

Acknowledgement

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CHAPTER 1

1.1 Introduction – SMEInnoBoost project

1.1.1 Aim, objective, scope of the project

The objective of the project is to boost transnational innovation capacity of SMEs and support them to make sustainable network formations, including innovation clusters with other SMEs from the BM region in order to share know how and develop innovations, through bringing together triple helix partners and equipping SMEs with relevant data, tools and systems.

Expected results:

- Increased knowledge and understanding within SMEs regarding their innovation capacity;
- Increased SME competitiveness by Supporting SMEs without discrimination, with data, tools and system of high quality and relevance for boosting their innovation capacity;
- Decreased innovations gap between EU and IPA countries by supporting know-how transfer in the BM region;
- Improved decision-making and strategic planning at government level by providing data, tools and system of high quality and relevance on transnational level for use by supranational, national, regional and local policy makers.

1.1.2 Consortium, partners and funding

The project partners are:

1. National Association of Small and Medium Business, Bulgaria.
2. National Statistical Institute of the Republic of Bulgaria.
3. State Statistical Office, Macedonia.
4. Institute of Statistics, Republic of Albania.
5. Foundation for development of small and medium enterprises, Skopje, Macedonia.
6. Foundation Regional Development Agency (S.M.E.) of Korce, Albania.
7. Institute of Information and Communication Technologies, Bulgarian Academy of Sciences.
8. Foundation for Research & Technology Hellas, Science & Technology Park of Crete, Greece.
9. Software Engineering and Internet Technologies Lab, University of Cyprus.
10. Fund for Innovations and Technology Development, Macedonia.

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CHAPTER 2

2.1 Innovation

2.1.1 *Concepts, types and context*

Innovation:

Innovation definition (Oslo Manual) Paragraph 146: “The introduction or implementation of a new or significantly improved product, service or process, new marketing methods or new ways of organizing business, work organization or external relations.”

(OECD, Oslo Manual, third edition 2005, for the measurement and comparison of innovation in business).

The definition is linked to the market through ‘implementation’ which is defined in paragraph 150. A common feature of an innovation is that it must have been *implemented*. A new or improved product is implemented when it is introduced on the market. New processes, marketing methods or organizational methods are implemented when they are brought into actual use in the firm’s operations.

An innovative firm is defined as follows in paragraph 152. An *innovative firm* is one that has implemented an innovation during the period under review.

It is only when implementation is defined in paragraph 150 that the definition of innovation, which is made up of both paragraphs 146 and 150, applies only to the Business enterprise sector.

There are three indications of this: 1. (product) “when it is introduced on the market”; 2. (process/method) “when they are brought into the firm’s operations” (both in paragraph 150); and 3. (process/method) “marketing method” (paragraph 146) or “methods” (paragraph 150).

The references to the firm and the market are consistent with the scope of the Oslo Manual. Paragraph 26 is very clear that the manual applies only to the Business enterprise sector, deals with

innovation at the level of the firm, covers four types of innovation, and the lowest level of novelty to qualify as an innovation is ‘new to the firm’.

The manual does say in paragraph 27 that innovation could occur in any sector of the economy and goes on to suggest that there is a place for a separate manual on innovation in the Public sector.

Concepts:

- *Innovation* is typically understood as the *introduction* of something *new* and *useful*;
- *Innovation* is the embodiment, combination, or synthesis of knowledge in original, relevant, valued new products, processes, or services;
- *Invention* is the first occurrence of an idea for a new product or process, while innovation is the first attempt to carry it out into practice;
- All innovation begins with *creative ideas*. We define innovation as the successful implementation of creative ideas within an organization. In this view, *creativity* by individuals and teams is a starting point for innovation; the first is necessary but not sufficient condition for the second;
- Innovation is the lifeblood of any organization. Without it, not only is there no growth, but, inevitably, a slow death;
- Innovation, like many business functions, is a management process that requires specific tools, rules, and discipline.
- An innovation is an invention that becomes implemented and taken to the market.
- The challenge is to cultivate and leverage innovation capabilities that allow to continuously deliver innovation.

Types of innovations:

Higgins (1996) suggests that there are four types of innovation:

1. *Product innovation* (which results in new products or services or enhancements to old products or services);
2. *Process innovation* (which results in improved processes within the organization – for example business process re-engineering);
3. *Management innovation* (which improves the way the organization is managed);
4. *Marketing innovation* (including the functions of product promotion, pricing and distribution);

Manuel Lorenzo Hernandez identifies 4 types of innovation on “Basic concepts of innovation and innovation management:

