS – FASt)** | | |

| | |
|---|---|
| **General comments:**<br>It should be a numeric scale.<br>To assess financial figures and return are difficult tasks for a start-up and depend on the business areas. In any case, it is only possible to make assumptions. Thus, it is easy to "fail to see the gaps", because in a start-up, everything is unpredictable.<br>Excellent is not a score a start-up should have, because start-ups are still trying to prove themselves. The answers were given understanding that the company still has many topics for learning and improvement.<br>Expected a tool for start-ups to learn more - the questions did not bring anything new, but found this type of internal reflection useful. Talking to the promoters is also different than crossing perspectives with employees. | Actions Taken:<br>***maintained***<br>***not changed - it is stated in the summary booklet that the answer to question 23 should be an estimate, based on information including market research studies and sales expectations at present*** |

## **Appendix VII** – Rice Me comments, changes in the questions' structure and scores

**Version 4 - 5th of August – Rice Me**

| Questions Asked | Comments | Actions taken | Score |
|---|---|---|---|
| 1 - The values of the promoters inspire experimentation and learning. | Values guide the company, but are not written, there is a long way to go in terms of application. Trade-off values for profitability. | | 2 (APL) |
| 2 – The promoters express an innovative vision, involving employees in setting goals. | Not every employee is prepared to assume the consequences. | | 2 (APL) |
| 3 - The team promotes the suggestion of innovative activities through accountability and autonomy of its employees. | This depends on the organisation's level of development. | ***updated in the Summary booklet*** | 3 (APL) |
| 4 - The team has a development plan/path with clear objectives, involving employees in its definition. | Perhaps the employee involvement is redundant in this question. The plan has to be defined by the promoters. | ***changed*** | 1 (APL) |
| 5 - The team is alert to the external environment and uses the gathered information to define the strategy. | Considered initial market research, consumption trends, questionnaires, competition and pricing analysis. | | 3 (A+A) |
| 6 - What is the risk tolerance / autonomy in relation to Corporate Venture Capital / Business Angels / investors? | Autonomy is greatly reduced. This question could be decomposed. | ***extending this point, however, would increase the length of the questionnaire*** | 2 (APR) |
| 7 - The team has the capacity to capture talent and this is reflected in its objectives. | This is not particularly a goal at the point, but for the future after the product has been launched. Attributed importance to employees who execute and do not question, the development / rewarding of employees within the team and to taking people with incremental characteristics on board, necessary for the company at that moment. Careful recruitment process. | ***updated in the Summary booklet*** | 3 (A+A) |
| 8 - The team has expertise in the management of RDI activities. | | | 2 (APL) |
| 9 - The team uses prototypes and pilot projects in the design of products and services. | | | 3 (A+A) |
| 10 - The team has competencies associated with the performance of its marketing activities. | | | 2 (APL) |
| 11 - The team develops cooperation activities in innovation with external entities. | It is not very easy in Portugal – but an increasing trend among start-ups. Incubators and cooperation with universities are a good example. | | 2 (APL) |
| 12 - The team participates in multiple forms of networking. | Networking - scarce realization. Cooperation is important. | | 1 (APL) |

| | | | |
|---|---|---|---|
| 13 - The team plans and carries out RDI activities. | This question is similar to question 8. | ***deleted*** | 2 (APL) |
| 14 - The team uses creativity tools in the production of ideas in innovation processes and these are organised in a knowledge management system. | Will be more relevant after the product is on the market and the team grows. Processes are not institutionalized. | ***updated in the Summary booklet*** | 2 (APL) |
| 15 - The team has communication systems that heighten innovation. | Is not justified yet, only in the future, for franchising - useful reflection for future practices | | 1 (APL) |
| 16 - The team integrates processes in order to understand the market's needs, expectations and opportunities. | | | 3 (A+A) |
| 17 - The team develops innovative processes in the management of the activities of the value chain / system. | | | 1 (APL) |
| 18 - The team plans and evaluates the protection of its intellectual capital and the results of its RDI activities. | | | 3 (A+A) |
| 19 - The team incorporates the obtained learnings and uses the knowledge generated as a source of decision. | | | 3 (APL) |
| 20 - The team develops processes for planning, organizing and monitoring its RDI projects. | | | 3 (A+A) |
| 21 - The team has set routines for the operation of its external relations networks. | Agreed volumes, set prices, have not yet closed deals with all suppliers. | | 2 (APL) |
| 22 - The RDI activities and the protection and valuation of intellectual capital have a positive contribution for the current or expected financial performance of the team. | | | 3 (APL) |
| 23 - The team has, or seeks to have, the ability to generate return for its stakeholders. | Expectation of return after 2 ½ years. Based the question analysis on rice consumption statistics and tendency analysis. | | 2 (APL) |
| 24 - The percentage of growth of turnover has been / will be predictably higher in comparison to the previous year(s). | Will structure to grow on the second year. Calculated a three years forecast based on expected in restaurant sales, which can grow with a takeaway service. Expectation of a moderate growth, in a prudent and sustainable perspective. | | 2 (APL) |
| 25 – The innovation features of the team prospect a positive impact on the business sector. | Employment opportunities, contributing for a healthy lifestyle. | | 2 (APL) |
| **TOTAL:** | | **560 (Version 4 of IS - FASt) 556,25 (Final Version of IS – FASt)** | |
| **General comments:**<br>It should be a numeric scale. It is not explained what to do in case the question asked does not apply to the reality of the start-up, for example in Rice Me's case, when the product is not yet on the market.<br>The questions could be more specific.<br>Identified areas for the start-up's improvement. It was a good discussion, but found qualitative scales difficult to use. Questioned if the result will actually be useful. Good thing of start-ups is that there is always plenty of room to grow, which is limited in highly organised companies. | | Actions Taken:<br>***maintained scale and updated in the Introduction booklet, p.7***<br>***however, this would be very difficult to accommodate due to the versatility the questionnaire aims for, to be functional to different business sectors.*** | |

**Appendix VIII** – Stickables Comments, comments, changes in the questions' structure and scores

**Version 5 - 12st of Aug - Stickables**

| Questions Asked | Comments | | Score |
|---|---|---|---|
| 1 - The values of the promoters inspire experimentation and learning. | | | 4 (A+A) |
| 2 – The promoters express an innovative vision, involving employees in setting goals. | | | 4 (A+A) |
| 3 - The team promotes the suggestion of innovative activities through accountability and autonomy of its employees. | | | 3 (A+A) |
| 4 - The team has a development plan/path with clear objectives. | | | 3 (A+A) |
| 5 - The team is alert to the external environment and uses the gathered information to define the strategy. | | | 2 (A+A) |
| 6 - What is the risk tolerance / autonomy in relation to Corporate Venture Capital / Business Angels / investors / financing sources? | | | 2 (APL) |
| 7 - The team has the capacity to capture talent and this is reflected in its objectives. | | | 3 (APL) |
| 8 - The team has expertise in the planning and management of RDI activities. | | | 3 (A+A) |
| 9 - The team uses prototypes and pilot projects in the design of products and services. | | | 4 (A+A) |
| 10 - The team has competencies associated with the performance of its marketing activities. | | | 4 (A+A) |
| 11 - The team develops cooperation activities in innovation with external entities. | | | 1 (A+A) |
| 12 - The team participates in multiple forms of networking. | | | 3 (A+A) |
| 13 - The team uses creativity tools in the production of ideas in innovation processes and these are organised in a knowledge management system. | | | 1 (A+A) |
| 14 - The team has communication systems that heighten innovation. | | | 4 (A+A) |
| 15 - The team integrates processes in order to understand the market's needs, expectations and opportunities. | | | 2 (APL) |
| 16 - The team develops innovative processes in the management of the activities of the value chain / system. | | | 2 (A+A) |
| 17 - The team plans and evaluates the protection of its intellectual capital and the results of its RDI activities. | | | 4 (A+A) |
| 18 - The team incorporates the obtained learnings and uses the knowledge generated as a source of decision. | | | 4 (A+A) |
| 19 - The team develops processes for planning, organizing and monitoring its RDI projects. | | | 2 (A+A) |
| 20 - The team has set routines for the operation of its external relations networks. | | | 1 (A+A) |
| 21 - The RDI activities and the protection and valuation of intellectual capital have a positive contribution for the current or expected financial performance of the team. | | | 3 (APL) |
| 22 - The team has, or seeks to have, the ability to generate return for its stakeholders. | | | 4 (APL) |
| 23 - The percentage of growth of turnover has been / will be predictably higher in comparison to the previous year(s). | | | 3 (APL) |
| 24 – The innovation features of the team prospect a positive impact on the business sector. | | | 4 (APL) |
| **TOTAL:** | **762,50 (Version 4 of IS - FASt) 770 (Final Version of IS – FASt)** | | |
| **General comments:** Enjoyed the thesis project presentation, the questions raised up reflection on the processes of the start-up and the way to deal with them. | | | |