1. *Incremental innovation*
 - Small improvements;
 - Problem-solving skills, constrained creativity;
 - Dominant form of innovation in established companies;
 - Fights commoditization;
2. *Technology innovation*
 - Significant technological changes delivering quantum leaps in performance or important architectural changes;
 - Deep knowledge and specialized capabilities required;
 - Intellectual Property (Patent) is a key tool;
3. *Business model innovation*
 - Significant change in the business model dimension;
 - Leverages existing or slightly change technology in a new way;
 - Deep understanding of market dynamics and competition and out-of-the-box thinking required;

4. *Radical innovation*

- Significant changes in both technology and business model dimensions;
- “Game changers”;

2.1.2 Innovation Models

To review the different models of the innovation process we draw heavily upon recent reviews of technological innovation (Tidd, 2006), organizational innovation (Isaksen and Tidd, 2006), and attempts to synthesize technological, organizational and commercial aspects of the innovation process (Tidd, Bessant and Pavitt, 2005). We begin with an assessment of the limitations of the more conventional linear technology-push models, and track the evolution to the more recent and realistic dynamic models of innovation that feature a network of actors, sources and constraints.

Early models (both explicit and, more importantly, the implicit mental models whereby people managed the process) saw innovation as a linear sequence of functional activities. Either new opportunities arising out of research gave rise to applications and refinements which eventually found their way to the marketplace (‘technology push’), or else the market signaled needs for something new which then drew out new solutions to the problem (‘need pull’, where necessity becomes the mother of invention).

Van de Ven and colleagues (2000) explored the limitations of simple models of the process. They drew attention to the complex ways in which innovations actually evolve over time, and derived some important modifiers to the basic model:

- *Shocks trigger innovations* – change happens when people or organizations reach a threshold of opportunity or dissatisfaction;

- *Ideas proliferate* – after starting out in a single direction, the process proliferates into multiple, divergent progressions;
- *Setbacks* frequently arise, plans are overoptimistic, commitments escalate, mistakes accumulate and vicious cycles can develop;
- *Restructuring* of the innovating unit often occurs through external intervention, personnel changes or other unexpected events;
- *Top management* plays a key role in sponsoring – but also in criticizing and shaping – innovation;
- *Criteria* for success shift over time, differ between groups, and make innovation a political process;

Innovation involves learning, but much of the outcome is due to other events which occur as the innovation develops – often making learning ‘superstitious’ in nature

Roy Rothwell was for many years a key researcher in the field of innovation management, working at SPRU at the University of Sussex. In one of his later papers, he provided a useful historical perspective on innovation management, suggesting that our appreciation of the nature of the innovation process has evolved from simple linear models (characteristic of the 1960s) to increasingly complex interactive models (Table 1). His ‘fifth-generation innovation’ concept sees innovation as a multi-actor process, which requires high levels of integration at both intra- and inter-firm levels, and which is increasingly facilitated by IT-based networking.

Table 1: Progress in conceptualizing innovation: Rothwell's five generations of innovation models

Generation	Key Features
First and second	The linear models – need pull and technology push
Third	Interaction between different elements and feedback loops between them – the coupling model
Fourth	The parallel lines model, integration within the firm, upstream with key suppliers and downstream with demanding and active customers, emphasis on linkages and alliances
Fifth	Systems integration and extensive networking, flexible and customized response, continuous innovation

Source: Adapted from Tidd, Bessant and Pavitt, 2005

2.1.3 Characteristics of Innovators

A key challenge for innovative companies is the identification, development and future tying of innovators because “the ultimate success and survival of these institutions depend on their ability to attract, select, and maintain creative individuals” (Feist, 1998, p. 289). Building on previous findings regarding the importance of personal characteristics for creativity (Amabile, 1988) and the

emergence of innovator roles (Witte 1977), several qualitative studies in the past years have aimed to identify personal characteristics of these innovators (Shane, 1994; Glynn, 1996; Griffin, 2009). These recent publications call for further, quantitative investigation of the specific behavior of innovators (Howell, 2005) and personal characteristics beneficial to innovation (Griffin et al., 2009)

The management of innovation requires persons who commit themselves with enthusiasm and self-motivation to the idea. These persons may or may not have been officially assigned to the innovation process. They do, however, show a high personal involvement in the innovative project and foster and nurture the project often in addition to their official organizational position. In the remaining of this article we will call these persons “innovators”.

We found 9 key traits of innovators and entrepreneurs at <http://www.smbceo.com/2020/03/24/key-traits-of-innovators-and-entrepreneurs/>

1. Sensitive intellect;

Innovators are sometimes described as autonomous individualistic geniuses and passionate persons who come together on their own with all kinds of revolutionary ideas; You will often find incredible innovators who are networking and creating relationships with people from different backgrounds and experiences, both within and abroad. Emotional and sensitive intellect has a crucial role to play here and also in the marketing of their ideas and communication with others.

2. Taking risks without any fear;

Innovators recognize that risk-taking leads to the advancement of significant discoveries and innovations. Inventors love to experiment and take risks and encourage others to do it as well. Most of the great innovators help people to be adventurous, and

most promote risk-taking systematically in the employees. A risk-taking culture means promoting new ideas and being patient with disappointments, seeing it as a chance to improve and not as an excuse to failure.

3. *Have a sense of pride;*

It may be seen as an ego, but brilliant innovators and successful entrepreneurs are incredibly confident at what they do. As “Gallup” analyzed creative potential, people with high confidence were performing better in stressful circumstances. If others see risk, businessmen see an opportunity, and if others see challenges and failures, they see achievement.

4. *Taking action immediately;*

Too many people think they can't go on with an idea until they are sure it's the best option. Good innovators understand that until they try them, they will never learn what great ideas are. Indeed, they don't hate to try bad ideas because they know that usually good ideas are just around them, and they just need to implement.

5. *Constantly searching connecting dots;*

Analog approaches are always being searched by innovators. It means that the ideas and solutions in one industry can be used in other industries after some molding. Innovators look everywhere for ideas. They have a keen sense to smell the ideas. It doesn't mean one cannot develop this trait. You just have to be creative and more active in terms of observation to get a brilliant idea.

6. *Communicate effortlessly;*

One of the most important characteristics that innovators and entrepreneurs have is the opportunity to interact with different people. Communication skill is considered a key trait in successful entrepreneurs. They don't hesitate to establish communication

where needed. You may be thinking of why communication is that necessary. Communication makes you get ideas from the problems various people are facing.

7. Prefer to work as a team;

The imaginative theory that inventors don't like to work collaboratively is totally wrong. I sometimes wonder where these stories come from about the loneliness and craziness of inventors. A great innovator understands the importance of teamwork and does everything possible to become a good team player.

8. Expanding the network every day;

Inventors and entrepreneurs love to expand their network because they realize the benefit of networking. Building a good network will allow you to work on diverse ideas. Successful entrepreneurs expand their network by attending several meetings, conferences, seminars, workshops, and events happening around them. You cannot be an innovator by locking yourself in a room to think about a great idea. Ideas come from people. That is why it is essential to make your network broader.

9. Have a mentality of invention;

As an innovator, you know that you can't do it yourself because you need new ideas and creativity that go beyond your team. Good innovators contribute to the development of innovation culture through their company to increase innovation scope. It helps not just the business, but the market and even society to have a culture of creativity.

10. Wrapping up;

Being innovative is a must for a major breakthrough, but it won't help you unless it is backed by the characteristics mentioned above. Fortunately, though, these are all qualities that can be taught and

learned. One can master anything by using inner abilities and willingness. Creativity is one of those traits that can be achieved with hard work and dedication.

2.2 Innovation and SMEs

2.2.1 Role of Innovation in SME development

Innovation is a key driver of productivity and long-term growth and can help solve social challenges at the lowest possible cost (OECD, 2015a). Innovation in small and medium sized enterprises (SMEs) is at the core of inclusive growth strategies: more innovative SMEs are more productive SMEs that can pay better wages and offer better working conditions to their workers, thus helping reduce inequalities. Furthermore, recent developments in markets and technologies offer new opportunities for SMEs to innovate and grow. Digitalization accelerates the diffusion of knowledge and is enabling the emergence of new business models, which may enable firms to scale very quickly, often with few employees, tangible assets or a geographic footprint (OECD, 2017c).

The importance of innovation for the survival and competitiveness of SMEs is an undeniable fact. The explosion of shared information, the growth of a more globalized economy and the rising crisis has changed the rules. Companies must conduct innovation processes to ensure sustainability and promote prominent positions in their markets.

The need to reconfigure and innovate in the face of change is one of the dominant issues that underlies business strategy making today (Covin and Slevin, 2002).

The economic environment is an ever-changing reality. Firms are driven to react as fast as they can as the speed and intensity of

events make this concern a critical condition for their permanence in market. The global markets and high-speed technological improvements have changed the competitive environment, making it more complex, more uncertain and forcing change in organizations.

The deepening crisis since 2007 and the competition in the current world market, where emerging economies grow faster than the others, require European countries to puzzle out products and services of higher quality and more innovative (Cordeiro, 2011).

Thus, the urgency and relevance for the companies, whatever the market in which they operate, to drive process improvements or changes involving their future sustainability is the current theme. The question that every business faces is in which way, using which tools and applying what attitudes and actions, will promote this claim.