# **Appendix IX** – Matrix of the changes in the questions' structure

| Q | Sensing Future | Δ1 | Line Health | Δ2 | Yonest | Δ3 | Skaphandrus | Δ4 | Rice Me | Δ5 | Stickables | Δ6 | FV IS FASt |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| ***1*** | The organization's values promote adaptability, experimentation, learning and continuous change. | → | The organization's values promote experimentation and learning. | = | = | → | The values of the founders inspire experimentation and learning. | → | The values of the promoters inspire experimentation and learning. | = | = | = | The values of the promoters inspire experimentation and learning. |
| ***2*** | Management transmits an innovative vision that guides the setting of goals and the organization's strategy. | → | The organization expresses an innovative vision, involving employees in goal setting. | = | = | → | The founders express an innovative business model, involving employees in setting goals. | → | The promoters express na innovative vision, involving employees in setting goals. | = | = | = | The promoters express na innovative vision, involving employees in setting goals. |
| ***3*** | Leadership strategies promote the emergence of ideas for the development of innovative activities, considering accountability and autonomy of its employees. | → | The organization promotes the development of innovative activities through accountability and autonomy of its employees. | = | = | → | The team promotes the development of innovative activities through accountability and autonomy of its employees. | → | The team promotes the suggestion of innovative activities through accountability and autonomy of its employees. | = | = | = | The team promotes the suggestion of innovative activities through accountability and autonomy of its employees. |
| ***4*** | The organization has a clear and shared innovation strategy, involving employees in its definition. | = | = | = | = | → | The team has a development plan/path with clear objectives, involving employees in its definition. | = | = | = | = | → | The team has a development plan/path with clear objectives. |
| ***5*** | The organization monitors the external environment, and uses the acquired knowledge for the definition and implementation of strategy. | = | = | = | = | → | The team is alert to the external environment and uses the gathered information to define the strategy. | = | = | = | = | = | The team is alert to the external environment and uses the gathered information to define the strategy. |
| ***6*** | The organization encourages and supports creativity and innovative initiative of its employees. | = | = | = | = | →7 | What is the risk tolerance / autonomy in relation to Corporate Venture Capital / Business Angels / investors? | = | = | → | What is the risk tolerance / autonomy in relation to Corporate Venture Capital / Business Angels / investors / financing sources? | = | What is the risk tolerance / autonomy in relation to Corporate Venture Capital / Business Angels / investors / financing sources? |
| ***7*** | The organization has specific skills in the management of RDI activities. | → | The organization has expertise in the management of RDI activities. | = | = | →8 | The team has the capacity to capture talent and this is reflected in its objectives. | = | = | = | = | = | The team has the capacity to capture talent and this is reflected in its objectives. |
| ***8*** | The organization has the appropriate expertise to carry out R&D activities. | → | The organization uses prototypes and pilot projects in the design of products and services. | = | = | →9 | The team has expertise in the planning and management of RDI activities. | = | = | = | = | = | The team has expertise in the planning and management of RDI activities. |
| ***9*** | The organization has specific skills associated with the performance of its marketing activities. | = | = | = | = | →10 | The team uses prototypes and pilot projects in the design of products and services. | = | = | = | = | = | The team uses prototypes and pilot projects in the design of products and services. |
| ***10*** | The organization plans and carries out RDI activities. | →12 | The organization develops cooperation activities in innovation with external entities. | = | = | →11 | The team has competencies associated with the performance of its marketing activities. | = | = | = | = | = | The team has competencies associated with the performance of its marketing activities. |
| ***11*** | The organization plans and develops knowledge management. | →13 | The organization organizes multiple forms of networking. | = | = | →12 | The team develops cooperation activities in innovation with external entities. | = | = | = | = | = | The team develops cooperation activities in innovation with external entities. |
| ***12*** | The organization uses information and communication systems that enhance innovation. | →14 | The organization plans and carries out RDI activities. | = | = | →13 | The team organizes multiple forms of networking. | → | The team participates multiple forms of networking. | = | = | = | The team participates multiple forms of networking. |

| Q | Sensing Future | Δ1 | Line Health | Δ2 | Yonest | Δ3 | Skaphandrus | Δ4 | Rice Me | Δ5 | Stickables | Δ6 | FV IS FASt |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| ***13*** | The organization develops systematic processes in order to understand the market's needs, expectations and opportunities. | ➔15 | The organization uses creativity tools in the production of ideas in innovation processes and has a knowledge management system. | = | = | ➔14 | The team plans and carries out RDI activities. | = | = | X | The team uses creativity tools in the production of ideas in innovation processes and these are organized in a knowledge management system. | ➔13 ➔14 | The team uses creativity tools and communication systems that heighten innovation. |
| ***14*** | The organization develops systematic processes for internal collaboration. | X | The organization has communication systems that heighten innovation. | = | = | ➔15 | The team uses creativity tools in the production of ideas in innovation processes and has a knowledge management system. | ➔ | The team uses creativity tools in the production of ideas in innovation processes and these are organized in a knowledge management system. | ➔13 | The team has communication systems that heighten innovation. | ➔13 ➔14 | The team organizes ideas in a knowledge management system. |
| ***15*** | The organization has good results in the functioning of project teams. | X | The organization develops processes to understand the market's needs, expectations and opportunities. | = | = | ➔16 | The team has communication systems that heighten innovation. | = | = | ➔14 | The team integrates processes in order to understand the market's needs, expectations and opportunities. | = | The team integrates processes in order to understand the market's needs, expectations and opportunities. |
| ***16*** | The organization develops innovative processes in the management of the activities of the value chain/system. | = | = | = | = | ➔17 | The team develops processes to understand the market's needs, expectations and opportunities. | ➔ | The team integrates processes in order to understand the market's needs, expectations and opportunities. | ➔15 | The team develops innovative processes in the management of the activities of the value chain/system. | = | The team develops innovative processes in the management of the activities of the value chain/system. |
| ***17*** | The organization incorporates in its activities the obtained learnings. | ➔18 | The organization plans and evaluates the protection of its intellectual capital and the results of its RDI activities. | = | = | ➔18 | The team develops innovative processes in the management of the activities of the value chain/system. | = | = | ➔16 | The team plans and evaluates the protection of its intellectual capital and the results of its RDI activities. | = | The team plans and evaluates the protection of its intellectual capital and the results of its RDI activities. |
| ***18*** | The organization has systematic mechanisms for adoption of good practices. | X | The organization incorporates the obtained learnings and uses the knowledge generated as a source of decision. | = | = | ➔19 | The team plans and evaluates the protection of its intellectual capital and the results of its RDI activities. | = | = | ➔17 | The team incorporates the obtained learnings and uses the knowledge generated as a source of decision. | = | The team incorporates the obtained learnings and uses the knowledge generated as a source of decision. |
| ***19*** | The organization has defined processes for the evaluation and decision on the protection and valuation of intellectual capital and the results of its RDI activities. | ➔17 | The organization develops processes for planning, organizing and monitoring its RDI projects. | = | = | ➔20 | The team incorporates the obtained learnings and uses the knowledge generated as a source of decision. | = | = | ➔18 | The team develops processes for planning, organizing and monitoring its RDI projects. | = | The team develops processes for planning, organizing and monitoring its RDI projects. |
| ***20*** | The RDI activities have a positive contribution to the financial performance of the organization. | ➔21 | The organization has set routines for the operation of its external relations networks. | = | = | ➔21 | The team develops processes for planning, organizing and monitoring its RDI projects. | = | = | ➔19 | The team has set routines for the operation of its external relations networks. | X | The RDI activities and the protection and valuation of intellectual capital have a positive contribution for the current or expected financial performance of the team. |
| ***21*** | The intellectual capital of the organization has a positive contribution to its financial performance. | (+20)➔ | The RDI activities and the protection and valuation of intellectual capital have a positive contribution for the current or expected financial performance of the organization. | = | = | ➔22 | The team has set routines for the operation of its external relations networks. | = | = | ➔20 | The RDI activities and the protection and valuation of intellectual capital have a positive contribution for the current or expected financial performance of the team. | ➔20 | The team has, or seeks to have, the ability to generate return for its stakeholders. |
| ***22*** | The contribution of innovation to the image and prestige of the organization and its products has been positive. | ➔ | The organization has, or seeks to have, the ability to generate return for its stakeholders. | = | = | ➔23 | The RDI activities and the protection and valuation of intellectual capital have a positive contribution for the current or expected financial performance of the team. | = | = | ➔21 | The team has, or seeks to have, the ability to generate return for its stakeholders. | ➔21 | The percentage of growth of turnover has been / will be predictably higher in comparison to the previous year(s). |
| ***23*** | The organization's innovation activities have a positive impact on the business sector. | ➔24 | The percentage of growth of turnover has been / will be predictably higher in comparison to the previous year(s). | = | = | ➔24 | The team has, or seeks to have, the ability to generate return for its stakeholders. | = | = | ➔22 | The percentage of growth of turnover has been / will be predictably higher in comparison to the previous year(s). | ➔22 | The innovation features of the team prospect a positive impact on the business sector. |
| ***24*** | X | X | The organization of innovation activities prospect a positive impact on the business sector. | = | = | ➔25 | The percentage of growth of turnover has been / will be predictably higher in comparison to the previous year(s). | = | = | ➔23 | The innovation features of the team prospect a positive impact on the business sector. | ➔23 | The innovation features of the team prospect a positive impact on the business sector. |
| ***25*** | X | X | X | X | X | | The innovation features of the team prospect a positive impact on the business sector. | = | = | ➔24 | X | X | X |

"➔" question changed // "X" question deleted // "=" no change // green font new question

Example of interpretation to track the progress of question 11 from the first version of IS FASt:

1 – After the first application (Sensing Future), the question was changed and moved from place. Question 11 to Sensing Future becomes question 13 to Line Health;
2 – After the second application (Line Health), the question remains unchanged;
3 – After the third application (Yonest), the question was changed and moved from place. Question 13 to Yonest becomes question 14 to Skaphandrus;
4 – After the fourth application (Skaphandrus), the question was changed but remains in place;
5 – After the fifth application (Rice Me), the question was changed and moved from place. Question 14 to Rice Me becomes question 13 to Stickables;
6 – After the sixth application (Stickables), the question was changed and moved from place. Question 13 to Stickables in divided into question 13 and 14 in the final version of IS FASt.