The large majority of SMEs do not have an IPR strategy in place, nor do they integrate IPRs into their overall business strategy or model, which is mostly the result of lack of knowledge and expertise in SMEs. Obstacles to the use of IPR become particularly acute when SMEs operate internationally and may involve legal overheads, multiple filings, regulatory and technical differences across countries, and the robustness of local IP enforcement (OECD, 2011). Supporting the development of managerial skills is also important to spread the use of IPRs in SMEs. SMEs are also often unaware of the close link between business innovation and business survival and growth, or may not be cognizant of how to engage in innovation; for example, small enterprise owners are often unaware of the extent to which digitalization can improve their business (OECD, 2017e). Small businesses may also be discouraged to innovate if large (international) players have dominant market positions, which may well be the case in an economy where technology leaders increasingly capture most market shares due to

“winner-takes-all” dynamics (OECD, 2015c). Globalization has increased the importance of cross-border collaboration in innovation, but SMEs find it difficult to identify and connect to appropriate knowledge partners and networks at the local, national and global levels (OECD, 2013).

2.2.2 Available tools, barriers-enablers, procedures.

Carayannis, Popescu, Sipp and Stewart (2006), SMEs are characterized by their ability to react quickly to changing market conditions, which represent a competitive advantage. In addition, SMEs are recognized by their growing participation in terms of employability and development of output. Notwithstanding that fact, SMEs suffer from lack of technology adoption as standard practice, despite their greater tendency for product innovation after applying technological innovation processes.

However, SMEs, according to previous authors, face critical economic challenges such as increasing competition driven by globalization, restrictions on access to finance, developed networks with foreign partners, imperfect access to the transfer of research results and technology, speed of change in the technological environment, and the uncertainty of sustainability.

Despite the competitive advantage could result from the size or ownership of assets, among others, there is favoritism, increasingly, to organizations that mobilize knowledge, technological skills and experience to the creation of novelty. This innovation is reflected in their offers and / or the way they create and integrate them in the product range. The theme of survival / growth raises the problem for established firms but provides a huge opportunity to rebuild the new rules of the game.

Undoubtedly, innovation is a key required for improving productivity, growth and business sustainability. Given this environment, knowledge of the factors that lift innovation is the key. Pinheiro (2002) Organizations dealing with change, uncertainty, instability, competition in a systematic way should be alert to breaking barriers and stimulating actions that maximize the opportunities for the emergence of innovations.

Small businesses that do not embrace innovation in its business strategy take the risk of becoming uncompetitive due to their obsolete products and processes.

Piatier (1984) describes the lack of government support as an important barrier to innovation in the European countries analyzed.

Janeiro (2009) asks why SMEs do they not innovate? He states, they deal with some innovation barriers, as described: (1) the organizational structure, as well as the climate; (2) the culture and strategy resistance to change; (3) the tradition and cemented rules; (4) the market leadership and the absence of rethinking on it; (5) the additional work brought by change, and finally, (6) the weak payoff on risk assumption.

(Eralda Xhafka) It is suggested that to a number of factors such as rapid changes in ICT and access to the worldwide web which appear to make it easier for SMEs to move across borders, are added other factors at play which may be contributing to impede SME access to the global economy. Another factor that continue to hurdle the SMEs contribution to the global economy is the complexity and differences in the regulatory systems and business environment between countries.

2.2.3 Sources of innovation

The tremendous changes in technology, strategy, culture and business models have greatly increased competitive pressures on firms.

The first step in the innovation process is to determine where to begin; That is to identify a source of innovation (von Hippel 1988).

Drucker's (1985) identifies seven sources of innovation that are demand-side or supply-side integrated in the system.

Demand-side sources of innovation are created due to the changes in the social, technological and regulatory environmental changes. For the demand-side sources of innovation managers identify emerging tastes and preferences that typically arise due to social, technological or regulatory environmental changes.

These tastes and preferences manifest themselves as unmet needs and wants for which managers develop new products.

Supply – Side sources of innovation can be created by first development of a new product and then leading consumers to that product.

Sources of innovation driven by consumers' demand are:

1. Unexpected occurrences;
2. Incongruities;
3. Process needs;
4. Industry and market changes;
5. Demographic changes.

Sources of innovation driven from the producers' ability to supply the market with innovations are:

1. Changes in perception;
2. Discovery of new knowledge;

Firms can use either internal or external sources of finance to fund their innovation activities.

The main internal source of finance is retained earnings, the profits accumulated over time which have not been returned to shareholders. Firms typically prefer to use internal financing rather than external financing as the latter can be very costly. As a result, there are projects that firms would choose to undertake if they had sufficient internal resources available, but which will not be taken forward if firms need to access external finance to develop them. In many cases firms do not have the option to access external financing.

In contrast, external sources of financing include debt and equity (as well as some hybrid forms), which can be provided by individual investors (such as business angels), venture capital funds, banks and capital markets (among others). Conditional on having to resort to external funds, debt is generally preferred to equity, since if available debt is typically a cheaper source of finance (even if still more expensive than internal funds).

2.2.4 Financing innovation

Finance plays a critical role in innovation as it allows organizations to conduct research, adopt technologies necessary for inventions as well as develop and commercialize innovations. Accessing external finance for innovation is an important challenge for firms. Firms can fund innovation activities using a variety of funding instruments provided by different types of financial intermediaries and investors. Access to external sources of finance is often particularly challenging at the seed and early stages of business development as at this stage companies face high barriers for accessing finance notably as they lack a track record.