NOTE:
1 – for readability purposes, whenever a question was moved from place the symbol of changed question ("➔") was introduced followed by the new number;
2 – some changes were not made on the immediate subsequent application of the IS FASt but only later. To confirm which start-up was responsible for specific changes, refer to Appendixes III to VIII.

| Q | Sensing Future | Δ1 | Line Health | Δ2 | Yonest | Δ3 | Skaphandrus | Δ4 | Rice Me | Δ5 | Stickables | Δ6 | FV IS FASt |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| ***11*** | The organization plans and develops knowledge management. | ➔13 | The organization organizes multiple forms of networking. | = | = | ➔12 | The team develops cooperation activities in innovation with external entities. | = | = | = | = | = | The team develops cooperation activities in innovation with external entities. |
| ***12*** | The organization uses information and communication systems that enhance innovation. | ➔14 | The organization plans and carries out RDI activities. | = | = | ➔13 | The team organizes multiple forms of networking. | ➔ | The team participates multiple forms of networking. | = | = | = | The team participates multiple forms of networking. |
| ***13*** | The organization develops systematic processes in order to understand the market's needs, expectations and opportunities. | ➔15 | The organization uses creativity tools in the production of ideas in innovation processes and has a knowledge management system. | = | = | ➔14 | The team plans and carries out RDI activities. | = | = | X | The team uses creativity tools in the production of ideas in innovation processes and these are organized in a knowledge management system. | ➔13<br>➔14 | The team uses creativity tools and communication systems that heighten innovation. |
| ***14*** | The organization develops systematic processes for internal collaboration. | X | The organization has communication systems that heighten innovation. | = | = | ➔15 | The team uses creativity tools in the production of ideas in innovation processes and has a knowledge management system. | ➔ | The team uses creativity tools in the production of ideas in innovation processes and these are organized in a knowledge management system. | ➔13 | The team has communication systems that heighten innovation. | ➔13<br>➔14 | The team organizes ideas in a knowledge management system. |

## **Appendix X** – Innovation Scoring – a Fast-track Approach for Start-ups (Final Version)

| | | Maximuim Score | # | Questions | Value [ 0 a 4 ] | Score | Pillar Score | Dimension Score | Global Score IS FASt |
|---|---|---|---|---|---|---|---|---|---|
| CONDITIONS | Culture | 75 | 1 | The values of the promoters inspire experimentation and learning. | | 0.00 | 0.00 | 0.00 | 0.00 |
| | Strategy and Planning | 30 | 2 | The promoters express an innovative vision, involving employees in setting goals. | | 0.00 | 0.00 | | |
| | | 20 | 3 | The team promotes the suggestion of innovative activities through accountability and autonomy of its employees. | | 0.00 | | | |
| | | 35 | 4 | The team has a development plan/path with clear objectives. | | 0.00 | | | |
| | | 20 | 5 | The team is alert to the external environment and uses the gathered information to define the strategy. | | 0.00 | | | |
| RESOURCES | Financial Resources | 40 | 6 | What is the risk tolerance / autonomy in relation to Corporate Venture Capital / Business Angels / investors / financing sources? | | 0.00 | 0.00 | 0.00 | |
| | Human Resources | 55 | 7 | The team has the capacity to capture talent and this is reflected in its objectives. | | 0.00 | 0.00 | | |
| | Skills | 35 | 8 | The team has expertise in the planning and management of RDI activities. | | 0.00 | 0.00 | | |
| | | 35 | 9 | The team uses prototypes and pilot projects in the design of products and services. | | 0.00 | | | |
| | | 20 | 10 | The team has competencies associated with the performance of its marketing activities. | | 0.00 | | | |
| | External Relationships | 35 | 11 | The team develops cooperation activities in innovation with external entities. | | 0.00 | 0.00 | | |
| | | 25 | 12 | The team participates in multiple forms of networking. | | 0.00 | | | |
| | Information Tools and Systems | 25 | 13 | The team uses creativity tools and communication systems that heighten innovation. | | 0.00 | 0.00 | | |
| | | 20 | 14 | The team organizes ideas in a knowledge management system. | | 0.00 | | | |
| PROCESSES | RDI Activities Management | 60 | 15 | The team integrates processes in order to understand the market's needs, expectations and opportunities. | | 0.00 | 0.00 | 0.00 | |
| | | 60 | 16 | The team develops innovative processes in the management of the activities of the value chain / system. | | 0.00 | | | |
| | | 40 | 17 | The team plans and evaluates the protection of its intellectual capital and the results of its RDI activities. | | 0.00 | | | |
| | Management of Knowledge and Learnings | 40 | 18 | The team incorporates the obtained learnings and uses the knowledge generated as a source of decision. | | 0.00 | 0.00 | | |
| | RDI Projects Management | 30 | 19 | The team develops processes for planning, organizing and monitoring its RDI projects. | | 0.00 | 0.00 | | |
| RESULTS | Ability to Generate Return | 70 | 20 | The RDI activities and the protection and valuation of intellectual capital have a positive contribution for the current or expected financial performance of the team. | | 0.00 | 0.00 | 0.00 | |
| | | 40 | 21 | The team has, or seeks to have, the ability to generate return for its stakeholders. | | 0.00 | | | |
| | Team's Development | 95 | 22 | The percentage of growth of turnover has been / will be predictably higher in comparison to the previous year(s). | | 0.00 | 0.00 | | |
| | | 95 | 23 | The innovation features of the team prospect a positive impact on the business sector. | | 0.00 | | | |

| Global Score IS FASt |
|---|
| 0.00 |

## **Appendix XI** – IS FASt – answers to the final version: Sensing Future

| | | Maximuim Score | # | Questions | Value [ 0 a 4 ] | Score | Pillar Score | Dimension Score | Global Score IS FASt |
|---|---|---|---|---|---|---|---|---|---|
| CONDITIONS | Culture | 75 | 1 | The values of the promoters inspire experimentation and learning. | 3 | 56.25 | 56.25 | 135.00 | 775.00 |
| | Strategy and Planning | 30 | 2 | The promoters express an innovative vision, involving employees in setting goals. | 3 | 22.50 | 78.75 | | |
| | | 20 | 3 | The team promotes the suggestion of innovative activities through accountability and autonomy of its employees. | 3 | 15.00 | | | |
| | | 35 | 4 | The team has a development plan/path with clear objectives. | 3 | 26.25 | | | |
| | | 20 | 5 | The team is alert to the external environment and uses the gathered information to define the strategy. | 3 | 15.00 | | | |
| RESOURCES | Financial Resources | 40 | 6 | What is the risk tolerance / autonomy in relation to Corporate Venture Capital / Business Angels / investors / financing sources? | 2 | 20.00 | 20.00 | 216.25 | |
| | Human Resources | 55 | 7 | The team has the capacity to capture talent and this is reflected in its objectives. | 3 | 41.25 | 41.25 | | |
| | Skills | 35 | 8 | The team has expertise in the planning and management of RDI activities. | 3 | 26.25 | 66.25 | | |
| | | 35 | 9 | The team uses prototypes and pilot projects in the design of products and services. | 4 | 35.00 | | | |
| | | 20 | 10 | The team has competencies associated with the performance of its marketing activities. | 1 | 5.00 | | | |
| | External Relationships | 35 | 11 | The team develops cooperation activities in innovation with external entities. | 4 | 35.00 | 60.00 | | |
| | | 25 | 12 | The team participates in multiple forms of networking. | 4 | 25.00 | | | |
| | Information Tools and Systems | 25 | 13 | The team uses creativity tools and communication systems that heighten innovation. | 3 | 18.75 | 28.75 | | |
| | | 20 | 14 | The team organizes ideas in a knowledge management system. | 2 | 10.00 | | | |
| PROCESSES | RDI Activities Management | 60 | 15 | The team integrates processes in order to understand the market's needs, expectations and opportunities. | 3 | 45.00 | 105.00 | 157.50 | |
| | | 60 | 16 | The team develops innovative processes in the management of the activities of the value chain / system. | 2 | 30.00 | | | |
| | | 40 | 17 | The team plans and evaluates the protection of its intellectual capital and the results of its RDI activities. | 3 | 30.00 | | | |
| | Management of Knowledge and Learnings | 40 | 18 | The team incorporates the obtained learnings and uses the knowledge generated as a source of decision. | 3 | 30.00 | 30.00 | | |
| | RDI Projects Management | 30 | 19 | The team develops processes for planning, organizing and monitoring its RDI projects. | 3 | 22.50 | 22.50 | | |
| RESULTS | Ability to Generate Return | 70 | 20 | The RDI activities and the protection and valuation of intellectual capital have a positive contribution for the current or expected financial performance of the team. | 4 | 70.00 | 100.00 | 266.25 | |
| | | 40 | 21 | The team has, or seeks to have, the ability to generate return for its stakeholders. | 3 | 30.00 | | | |
| | Team's Development | 95 | 22 | The percentage of growth of turnover has been / will be predictably higher in comparison to the previous year(s). | 4 | 95.00 | 166.25 | | |
| | | 95 | 23 | The innovation features of the team prospect a positive impact on the business sector. | 3 | 71.25 | | | |