Both funding needs and funding availability are closely related to the stage of development of the firm and its innovation projects.

In the initial phase when inventions are developed and research conducted, there is still much uncertainty about what innovations will emerge, if any. This makes it very difficult to obtain funding. These financial constraints are one of the reasons why policy typically plays an important role at funding the early stages of technological development.

At more advanced stages, with the development of prototypes and the commercialization of inventions, specialized investors who are skilled in assessing new technologies and can handle risk, such as venture capitalists and business angels, become more willing to provide funding.

In the final stages, at the level of technology diffusion and adoption, once both technological and market uncertainty have all but disappeared, more traditional suppliers can provide the required funding to scale up operations as well as to finance purchasers interested in adopting new innovations.

It is worth noting that even if the innovation process may involve the same stages in small start-up and a large multinational, the sources of finance that they have available vary significantly. Large firms can more easily finance their R&D activities, whether using internal resources, getting a loan from a bank (using their tangible assets as collateral if required), issuing bonds, or raising equity finance in the stock markets. Start-ups do not have as many assets to use as collateral and their innovation investment is less diversified, and may also represent a much larger share of their activities for really innovative firms. As a result, their funding options are much more limited, and often need to rely on friends and family before being able to access other sources of capital.

2.2.5 *Measuring innovation*

To understand if an organization is successful in its adoption of innovative work

practices and pursuing its innovative strategy they must measure innovation performance.

Essentially, if an organization is being innovative then they have embraced change.

Consequently, their overall business indicators should reflect a positive performance.

A stable business performance would suggest that the organization is simply maintaining its relative position to the external environment (maintaining a reactive stance).

A downward performance might be explained by uncontrollable factors such as interest rates, GDP and so on, however this only serves to disguise an organization's lack of internal capabilities to monitor its external influences and respond accordingly. Thus, an innovative organization should see improvements on all business indicators, especially over the mid- to long-term.

The following sets out some ways of measuring innovation performance along the four types of innovation explored above. Combined these represent a means for measuring the success of a firm in embracing innovation.

Input innovation – requires assessing the performance of an organization to seek out and provide new resources or source of resources, together with new knowledge.

- Number of technology licenses bought – will provide a means for determining the extent to which a firm explores and utilizes technology developed by other organizations.
- Number of collaborative agreements signed – will measure the degree to which an organization is extending its value chain into the supply side of the business, and collaboratively working with suppliers on innovations.

- Ratio of supply value to number of suppliers – will indicate the degree to which an organization is embracing supply relationship management, insofar as the key suppliers supplying the bulk of input materials.
- Investment in business intelligence – will show the degree to which an organization seeks data about its external environment as input into innovative activities.
- Number of linkages with universities – as a means of determining a potential source of new information.

Process innovation – requires measuring the performance of all activities within the organization to determine if continual improvement is being adopted. These measures need to include the structure, process, people and culture.

- Span of control index – measures the degree to which an organization is introducing flexible, autonomous work structures.
- Number of supply-chain collaborations – indicates the degree to which a firm has adopted innovative network organization structures.
- Cost of quality measures – internal failure, external failure, prevention, appraisal – provide a measure of the quality associated with the service or product ‘production’ process.
- Cost of sales performance – can indicate whether the ‘production’ processes are constantly being improved to reduce overall costs.
- Cost per innovation – provides a guide as to whether the innovation introduction process is, in itself, being innovated. That is, that the cost of bringing new innovations on-line is reducing.
- Number of innovations undertaken by size – to gauge whether the organization is constantly innovating and has a range of projects underway.

- Investment in process innovation as a percent of process costs – will measure the degree to which process innovation is encouraged.
- Human relations measures – absenteeism, turnover, morale – measure the effectiveness of human resource management activities.
- Cost of human relations function as a percent of total expenditure – to indicate whether innovative human resource management is becoming integral to the organization.

New product innovation – refers to changes to existing products (minor and significant) as well as the introduction of entirely new products. To ensure that the innovation pipeline continues to yield a progression of innovations, the following performance measures are required.

- R&D expenditure as a percentage of sales – indicates the level of commitment that an organization has to innovation.
- Market research as a percent of sales – to indicate the degree to which an organization actively seeks data about customers' needs.
- Number of research programs – to ensure that too many projects are not undertaken simultaneously thereby stretching resources too thin.
- Mix of research programs – to ensure that the organization is investing in a range of innovations (short- and long-term; high and low risk) to increase the success rate and have a continual flow of innovations entering the market.
- Number of product innovation introductions – minor, significant, major – will measure the outcome of research programs.
- Product innovation progression rate – per innovation type – will monitor the effectiveness of the innovation process to allow for the removal of blockages, thereby minimizing cycle time.