| Global Score IS FASt |
|---|
| 775.00 |

## **Appendix XII** – IS FASt – answers to the final version: Line Health

| | | Maximuim Score | # | Questions | Value [ 0 a 4 ] | Score | Pillar Score | Dimension Score | Global Score IS FASt |
|---|---|---|---|---|---|---|---|---|---|
| CONDITIONS | Culture | 75 | 1 | The values of the promoters inspire experimentation and learning. | 4 | 75.00 | 75.00 | 175.00 | 978.75 |
| | Strategy and Planning | 30 | 2 | The promoters express an innovative vision, involving employees in setting goals. | 4 | 30.00 | 100.00 | | |
| | | 20 | 3 | The team promotes the suggestion of innovative activities through accountability and autonomy of its employees. | 4 | 20.00 | | | |
| | | 35 | 4 | The team has a development plan/path with clear objectives. | 4 | 35.00 | | | |
| | | 20 | 5 | The team is alert to the external environment and uses the gathered information to define the strategy. | 3 | 15.00 | | | |
| RESOURCES | Financial Resources | 40 | 6 | What is the risk tolerance / autonomy in relation to Corporate Venture Capital / Business Angels / investors / financing sources? | 4 | 40.00 | 40.00 | 283.75 | |
| | Human Resources | 55 | 7 | The team has the capacity to capture talent and this is reflected in its objectives. | 4 | 55.00 | 55.00 | | |
| | Skills | 35 | 8 | The team has expertise in the planning and management of RDI activities. | 4 | 35.00 | 90.00 | | |
| | | 35 | 9 | The team uses prototypes and pilot projects in the design of products and services. | 4 | 35.00 | | | |
| | | 20 | 10 | The team has competencies associated with the performance of its marketing activities. | 4 | 20.00 | | | |
| | External Relationships | 35 | 11 | The team develops cooperation activities in innovation with external entities. | 4 | 35.00 | 60.00 | | |
| | | 25 | 12 | The team participates in multiple forms of networking. | 4 | 25.00 | | | |
| | Information Tools and Systems | 25 | 13 | The team uses creativity tools and communication systems that heighten innovation. | 3 | 18.75 | 38.75 | | 978.75 |
| | | 20 | 14 | The team organizes ideas in a knowledge management system. | 4 | 20.00 | | | |
| PROCESSES | RDI Activities Management | 60 | 15 | The team integrates processes in order to understand the market's needs, expectations and opportunities. | 4 | 60.00 | 160.00 | 230.00 | |
| | | 60 | 16 | The team develops innovative processes in the management of the activities of the value chain / system. | 4 | 60.00 | | | |
| | | 40 | 17 | The team plans and evaluates the protection of its intellectual capital and the results of its RDI activities. | 4 | 40.00 | | | |
| | Management of Knowledge and Learnings | 40 | 18 | The team incorporates the obtained learnings and uses the knowledge generated as a source of decision. | 4 | 40.00 | 40.00 | | |
| | RDI Projects Management | 30 | 19 | The team develops processes for planning, organizing and monitoring its RDI projects. | 4 | 30.00 | 30.00 | | |
| RESULTS | Ability to Generate Return | 70 | 20 | The RDI activities and the protection and valuation of intellectual capital have a positive contribution for the current or expected financial performance of the team. | 4 | 70.00 | 100.00 | 290.00 | |
| | | 40 | 21 | The team has, or seeks to have, the ability to generate return for its stakeholders. | 3 | 30.00 | | | |
| | Team's Development | 95 | 22 | The percentage of growth of turnover has been / will be predictably higher in comparison to the previous year(s). | 4 | 95.00 | 190.00 | | |
| | | 95 | 23 | The innovation features of the team prospect a positive impact on the business sector. | 4 | 95.00 | | | |

## **Appendix XIII** – IS FASt – answers to the final version: Yonest

| | | Maximuim Score | # | Questions | Value [ 0 a 4 ] | Score | Pillar Score | Dimension Score | Global Score IS FASt |
|---|---|---|---|---|---|---|---|---|---|
| CONDITIONS | Culture | 75 | 1 | The values of the promoters inspire experimentation and learning. | 2 | 37.50 | 37.50 | 95.00 | 765.00 |
| | Strategy and Planning | 30 | 2 | The promoters express an innovative vision, involving employees in setting goals. | 2 | 15.00 | 57.50 | | |
| | | 20 | 3 | The team promotes the suggestion of innovative activities through accountability and autonomy of its employees. | 3 | 15.00 | | | |
| | | 35 | 4 | The team has a development plan/path with clear objectives. | 2 | 17.50 | | | |
| | | 20 | 5 | The team is alert to the external environment and uses the gathered information to define the strategy. | 2 | 10.00 | | | |
| RESOURCES | Financial Resources | 40 | 6 | What is the risk tolerance / autonomy in relation to Corporate Venture Capital / Business Angels / investors / financing sources? | 4 | 40.00 | 40.00 | 235.00 | |
| | Human Resources | 55 | 7 | The team has the capacity to capture talent and this is reflected in its objectives. | 3 | 41.25 | 41.25 | | |
| | Skills | 35 | 8 | The team has expertise in the planning and management of RDI activities. | 3 | 26.25 | 71.25 | | |
| | | 35 | 9 | The team uses prototypes and pilot projects in the design of products and services. | 4 | 35.00 | | | |
| | | 20 | 10 | The team has competencies associated with the performance of its marketing activities. | 2 | 10.00 | | | |
| | External Relationships | 35 | 11 | The team develops cooperation activities in innovation with external entities. | 4 | 35.00 | 60.00 | | |
| | | 25 | 12 | The team participates in multiple forms of networking. | 4 | 25.00 | | | |
| | Information Tools and Systems | 25 | 13 | The team uses creativity tools and communication systems that heighten innovation. | 2 | 12.50 | 22.50 | | |
| | | 20 | 14 | The team organizes ideas in a knowledge management system. | 2 | 10.00 | | | |
| PROCESSES | RDI Activities Management | 60 | 15 | The team integrates processes in order to understand the market's needs, expectations and opportunities. | 3 | 45.00 | 120.00 | 180.00 | |
| | | 60 | 16 | The team develops innovative processes in the management of the activities of the value chain / system. | 3 | 45.00 | | | |
| | | 40 | 17 | The team plans and evaluates the protection of its intellectual capital and the results of its RDI activities. | 3 | 30.00 | | | |
| | Management of Knowledge and Learnings | 40 | 18 | The team incorporates the obtained learnings and uses the knowledge generated as a source of decision. | 3 | 30.00 | 30.00 | | |
| | RDI Projects Management | 30 | 19 | The team develops processes for planning, organizing and monitoring its RDI projects. | 4 | 30.00 | 30.00 | | |
| RESULTS | Ability to Generate Return | 70 | 20 | The RDI activities and the protection and valuation of intellectual capital have a positive contribution for the current or expected financial performance of the team. | 2 | 35.00 | 65.00 | 255.00 | |
| | | 40 | 21 | The team has, or seeks to have, the ability to generate return for its stakeholders. | 3 | 30.00 | | | |
| | Team's Development | 95 | 22 | The percentage of growth of turnover has been / will be predictably higher in comparison to the previous year(s). | 4 | 95.00 | 190.00 | | |
| | | 95 | 23 | The innovation features of the team prospect a positive impact on the business sector. | 4 | 95.00 | | | |

| Global Score IS FASt |
|---|
| 765.00 |

## **Appendix XIV** – IS FASt – answers to the final version: Skaphandrus

| | | Maximuim Score | # | Questions | Value [ 0 a 4 ] | Score | Pillar Score | Dimension Score | Global Score IS FASt |
|---|---|---|---|---|---|---|---|---|---|
| CONDITIONS | Culture | 75 | 1 | The values of the promoters inspire experimentation and learning. | 3 | 56.25 | 56.25 | 135.00 | 692.50 |
| | Strategy and Planning | 30 | 2 | The promoters express an innovative vision, involving employees in setting goals. | 3 | 22.50 | 78.75 | | |
| | | 20 | 3 | The team promotes the suggestion of innovative activities through accountability and autonomy of its employees. | 3 | 15.00 | | | |
| | | 35 | 4 | The team has a development plan/path with clear objectives. | 3 | 26.25 | | | |
| | | 20 | 5 | The team is alert to the external environment and uses the gathered information to define the strategy. | 3 | 15.00 | | | |
| RESOURCES | Financial Resources | 40 | 6 | What is the risk tolerance / autonomy in relation to Corporate Venture Capital / Business Angels / investors / financing sources? | 3 | 30.00 | 30.00 | 191.25 | |
| | Human Resources | 55 | 7 | The team has the capacity to capture talent and this is reflected in its objectives. | 3 | 41.25 | 41.25 | | |
| | Skills | 35 | 8 | The team has expertise in the planning and management of RDI activities. | 1 | 8.75 | 50.00 | | |
| | | 35 | 9 | The team uses prototypes and pilot projects in the design of products and services. | 3 | 26.25 | | | |
| | | 20 | 10 | The team has competencies associated with the performance of its marketing activities. | 3 | 15.00 | | | |
| | External Relationships | 35 | 11 | The team develops cooperation activities in innovation with external entities. | 2 | 17.50 | 36.25 | | |
| | | 25 | 12 | The team participates in multiple forms of networking. | 3 | 18.75 | | | |
| | Information Tools and Systems | 25 | 13 | The team uses creativity tools and communication systems that heighten innovation. | 3 | 18.75 | 33.75 | | |
| | | 20 | 14 | The team organizes ideas in a knowledge management system. | 3 | 15.00 | | | |
| PROCESSES | RDI Activities Management | 60 | 15 | The team integrates processes in order to understand the market's needs, expectations and opportunities. | 3 | 45.00 | 100.00 | 152.50 | |
| | | 60 | 16 | The team develops innovative processes in the management of the activities of the value chain / system. | 3 | 45.00 | | | |
| | | 40 | 17 | The team plans and evaluates the protection of its intellectual capital and the results of its RDI activities. | 1 | 10.00 | | | |
| | Management of Knowledge and Learnings | 40 | 18 | The team incorporates the obtained learnings and uses the knowledge generated as a source of decision. | 3 | 30.00 | 30.00 | | |
| | RDI Projects Management | 30 | 19 | The team develops processes for planning, organizing and monitoring its RDI projects. | 3 | 22.50 | 22.50 | | |
| RESULTS | Ability to Generate Return | 70 | 20 | The RDI activities and the protection and valuation of intellectual capital have a positive contribution for the current or expected financial performance of the team. | 1 | 17.50 | 47.50 | 213.75 | |
| | | 40 | 21 | The team has, or seeks to have, the ability to generate return for its stakeholders. | 3 | 30.00 | | | |
| | Team's Development | 95 | 22 | The percentage of growth of turnover has been / will be predictably higher in comparison to the previous year(s). | 3 | 71.25 | 166.25 | | |
| | | 95 | 23 | The innovation features of the team prospect a positive impact on the business sector. | 4 | 95.00 | | | |