- Number of patent applications and approvals – while patents do not signify viable commercial projects, innovative organizations will be developing proprietary intellectual property that must be protected. A further measure might be the relationship between patents such that a firm is developing a web of patents to protect a field of inquiry.
- R&D expenditure per patent – can measure the efficiency of the research process and allow benchmarking against competitors.
- Percentage of sales from new products – to determine the level of return from innovation to an organizations financial success.
- Number of licenses issued for new technologies – provides a measure of collaborative arrangements with customers and partners, and that intellectual property developed by an organization might be utilized by other organizations.
- Number of collaborative agreements – customers and partners – provides an insight into the value web of an organization.

Strategy innovation – can be measured by an organizations growth; that is, that innovative strategies have enabled the organization to grow. Growth is an essential element in Kaplan and Norton's (1992) Balanced Scorecard.

- Sales – indicates whether the demand for an organization's products or services is attracting more customers as a result of innovative activities.
- Profitability – will provide insight into whether the organization is undertaking innovations in such a way as to improve its overall business performance.
- Return on assets – to determine the organization's ability to generate a return on its investment.
- Market share – will provide data as to whether an organization is growing relative to its competitors.
- Market value – provides a measure of the market's perception of the organization and its ability to be innovative. In sum,

innovative organizations require constant feedback, not only from the external world and the influences that impact its performance, but data relative to its performance per se.

2.2.6 Innovation Strategy for SMEs

Governments can foster innovation in established SMEs, in co-operation with the other main stakeholders of the national innovation ecosystem, by providing a business environment that is conducive to growth; and supporting the development of strategic assets and resources at the firm level (skills, ICT, access to finance, etc.).

- Upgrading workforce skills in SMEs. Improving workforce skills supports both the generation of new in-house innovation and the absorption of new knowledge sourced through collaborations with external partners.
- Helping SMEs adopt ICT and adapt to the digital revolution. It is important not only to support SMEs in adopting and effectively using ICT hardware and software which can professionalize business management, but also open up SMEs to the new opportunities of the ongoing digital revolution (e.g. cloud computing, data analytics, etc.).
- Ensuring that R&D policy is inclusive of SMEs. R&D grants are typically more likely than tax credits to reach SMEs, as they can directly be targeted at small enterprises or at activities in which small enterprises are more likely to be involved (e.g. collaborative innovation). Governments can also design existing R&D tax credit programs so that they better serve the needs of SMEs, including through enhanced investment tax credit rates for SMEs and simpler operational rules.
- Fostering IP use among SMEs. It is also important to encourage the use of IP by SMEs by raising awareness about the different types of IPRs, increasing IPR related skills in SMEs through

education and training, and making the overall IP system friendlier to SMEs by streamlining procedures, adequately structuring fees and costs, and improving litigation and enforcement mechanisms (OECD, 2011).

- Developing an effective and inclusive national innovation system. National governments have an important role to play in building national innovation systems that are effective in knowledge commercialization and inclusive of SMEs of different sizes and from different sectors. This primarily involves strengthening collaborations and knowledge flows among the main players of the innovation system (e.g. enterprises, business service providers, universities, government organizations, financiers) through policies such as technology extension services, industry-university collaborative research, business accelerators, and business clusters (OECD, 2010a).

CHAPTER 3

3.1 Innovation Culture and Management

3.1.1 *Building culture for innovation*

Culture is the sum total of values, norms, assumptions, beliefs and ways of living built up by a group of people and transmitted from one generation to another. *The culture of innovation* can therefore be defined as an organizational culture that values innovation, where there is implicit encouragement for staff to think differently, take calculated risks and challenge the status quo.

What are its main characteristics?

- Leadership by visionary, enthusiastic champions of change;
- Top management support and encouragement of creativity, both financial and psychological;

- An effective communication system. Leaders share the business vision with their staff and empower them to optimize their potential in achieving the business goals;
- Flexibility towards new thinking and new behavior patterns. The creative organization readily adapts to change and proactively searches for new opportunities;
- Customer focus A creative culture is outwardly focused, looking for ideas among customers, competitors, academia, suppliers and even industries with a different focus;

The culture of innovation can be developed by:

- Selecting innovative employees;
- Training for creativity and innovation;
- Developing a learning culture;
- Empowering the employees;
- Setting up idea capture schemes;
- Developing managers to support the innovation of others;
- Making creativity a requirement of the job;
- Improving employee participation in decision-making;
- Having appropriate reward systems for innovation;
- Allowing risk-taking as an acceptable mode of practice;
- Encouraging investment in research and development;
- Benchmarking (actively undertaking systematic approaches to locate and assess good practice elsewhere in attempts to improve your own performance);

Obstacles that will need to be addressed if you expect to establish a sustainable culture of innovation:

- Lack of a shared vision and/or strategy;
- Innovation not articulated as a company-wide commitment;
- Lack of ownership by Senior Leaders;
- Constantly shifting priorities;

- Short-term thinking;
- Internal process focus rather than external customer focus;
- Focus on successes of the past rather than the challenges of the future;
- Unwillingness to change in the absence of a burning platform;
- Politics – efforts to sustain the status quo to support entrenched interests;
- Rewarding crisis management rather than crisis prevention;
- Hierarchy – over-management and review of new ideas;
- Under-funding of new ideas in the name of sustaining current efforts;
- Workforce workloads (i.e. too much to do, not enough time);
- Risk aversion (i.e. punishment for “failure”);
- Inelegant systems and processes;
- Analytical thinking (“data is God”);
- Absence of user-friendly idea management processes;
- Unwillingness to acknowledge and learn from past “failures”;
- Inadequate understanding of customers;
- Innovation not part of the performance review process;
- Lack of skillful brainstorm facilitation;
- Lack of “spec time” to develop new ideas and opportunities;
- Inadequate “innovation coaching”;
- No creative thinking training;
- No reward and recognition programs;
- “Innovation” relegated to R&D;

3.1.2 *Innovation management*

According to the words of management guru Peter Drucker each organization needs one key competence: innovation. Innovation is the process by which businesses improve their competitiveness and profitability by creating and/or adopting relevant new products and

ideas. Innovations result in the development of new products and services, new features in existing products and services, and new ways to produce or sell them or a different approach to any other process within the company (Beerens et al., 2004, Vemuri et al., 2003, Gellatly and Peters, 1999).

Innovation management begins with defining the strategy and setting innovation objectives. Innovation strategy is a strategy of efficient answer to competition.

- Production strategy may focus on improving production flexibility, reducing lead times, improving working conditions, or reducing labor costs.
- Product strategy may center on improving product quality, replacing products that are being phased out, or extending the product range.
- Market strategy may focus on opening new domestic or foreign markets, or simply on maintaining current market share. Developing successful innovation strategies is often difficult, which explains why many firms choose not to do so, even though the benefits of innovating are widely understood.

The scope of innovation can be quite varied. Activities ranging from automation of order taking to developing hydrogen-powered automobiles are broadly considered innovations.

Specifically, the most important innovations *goals* are the following:

- Increase added value for customers;
- Reduce product/ service cost;
- Increase innovation hit rate;
- Improve product/ service quality;
- Increase development efficiency;
- Increase rate of product/ service introductions;
- Shorten time to market;
- Develop new product/ service categories;
- Create new business models;

3.1.3 *Innovation management tools and techniques*

At the simplest level a tool is something which helps get a job done — but it is not a substitute for the person doing the job. It can be extremely simple — a back of the envelope checklist of questions to ask — or it can be a formally structured, computer based aid to analysis. But in essence it is still something which can be used to help get something done.

We can apply such tools to the problems of helping with innovation and design in companies.

There are thousands of tools available — from simple well-known and widely used techniques like ‘brainstorming’ or checklists through to more specialized examples. And tools are increasingly bundled up into integrated sites which can be targeted at a particular problem area — for example, the process of identifying and developing new products.

Some tools are useful for the diagnosis and analysis end of things — helping clarify and focus information on what has to be done. And other tools are more concerned with implementation, helping to make things happen or to monitor and control what happens.

IMTTs have a wider and accurate consideration and have been defined as a “range of tools, techniques, and methodologies that help companies to adapt to circumstances and meet market challenges in a systematic way” (Hidalgo and Albors, 2008, p. 117). IMTS results from a new way of thinking and are J. Albors-Garrigos, J. I. Igartua & A. Peiro 1850051-4 Int. J. Innov. Mgt. Downloaded from www.worldscientific.com by WSPC on 04/17/18. For personal use only. related to the capacity of firms to apply their knowledge to improve their businesses internally and their relationship with external actors (EC, 2005).

Innovation is driven by the ability to identify opportunities and linkages, to see interactions or connections between two or more (seemingly) isolated facts, and to take advantage of them.

Sometimes, the process to innovate is more complex than we can expect at the beginning, and a quality, effectiveness and efficient management of the process will increase our possibilities of success.

To manage this process, it must be taken in account the following aspects:

- Planning (Innovation Plan);
- The process of innovate;
- The management of innovation projects and technology;
- How to finance innovation;
- Competitive intelligence, technological watch and benchmarking;

5 Tools Every Innovation Manager Needs

- Communication. It's certainly no secret that communication is key to successful teamwork – but maybe that's exactly why it often doesn't get the attention it deserves. ...

- Team Building. When a company sets up an innovation process, usually new teams are created.

- Task Management.

- File Management.

- Conception.