| Global Score IS FASt |
|---|
| 692.50 |

## **Appendix XV** – IS FASt – answers to the final version: Rice Me

| | | Maximuim Score | # | Questions | Value [ 0 a 4 ] | Score | Pillar Score | Dimension Score | Global Score IS FASt |
|---|---|---|---|---|---|---|---|---|---|
| CONDITIONS | Culture | 75 | 1 | The values of the promoters inspire experimentation and learning. | 2 | 37.50 | 37.50 | 91.25 | 556.25 |
| | Strategy and Planning | 30 | 2 | The promoters express an innovative vision, involving employees in setting goals. | 2 | 15.00 | 53.75 | | |
| | | 20 | 3 | The team promotes the suggestion of innovative activities through accountability and autonomy of its employees. | 3 | 15.00 | | | |
| | | 35 | 4 | The team has a development plan/path with clear objectives. | 1 | 8.75 | | | |
| | | 20 | 5 | The team is alert to the external environment and uses the gathered information to define the strategy. | 3 | 15.00 | | | |
| RESOURCES | Financial Resources | 40 | 6 | What is the risk tolerance / autonomy in relation to Corporate Venture Capital / Business Angels / investors / financing sources? | 2 | 20.00 | 20.00 | 155.00 | |
| | Human Resources | 55 | 7 | The team has the capacity to capture talent and this is reflected in its objectives. | 3 | 41.25 | 41.25 | | |
| | Skills | 35 | 8 | The team has expertise in the planning and management of RDI activities. | 2 | 17.50 | 53.75 | | |
| | | 35 | 9 | The team uses prototypes and pilot projects in the design of products and services. | 3 | 26.25 | | | |
| | | 20 | 10 | The team has competencies associated with the performance of its marketing activities. | 2 | 10.00 | | | |
| | External Relationships | 35 | 11 | The team develops cooperation activities in innovation with external entities. | 2 | 17.50 | 23.75 | | |
| | | 25 | 12 | The team participates in multiple forms of networking. | 1 | 6.25 | | | |
| | Information Tools and Systems | 25 | 13 | The team uses creativity tools and communication systems that heighten innovation. | 1 | 6.25 | 16.25 | | |
| | | 20 | 14 | The team organizes ideas in a knowledge management system. | 2 | 10.00 | | | |
| PROCESSES | RDI Activities Management | 60 | 15 | The team integrates processes in order to understand the market's needs, expectations and opportunities. | 3 | 45.00 | 90.00 | 142.50 | |
| | | 60 | 16 | The team develops innovative processes in the management of the activities of the value chain / system. | 1 | 15.00 | | | |
| | | 40 | 17 | The team plans and evaluates the protection of its intellectual capital and the results of its RDI activities. | 3 | 30.00 | | | |
| | Management of Knowledge and Learnings | 40 | 18 | The team incorporates the obtained learnings and uses the knowledge generated as a source of decision. | 3 | 30.00 | 30.00 | | |
| | RDI Projects Management | 30 | 19 | The team develops processes for planning, organizing and monitoring its RDI projects. | 3 | 22.50 | 22.50 | | |
| RESULTS | Ability to Generate Return | 70 | 20 | The RDI activities and the protection and valuation of intellectual capital have a positive contribution for the current or expected financial performance of the team. | 3 | 52.50 | 72.50 | 167.50 | |
| | | 40 | 21 | The team has, or seeks to have, the ability to generate return for its stakeholders. | 2 | 20.00 | | | |
| | Team's Development | 95 | 22 | The percentage of growth of turnover has been / will be predictably higher in comparison to the previous year(s). | 2 | 47.50 | 95.00 | | |
| | | 95 | 23 | The innovation features of the team prospect a positive impact on the business sector. | 2 | 47.50 | | | |

## **Appendix XVI –** IS FASt – answers to the final version: Stickables

| | | Maximuim Score | # | Questions | Value [ 0 a 4 ] | Score | Pillar Score | Dimension Score | Global Score IS FASt |
|---|---|---|---|---|---|---|---|---|---|
| CONDITIONS | Culture | 75 | 1 | The values of the promoters inspire experimentation and learning. | 4 | 75.00 | 75.00 | 156.25 | 770.00 |
| | Strategy and Planning | 30 | 2 | The promoters express an innovative vision, involving employees in setting goals. | 4 | 30.00 | 81.25 | | |
| | | 20 | 3 | The team promotes the suggestion of innovative activities through accountability and autonomy of its employees. | 3 | 15.00 | | | |
| | | 35 | 4 | The team has a development plan/path with clear objectives. | 3 | 26.25 | | | |
| | | 20 | 5 | The team is alert to the external environment and uses the gathered information to define the strategy. | 2 | 10.00 | | | |
| RESOURCES | Financial Resources | 40 | 6 | What is the risk tolerance / autonomy in relation to Corporate Venture Capital / Business Angels / investors / financing sources? | 2 | 20.00 | 20.00 | 200.00 | |
| | Human Resources | 55 | 7 | The team has the capacity to capture talent and this is reflected in its objectives. | 3 | 41.25 | 41.25 | | |
| | Skills | 35 | 8 | The team has expertise in the planning and management of RDI activities. | 3 | 26.25 | 81.25 | | |
| | | 35 | 9 | The team uses prototypes and pilot projects in the design of products and services. | 4 | 35.00 | | | |
| | | 20 | 10 | The team has competencies associated with the performance of its marketing activities. | 4 | 20.00 | | | |
| | External Relationships | 35 | 11 | The team develops cooperation activities in innovation with external entities. | 1 | 8.75 | 27.50 | | |
| | | 25 | 12 | The team participates in multiple forms of networking. | 3 | 18.75 | | | |
| | Information Tools and Systems | 25 | 13 | The team uses creativity tools and communication systems that heighten innovation. | 4 | 25.00 | 30.00 | | |
| | | 20 | 14 | The team organizes ideas in a knowledge management system. | 1 | 5.00 | | | |
| PROCESSES | RDI Activities Management | 60 | 15 | The team integrates processes in order to understand the market's needs, expectations and opportunities. | 2 | 30.00 | 100.00 | 155.00 | |
| | | 60 | 16 | The team develops innovative processes in the management of the activities of the value chain / system. | 2 | 30.00 | | | |
| | | 40 | 17 | The team plans and evaluates the protection of its intellectual capital and the results of its RDI activities. | 4 | 40.00 | | | |
| | Management of Knowledge and Learnings | 40 | 18 | The team incorporates the obtained learnings and uses the knowledge generated as a source of decision. | 4 | 40.00 | 40.00 | | |
| | RDI Projects Management | 30 | 19 | The team develops processes for planning, organizing and monitoring its RDI projects. | 2 | 15.00 | 15.00 | | |
| RESULTS | Ability to Generate Return | 70 | 20 | The RDI activities and the protection and valuation of intellectual capital have a positive contribution for the current or expected financial performance of the team. | 3 | 52.50 | 92.50 | 258.75 | |
| | | 40 | 21 | The team has, or seeks to have, the ability to generate return for its stakeholders. | 4 | 40.00 | | | |
| | Team's Development | 95 | 22 | The percentage of growth of turnover has been / will be predictably higher in comparison to the previous year(s). | 3 | 71.25 | 166.25 | | |
| | | 95 | 23 | The innovation features of the team prospect a positive impact on the business sector. | 4 | 95.00 | | | |

**Appendix XVII** – Summary Booklet

ISCTE Business School
University Institute of Lisbon

cotec Portugal

"Innovation Scoring, a Fast Track Approach for Start-ups"

**Summary Booklet**

I – CONDITIONS

In a company that has just been born or that is still in a project design phase, one might think, "what conditions, if these are not yet fully defined?!" The purpose of this dimension is to consider whether the first sketches constitute the pillars that will serve as foundation for the company's growth.

This dimension regards the aspects that influence the attitudes and the behaviour of the companies taking their first steps, regarding innovation. In small companies, it is relevant to assess the extent to which all the team members are involved in the orchestration of the various activities, the formulation of values and the strategy of the company. Two distinct areas are considered: **Culture**, which aims to reflect the adequacy of the company's values regarding innovation, and **Strategy and Planning**, concerning the team's involvement in the construction and implementation of the organisation's strategies, which seeks to assess how the characteristics of the organisation are likely to stimulate innovation.

**1 – The values of the promoters inspire experimentation and learning.**

Values represent an indispensable element for the assessment of business innovation. Even since the first steps of a company, they may be seen as shaping the "DNA" of the organisation. The recognition of the importance of values for the identity of organisations, often leads them to disclose their values in their contents and on the website. Values can be in the cultural skills base that allows the organisation to be distinguished from others and are hardly "imitable". This intangible dimension can be expressed in features such as entrepreneurship, teamwork, the "attention to others" (whether employees, customers, partners or competitors), readiness, commitment to the answer and the willingness to do better.

This question seeks to assess to what extent the values of start-ups and small companies contribute to innovation. When the values of the promoters emphasise the entrepreneurial spirit, the creative "dissatisfaction" and the search for new solutions, the team will be better prepared to avoid complacency and to innovate. In a logic of *learning organisation*, it is intend to ascertain whether the team actively promotes openness.

As an example, below are referred several aspects that reflect organisational values that favor change and innovation. The definition of the team's Mission can explicitly include details concerning the promotion of innovation. Some of the rules that encourage experimentation and the exchange of ideas and solutions may not be written, only stated. Contrary to the spirit of conformism, what matters is the sharing of perspectives to discover the future as a team and the acceptance of divergent thinking. It can also serve as an example the identification and integration of feedback (from customers and employees, for example) as an expression of a philosophy of continuous learning. A spirit of permanent improvement stimulates innovation. Also, an ethical dimension in the values encourages the commitment to do better.

**2 – The promoters express an innovative vision, involving employees in setting goals.**

To imagine possible futures as a team and moving forward "through the unknown" becomes an exercise in differentiation and competitiveness. In addition to designing an innovative vision, the promoters must convey this vision by stimulating the emotional involvement of the team. Such a Vision is sometimes designated strategic intent and it is important that this is set at an early stage of the constitution of the company in order to determine its growth.

This question examiner whether the promoters transmit an innovative Vision, mobilizing the team and guiding goal definition, taking in consideration the competencies of the organisation. Their practices and actions reflect the direction they want to disseminate. In short, it is intended to assess if the team has specified innovation objectives that ensure the alignment of its activities with the Vision, Mission and Strategy of the team.

There are several aspects that may be considered as reference elements. First there is the question of the existence (or not) of such a Vision. Then, assuming that it exists, an important aspect will be how that Vision is transmitted: what is the effect on employee engagement? On another level still, how will the innovative Vision, if any, express the definition of strategic objectives?

**3 – The team promotes the suggestion of innovative activities through accountability and autonomy of its employees.**

The dynamics of innovative start-ups involves the encouragement of initiative and the emergence of innovative projects by people who believe in them. In this perspective, those people should be provided the opportunity to manage a set of resources and mobilize other employees.

This question is intended to assess the level of autonomy and freedom (as well as the inherent accountability) of employees to develop innovative activities.

Examples of issues to be addressed in this section are the following: selection policy and allocation of financial and human resources who are responsible for innovation projects or activities; availability of time and resources for unplanned innovative initiatives and acceptance of proposed innovative projects. A key indicator of the performance will be the percentage of projects in which the proponents of the idea assumed important responsibilities in their implementation.

**4 – The team has a development plan/path with clear objectives.**

The definition of strategic objectives by the team poses challenges for the future. They simultaneously guide the action and incentives that help the team to transcend itself. In this context, the team demonstrates its competitive assertiveness. Given the pace of change in today's business environment, innovation should be a central dimension of the strategy.

This topic seeks to assess whether the team manifests an explicit articulation between their Vision, the involvement of the team members and the importance given to innovation in defining the strategy and in its implementation, with a special regard on the intervention of all the elements.

Illustrative examples of relevant practices related to this item are illustrated below. In some companies, innovation is at the heart of the strategy: the challenges of innovation "guide" the design and implementation of the global (corporate) strategy of the company. In other cases it is not so well defined, but there is a strategy or "path" that originates specific goals. The link between Mission, Vision, and Strategy is consistent and may or may not be expressed in the corporate documents. Another relevant aspect is the involvement of employees, which can take many forms, such as: discussion with employees which provides "clues" to consider in the definition of the innovation strategy; team brainstorming in order to define and validate strategic guidelines; joint analysis of the environment and the skills of the team, leading to the definition of goals.

**5 – The team is alert to the external environment and uses the gathered information to define the strategy.**

Monitoring the external environment includes all the activities related to the characterization of the current and future trends in a short and medium term of the business environment of a start-up or small business. It involves prospects, technological surveillance, analysis of new business trends, business intelligence and/or benchmarking. The resulting information from these activities is of great importance for the identification of threats and opportunities and to evaluate strengths and weaknesses and comparing to competitors. Constant monitoring of the external environment becomes essential for the foundation of the innovation strategy. It allows the analysis of trends in the evolution of technologies and of the demand that enable the identification of gaps in the knowledge base and the team's technologies and of innovation opportunities. In fact, innovation skills require the capacity to integrate scientific and technological advances in order to develop new products and processes that meet the requirements and needs of customers and markets.

This question seeks to assess to what extent the team uses the evolution of its external environment (prospects, technological monitoring, analysis of social and market trends, business intelligence and benchmarking) in its strategic process. This question seeks to assess if these activities are used to capture and process clues indicating potential innovation opportunities.

Examples of relevant activities are the following: technological surveillance practices, including meetings with scientific and technological societies, literature analysis or patent research; business intelligence initiatives; analysis of trends in the demand and monitoring competitors, through participation in international fairs, involvement in groups and benchmarking studies and partnerships.

II – RESOURCES

Often, to have good ideas is not the same as to have all the resources to put them into practice. A crucial aspect for a start-up is precisely the ability to mobilize resources through partnerships and networks of external relationships. This analysis may also serve as a reflection for the future, in which case, the answers to the questions in this dimension should address practices, tools and information systems that are expected to be applied in the future for start-ups.

The purpose of this dimension is to assess the contribution of the team members and resources to ensure a better and more dynamic innovation performance. This analysis takes into account the importance of the integration of small businesses into networks or intermediation structures facilitating their development (e.g. business incubators, business parks, etc.). There are multiple types of organisational resources. Herein are considered five types of resources: **Financial Resources**, aiming to determine the autonomy of start-ups in relation to investors such as business angels or corporate venture capital. **Human Capital**, which aims to assess how the human resources are involved in innovation activities; **Organisational Skills**, corresponding to the analysis of the most relevant skills and capabilities for the organisation to enhance its innovative performance and hence its competitive assertion; **External Relationships,** aiming to map the main connections and collaborations established for heightening innovation, and more specifically cooperation with other entities to enhance innovation; and **Tools and Information Systems**, evaluating the application of these as facilitators of innovation.

**6 – What is the risk tolerance / autonomy in relation to Corporate Venture Capital / Business Angels / investors / financing sources?**

Several obstacles shape the environment start-ups face when turning good business ideas into new ventures, such as the lack of financial resources, high uncertainty due to the absence of the firm's track record and an expected high risk. Venture capitalists and business angels act as catalysts for entrepreneurial activity, funding growth and therefore fostering new entrepreneurship. Well performed initial scan ensures good investments and the seed capital provided then enables firms to set off. Fresh capital inflow is complemented with value-adding, strategic advice and funding, including monitoring, skills, expertise and help.

This question seeks to assess to what extent was the initial investment critical for the launch of the business, as well as the autonomy of the team in relation to investors to make decisions about management.

Examples for a good score in this question would be to possess the autonomy to make decisions, a certain level of financial independence and good quality financing sources.

**7 – The team has the capacity to capture talent and this is reflected in its objectives.**

Start-ups and small businesses that cultivate an open environment to innovation promote creativity and innovative initiative among themselves. Encouraging the initiative of employees, their capacity for innovation and the adoption of pro-active attitudes involves: commitment to growth, acceptance of constructive criticism and formulating suggestions for the improvement of the team; promoting individual or group initiatives aiming at improving the team's performance; promoting relevant information sharing across the team and the availability of tools that facilitate the development of innovative initiatives.

The purpose of this question is to evaluate the team's dedication to reward creativity, promote innovative behaviour, provide resources for unplanned activities and take the risks inherent to the innovative efforts of the team members. Also, if the environment of openness has been arising the interest of talented people to collaborate with the team.

Examples of indicators of the degree of involvement of the team members in innovation can relate to the percentage of team members proposing innovative ideas and/or the number of innovative tools available. Also, the following can be regarded as examples of instruments for the involvement of employees in the business innovation: awards and incentives linked to innovative activities; diversification of tasks to stimulate transversal skills and problem solving; creating communities of practice for innovation in the company; contests of innovative ideas; encouragement to promote innovation groups within or outside working hours and promoting the recognition of the innovative spirit of employees.

**8 – The team has expertise in the planning and management of RDI activities.**

The practices relating to RDI activities imply the structuring of a diverse set of functions, such as:

• Strategic assessment and project discussion (meetings, brainstorming, etc.);
• Dissemination activities and sharing an innovation culture (seminars, workshops, etc.);

• Institutional Communication: participation in events to promote the team's RDI or the results;
• Planning, coordinating and assessing the management of RDI projects;
• Development of procedures for planning, implementation and evaluation of projects, as well as analysis and optimization of the expected or obtained results.

The management of the team's interfaces comprises, according to the Multi-Channel Interactive Learning Model, three types of links between the team and the external surroundings:

• Scientific and technological research;
• Market research and design (including the management of intellectual property); and
• Research on methods and organisations (including knowledge management).

This question relates to the assessment of the team's skills in the coordination and planning of RDI activities. More specifically, it is intended to assess the performance of the functions listed above and the correct management of the interfaces.

Among the aspects to consider in answering this question, the following examples are included: existence of an RDI plan; sketch or definition of an RDI projects portfolio and planning of result assessment and dissemination activities. RDI activity management skills can be expressed in the actual or expected results of RDI projects and their contribution for the team's performance.

**9 – The team uses prototypes and pilot projects in the design of products and services.**

The R&D activities contribute from the outset to increase the team's knowledge base and to outline new applications, particularly in terms of products and processes. RDI reinforces the learning potential of the team and allows to respond more effectively to the challenges posed by customers or by competitors. Generally, the design, construction and testing of a prototype is an important stage of any R&D process. Software development can also be included in the R&D activities as long as it involves scientific or technological advances. R&D can be developed within the organisation, in partnerships or be acquired from other entities. However, even in these cases the existence of internal technical skills is important to adjust the development of the project to the needs and challenges of the team.

This question aims to assess the skills of the team that support the development of R&D projects and/or that constitute the ‘‘anchor’’ to learn and achieve results from R&D carried out in partnership. The existence of current activities of research and development, including the construction of

prototypes may also be relevant. The ability to maintain the cooperation with other organisations, including universities, to carry out R&D activities should also be considered. Another important aspect can be the participation in national and international projects of cooperation in R&D.

**10 – The team has competencies associated with the performance of its marketing activities.**

For a start-up to compete in the turbulent environment of a market which rules are constantly changing, it need to develop specific skills in marketing activities, from managing the four market-mix aspects (product, price, communication and distribution) to the "proximity" and "interpretation" of the wishes of customers, through branding. Brands are a central element in marketing skills and are closely associated with innovation. Brands allow differentiated solutions over competing value proposals. Even when innovation corresponds to the creation of totally new products/services segments, skills in marketing are essential for the team to promote their offer and own a significant part of the additional generated income.

The focus of this question is on the distinctive skills marketing skills over competition.

The ability to develop the excellence of the team's brand (s) is, an important aspect to take into consideration. This capability can be expressed particularly by the national and international registration of the brand (s), its (their) relevance in the markets where the company operates and the added value of the product (s) of the team. Another example of a relevant skill is the articulation between marketing activities and RDI. The relationship with customers is an equally important skill in marketing; the evaluation of feedback from customers or "lead users" can be pointed out as examples. The usage of e-commerce, both Business-to-Business and Business-to-Consumer, can be another aspect to be considered.

**11 – The team develops cooperation activities in innovation with external entities.**

The speed of change, both in terms of competition and technological, encourages the development of multiple forms of cooperation between the economic agents. Often, start-ups and small companies lack of individual resources and capabilities to address the innovation challenges in the global markets. Proper coordination of joint action of start-ups with other entities allows them to overcome these difficulties and to strengthen their ability to compete globally. Thus, the productivity that comes from this coordination of activities is likely to bring competitive advantages based on costs for small businesses in global markets. They cooperate to be faster, to

broaden international operation, to benefit from the dynamics of specialization of partners, to reduce costs, to gain scale and to access (or even internalize) additional knowledge. Cooperation in RDI activities becomes critical in enabling teams to increase productivity, reducing the costs of those activities or valuing market results, better and faster. Cooperation may take forms such as joint project teams to develop new products or technologies, which may have a formal or informal nature, as often happens with relationships between customers and suppliers.

This question is intended to question teams about their external relationships regarding innovation. In particular, it is intend to analyse the formal or informal agreements for cooperation in RDI with external entities, their respective objectives, duration, amplitude and obtained or expected results.

Evaluating the team's performance in this field can take in consideration aspects such as: (1) connection to networks or facilitating structures of development (e.g. incubators, business parks, etc.); (2) national or international partnerships or alliances with other companies (customers, suppliers, competitors or partners), to develop RDI activities and/or share relevant knowledge for innovation; (3) projects in cooperation with universities, laboratories, technology centres or other organisations in the science and technology system, in Portugal or abroad; (4) participation in national and international cooperation R&D projects, including projects financed by the European Union; (5) participation in cooperation projects combining innovation and internationalization; (6) policy of welcoming and recruiting of university teachers; (7) participation in programs that promote research in business environment; and (8) connecting with customers in RDI projects (“resident” technicians, use of lead users methodology, etc.).

**12 - The team participates in multiple forms of networking.**

The concept of networking is associated with the existence of a network of contacts and informal relationships of a team and/or its members. Involvement in informal collaboration networks currently has a key role in competitiveness, especially in small companies, where such relationships can be crucial for their success. In fact, such involvement can enable the organisation to establish relations that are likely to grant access to diverse expertise and resource mobilization, distinct from those of competitors. Relationship networks enable the sharing of knowledge and ideas that lead to innovation.

Alongside the informal relationships of the team, also the networks of business and social relationships of its members can be mobilized for the benefit of the team. The professional

connections, often initiated on school benches or in activities in the past, often form the basis of the "informal know-how trading", which allows the resolution of problems and the identification opportunities to explore.

Whilst in the previous question the focus was on cooperation agreements with other organisations, oriented to innovation, this question aims to assess the importance given by the team to leverage more or less structured networks, contacts and relationships with third parties, in particular other actors in the innovation system. It aims to analyse to what extent the team encourages external relations of its employees and how this relationship encourages innovation.

Among the many examples of networking oriented innovation used by organisations, the followings are suggested: participation in informal networks of cooperation with other companies and/or entities of the scientific and technological system; participation in conferences, seminars, etc.; encouragement of employee participation in these events and in professional and/or scientific associations and encouragement of employee engagement in multi-organisational "communities of practice".

**13 – The team uses creativity tools and communication systems that heighten innovation.**

Information and communication systems allow to improve the quality and availability of information and explicit knowledge, important for start-ups. The access to technologies, equipment and advanced information and communication systems are enhancing factors for business innovation. They enable and encourage greater sharing and interaction between the elements of the team and facilitate interaction with other organisations in the context of supply chain systems, thus opening opportunities for innovation.

This question seeks to evaluate how the organisation has been preparing, overall, for the use of technologies, equipment and communications and information systems. The existence and sophistication of infrastructures and software tools, as well as their compatibility, connectivity and the degree of use as instruments of innovation and organisational change, should be considered for the answer to this question.

Examples such as the implementation of Enterprise Resource Planning systems, Customer Relationship Management, Electronic Data Interchange, Radio-frequency Identification, intranets or the usage of tools currently available such as the Voice over Internet Protocol or Skype, among others, may be illustrative of this question.

**14 – The team organises ideas in a knowledge management system.**

Managing knowledge means to capture and extract value from the available universe of information. It involves a comprehensive approach of the areas of interest and following the evolution of the key topics for the company, at an early stage. It important to clarify concepts, stimulate creativity, encourage initiatives, internal and external interactions and continuous learning.

This question addresses the ability of the team to collect, to promote the dissemination and internal sharing of ideas and knowledge and to generate or expect to generate new knowledge relevant to their activity. Particularly, it is assessed how the knowledge is collected and disseminated and the relevant dynamics for this to happen.

Examples of strategies targeted for creativity in the production and organisation of ideas include: creating physical and virtual meeting points for dialogue and sharing of knowledge and ideas – "innovation points", "innovation corners" or "innovation cafes"; regular seminars and experiences and results sharing sessions, as well as the use of the intranet as a technical, economic and commercial information dissemination tool among the team.

III – PROCESSES

Creativity and processes do not always sound compatible. Even for start-ups, where management processes are scarce, to measure progress, set goals and to prioritize work becomes crucial to their growth and success.

The purpose of this dimension is to identify the main organisational processes susceptible to support an innovative dynamic and assess their development and contribution for the generation of innovation performance: **RDI activities Management** (including Intellectual Property management); **Management of Knowledge and Learnings**; **RDI Projects Management**.

**15 – The team integrates processes in order to understand the market's needs, expectations and opportunities.**

The perception of the potential market is critical to the development of innovative products and processes. Innovation depends on the identification of a potential market as a starting point. In addition to internal creativity, the interface with the market provides indispensable contributions to understanding the needs, values and preferences of potential customers. The definition of concepts of new products or services requires a segmentation of the market, which becomes easier when the organisation has processes for capturing trends, needs and expectations of current and potential clients. In products in which the degree of novelty either of the technology or the market is limited, market segmentation is more common and more reliable, as there are previous references that delimit the analysis. For products or services that "create" new markets, capturing opportunities is more difficult, often involving the anticipation of social and economic trends but is even more necessary.

This question relates to the commercial area, but has different characteristics. The goal is to analyse to what extent the team puts into practice the understanding of the needs, expectations and market opportunities as part of the wider process of development of new products, processes or services.

Among the many examples of practices and tools used in the market interpretation process, the following are highlighted: market research; analysis, review and/or treatment of customer/user satisfaction surveys; analysis of relevant social trends for the business; use of focus groups; liaison with "leading users"; using the Quality Function Deployment; mapping products and

services; techniques to capture market trends, such as the empathetic design; analysis of the applicability of solutions developed in different contexts; "anthropological expeditions", monitoring analysing user behaviour; development of "future scenarios"; and participation in "technology platforms".

**16 – The team develops innovative processes in the management of the activities of the value chain/system.**

The value chain of a start-up is linked to customer value chains, suppliers and partners, constituting a "value system". In a company, innovation does not correspond only to the development and commercialization of new products or services. It can occur in several parts of the value chain, as well as in the way a team directs and influences its "value system".

This question intends to review how the team manages its value chain and its "value system" and assess how the innovation in its management leads to increased efficiency and increased value for the company and for their customers.

Good management practices in this topic depend on the strategy and the type of business, as well as on its phase of implementation in the market. As for example, initiatives or innovation projects involving suppliers, often in cooperation with logistics providers, such as pre-order systems that avoid stocks, thus reducing costs, or "tracking" and "tracing" systems for ordering; To promote joint innovation in terms of "value system" certain companies organise idea exchanges with partners (e.g. "supplier day"). In order to enhance collaborative development, some companies prepare specific tools and applications that they provide to their suppliers. It can also be considered as an innovative practice in terms of "value system" the establishment in business incubators or service centres, shared with other companies, whether within economic groups or with independent companies.

**17 – The team plans and evaluates the protection of its intellectual capital and the results of its RDI activities.**

The ability of a start-up leverage their intellectual capital and the results achieved in their RDI activities is associated with its protection and valuation, even if this is not an immediate result. Often, depending on the characteristics of the industry, the results of this investment only become evident after several years. However, especially for start-ups, it is necessary for this investment to be a goal, because it will later be reflected as value.

The protection of intellectual capital and the IDI results can include: patents; secret; continuous technological advance (“lead time”); advance the learning curve and commercial and service efforts (including registered trademarks). The mix of mechanisms used depends on factors such as the financial resources of the team, the markets in which it operates, the industry characteristics, the nature of the technology in question (product/process) and the more or less systematic nature of its knowledge, the possibility of setting international standards and the company's preferences as to the commercial valuation. Regarding the valuation of the results (and intellectual capital), the most common options are the internal exploration through the application of the procedures, the manufacture and sale of products and/or provision of services resulting from the RDI. Other possibilities include “licensing out”, subcontracting the manufacture or marketing, specialization in the provision of specific services or the establishment of joint ventures.

This question aims to assess how the organisation protects or prospects to protect and value the obtained or expected results of RDI, taking into account the characteristics, the business model and the relevance of the results.

The following can be considered examples: valuation of the results of RDI; relevance to the general strategy of the team; processes of secrecy maintenance (preservation of formulas and models, confidentiality agreements with employees, suppliers and customers); trademark registration, copyright protection and the valuation of intellectual capital; registration and maintenance of patents; “licensing-out” and monitoring of contracts.

**18 – The team incorporates the obtained learnings and uses the knowledge generated as a source of decision.**

Competitiveness is associated with the ability of a start-up to recognize its competition and learn faster, aiming for the construction and improvement of its processes. The willingness to learn and the ability to apply the learning is essential for the continuous improvement of the team and for the sustained creation of value. Learning also involves doing new “things”, combining existing knowledge with new knowledge.

This item aims to assess how individual and collective learning are stimulated and applied to improve the team's performance. One aspect to consider is the application of learning in the development of various types of innovation: of product, processes, marketing and organisational.

Below are presented some examples susceptible of being considered in the response to this item: product research/testing within the market; error analysis, non-conformities, deviations, customer/user complaints; creating conditions for the rapid sharing and application of learnings within the members of the team; promoting experimentation and changing processes to resolve issues with an impact on the organisation's productivity.

**19 - The team develops processes for planning, organizing and monitoring its RDI projects.**

The assessment, programming and monitoring of RDI projects plays an important role to increase their probability of success, especially considering the high level of uncertainty that a start-up experiences, as well as for a better allocation of resources and to learn from experiences for future projects. Resources and project risk assessment are important to anticipate scenarios of threats and vulnerabilities. For each scenario it is necessary to estimate the type and amount of losses associated with each threat identified and conduct a cost/benefit analysis.

Regarding planning of innovation projects, it is useful for start-ups and small businesses to identify innovation the goals that the RDI projects aim to achieve. In order to do this, the team must seek to value knowledge through the management of the interfaces, following a set of steps:
a) Describing the state of the art;
b) Characterizing the limitations of the current state;
c) Identifying the advances that the project seeks to obtain, quantifying where possible;
d) Prospecting the expected benefits of the project.

For each selected project, the team should develop a plan, identifying and delimiting the set of activities to be performed.

This question aims to assess if the team has processes for planning, organizing and monitoring RDI projects (more or less formally instituted) as well as the quality of these processes.

Examples of aspects to take into consideration in this answer may refer to: evaluation prior to selection and planning of RDI projects; feasibility studies, including risk calculation; the monitoring projects, including monitoring of deadlines and budgets; reorientation and cancellation decisions for projects depending on initial or progress assessment; use of milestones in project monitoring. As performance indicators, deviations in meeting deadlines, budget and outcomes (obtained or expected), and the ratio between the number of completed projects and the started projects can be suggested.

## IV – RESULTS

Whether a start-up is already established on the market or has recently launched its first product or even if is in a design phase, it is important to note that all RDI processes should reflect in results.

The development of RDI activities is not a goal in itself, but rather an instrument for achieving the general objectives defined for the organisation, in particular taking into consideration the interests of the stakeholders and the sustainability of the company. This dimension intends to analyse to what extent conditions, resources and processes are oriented for innovation to translate into results, as far as possible measurable. This part of IS FASt was particularly challenging to address to star-up's characteristics, as it was commonly found that results were not yet obtained and therefore the assessment of this dimension would have to rely on expectations. Therefore, results were considered from two points of view: **Ability to Generate Return** for shareholders, business angels, venture capital companies or other stakeholders; ability to leverage the **Team's Development** (percentage of growth and productivity obtained or expected).

### 20 – The RDI activities and the protection and valuation of intellectual capital have a positive contribution for the current or expected financial performance of the team.

The RDI activities of start-ups and small businesses should be reflected in value creation, increased competitiveness and hence in improved financial performance.

This section aims to assess to what extent RDI activities and the protection and valuation of intellectual capital produce or are expected to have a positive effect in the overall financial performance of the team, even if not on short term. This assessment faces, however, two problems. The first regards the expected effects: the existing accounting tools, for most start-ups, do not identify clearly the impact of investments in RDI in financial results. The second relates to the temporal dimension, as in what is the existing time lag between investment and results. For example, in the pharmaceutical industry this time lag can exceed 10 years. The answer to this question considers an estimate of the timeline of relevant results originated from investment in RDI, weighing the obtained results or the results expected in the future. It can also be taken into account an estimated global value of the intellectual capital, as well as the expected weight of product sales and services protected as intellectual property in the total turnover of the business.

Determining the gap will be easier for teams that have chronological information on the process of converting ideas into new products and on the time of arrival of new products to the market.

It is sensible, however, to consider that the investments in RDI can be expressed in an increase of sales, a reduction of operating costs (due, for example, to process innovations) or both.

**21 - The team has, or seeks to have, the ability to generate return for its stakeholders.**

In a new business, in any niche market, generating returns can seem like a daunting task, especially if all one has is a new product and not enough capital. Most start-ups fail not because they have bad products, but because they are unable to generate sufficient interest among consumers, which depends partly on the influence of the innovative performance on the image of the team. Business angels and venture capital firms are relatively common and appreciated among entrepreneurs, but several conditions have to be met and coordinated in order to establish and govern these relationships so that they are in fact beneficial to all parties.

Innovation, in particular on products and marketing, requires a "clash" with the market. So before it has a financial expression, it translates immediately into a better technical or commercial performance. This can be measured in several ways, from reducing the time waived or an increased efficiency in a certain task (process innovation), an increased interest and demand for the product in social networks, an increased value or number of product sales, an increased provision of services or of the value in stock market following patenting advertisement, granted licenses or establishment of strategic alliances. Innovation can also allow the entry into new geographic markets or market segments, perhaps more sophisticated and with higher margins, in which the company did not act.

For the answer to this question, the effect of innovation in terms of financial results in the present or estimated in the future of the organisation, will be relevant. It is suggested that the following aspects are considered: increase in the value of sales and/or turnover; market share; organisation of innovative initiatives with which the team excels in their market segment and impact on public opinion; premium added to the price of products resulting from innovative image; innovative image leading to awareness of the team's products; recognition of innovative capacity by peers and clients; innovative image among young talent in the team's field of activity; awards won for business innovation; peer recognition as a reference company; News and articles on the Internet, media and magazines/specialty journals recognizing the innovative performance of the team; entry into new market segments or even creating new markets through the provision of pioneer products and services; entry into new geographic markets; conquering markets through new or more efficient ways of product placement and impact of the adoption of new business models.

**22 – The percentage of growth of turnover has been / will be predictably higher in comparison to the previous year(s).**

In the case of start-ups with innovative products, the turnover from the sale of new (or significantly improved) products and the provision of new (or significantly improved) services is one of the metrics used to evaluate the results of innovative activities. This metric can, however, pose problems of inter-sectoral comparability. High-growth companies are companies that grew by 60% or more in three years or 20% or more per year for three years, although this metric considers only companies with more than 10 employees or more than 0.5 M € of turnover.

There is an obvious difficulty in this question – in the case of start-ups, it is not always possible to evaluate their growth efficiently due to their recent entry in the market, often and at an early stage, with their product in a development and testing phase.

What is proposed in this question is an exercise of reflection about the influence of innovation in the way the organisation has been able to promote their products and services. This question aims to determine the tendency of the evolution of sales. However, and if concrete metrics are unavailable, it is intended that the answer to this question is an estimate of the evolution sales for the next three years, based on market research and brand testing, i.e., considering the data available at the moment.

In case the team has been selling for at least three years, how innovation is reflected in turnover can more easily determined and compared to previous years. The tendency of evolution is given by a comparison between the indicators:

[(n-3), (n-2) e (n-1)].

Exemple:

| | Year | | |
|---|---|---|---|
| | 2012 | 2013 | 2014 |
| *Turnover* | 10.500 € | 15.000 € | 28.000 € |

Calculation for the first 2 years (2012 to 2013):

Turnover difference between 2013 and 2012:

$$[\ (n–2) – (n–3)\ ] = \Delta 1$$

$$\Leftrightarrow 15.000 – 10.500 = 4.500\ €$$

Percentage of growth in the first 2 years (2012 to 2013):

$$\%\ \Delta 1 = \frac{\Delta 1 \times 100}{(n–3)} \Leftrightarrow \frac{4.500 \times 100}{10.500} = 42.86\%$$

In this case, the evolution of the turnover difference would be:

% Δ1 (from 2012 to 2013) = 42.86%

% Δ2 (from 2013 to 2014) = 86.66%

In practice, these percentages translate the company's growth.

**23 – The innovation features of the team prospect a positive impact on the business sector.**

The excellence of the innovative performance of certain organisations (in terms of products, processes, organisation and marketing) may ultimately induce significant direct and indirect effects in the business sector, even if they are start-ups or small companies. Such effects can be seen in terms of the "value system" and supply chain, but also in the behaviour of rivals (attempting to copy) or in the perception of international clients of the products.

The aim of this item is precisely to assess how the team's innovative performance influences or expects to influence its sector of activity. This influence can be registered at the level of suppliers, customers, competitors and other stakeholders connected to the sector.

In this question it is difficult to establish quantitative indicators. It is possible, however, to collect evidence to assess the impact of innovation in the sector in which the team operates. As examples that may be relevant for the assessment of that impact, the following are suggested: cases when the team's innovation process (e.g. in terms of products/services or business models) led or is expected to lead to changes on the dominant forms of competition in the sector of activity; effects induced in the supply chain; establishment of new national or international standards; cases of pioneer entry into new markets ("blue ocean strategy") and/or when the reputation of innovation achieved "opened/will open the doors" to the entry of other organisations in the sector; participation in pioneer initiatives of adoption or development of new technologies or systems in the sector and the creation or involvement in sectoral technology platforms or centres of competitiveness and technology.