Fundamental concepts for all creative techniques are:

- The suspension of premature judgement and the lack of filtering of ideas;
- Use the intermediate impossible;
- Create analogies and metaphors, through symbols, etc., by finding similarities between the situation, which we wish to understand and another situation, which we already understand;

- Build imaginative and ideal situations (invent the ideal vision);
- Find ways to make the ideal vision happen;
- Relate things or ideas which were previously unrelated;
- Generate multiple solutions to a problem;

Main points to increase or encourage creativity in a company are:

- to be happy, to have fun;
- keep channels of communication open;
- trust, failure accepted;
- contacts with external sources of information;
- independence, initiatives taken;
- support participatory decision-making and employees' contribution;
- experiment with new ideas.

CHAPTER 4

4.1 Innovation in a Knowledge-based economy

4.1.1 *Role of technology*

Technology, according to Wikipedia, is “the making, modification, usage, and knowledge of tools, machines, techniques, crafts, systems, methods of organization, in order to solve a problem, improve a pre-existing solution to a problem, achieve a goal or perform a specific function”.

Technology plays a part in innovation, but not in the way that many people think. For the common person, technology has no value on its own. To make a difference, it has to be appropriately applied to solve specific problems or meet certain goals as defined by the business or the customer. To maximize the value of that difference, it's essential to apply only the smallest amount of technology to the areas that stand to benefit from it.

Too many people like technology for its own sake. They get caught up in fancy gadgets, spec sheets, and bullet points. They think that having technology is innovative in and of itself. This is not true. Innovation only happens when you use technology to provide a real or perceived value to your customer.

There are two primary uses for technology in business: to meet *the status quo* and to *create something new* that moves the business forward (innovation). In either case, the use of technology should be driven by the needs of the business and the customer.

The status quo case is basically the price of admission. It really doesn't add much value to your company, but you need it to do business. The most successful companies are those that use technology to support and enhance their market differentiators.

Take, for example, Domino's pizza. After mounting criticism of their pizza from focus groups and social media sites, Domino's decided to try something new: listen to their customers, speak frankly to them, encourage feedback and create a better pizza and a better experience.

They revamped their recipes, created a new marketing campaign, and tried again. They also used technology in several targeted ways to facilitate communication between them and their clients. Specifically, they created an online Pizza ordering tool that allowed customers to

1) order their pizza, 2) track its cooking and delivery process, and 3) provide feedback to the store about "how they're doing".

The result of the campaign? Domino's reported a more than doubled fourth-quarter profit.

The driver of innovation today is not technology, but insight.

What do customers want? How can you make it easier for them to

do business with you? And where can technology help reinforce those insights?

Research-based competence plays an increasingly important role in the development of innovations and new technology. In developing effective innovation-oriented R&D policies, it is important to understand how, and under what conditions, research-based expertise can contribute to prosperity and address social challenges.

The main message is that we need to think of innovation not as a sudden flash of inspiration, but as a long process of searching, experimenting and learning. Publicly funded research can contribute in many different ways and at all stages of the innovation process. For this to become a reality requires policies that allow for continuous interaction so that researchers and companies can learn from each other. We hope this publication may help stimulate innovation efforts through increased understanding of the long-term effects and the complex relationship between public investment in research and sustainable growth.

Innovation is the process by which new products, processes, methods or services are created. Innovation offers added value for end users by providing better and/or cheaper functionality than previous options. Innovation combines changes in technology, business models, organization etc. The basic idea may be a new technical solution, a new business model or a change in organization. More often than not, however, changes in all aspects are required in order to realize the full potential.

In a competitive economy, no business can survive long term without updating its products and services or the ways in which they are produced or delivered. Innovation policy must promote renewal across all business sectors and not just focus on high tech industries.

The ultimate value of an innovation is also built through adaptation and improvement, often accumulated over decades. Whether the origin was a market opportunity or a new technological capability, innovation can best be thought of as an iterative, experimental search process.

Historically, new technology was developed on the basis of practical experience. A scientific understanding of how and why a technology works has often paved the way for later improvements, but was not always necessary for the original innovation. Today, the relationship between science and innovation is more complex and interdependent.

Science-based technologies such as microelectronics or biotechnology could not have been developed without scientific understanding – but modern science is equally dependent on advanced technology.

4.1.2 Achieving competitive advantage

Innovation integrates knowledge from a number of different fields: technology, market, design, economics etc. It is hard to collect all the necessary competences in a single organization. The costs are high, competence quickly become outdated and the company misses' opportunities to learn from a broader set of experiences. Thus, innovation has become a process of constant interaction with current or future customers, with suppliers and competitors, with consultants and with academic researchers.

“Innovation systems” is our way of summarizing the patterns of interaction and mutual dependence we observe between businesses and public actors. The capacity to innovate depends on how well different parts of this system are adapted to each other and how well they work together.

Innovation policy has traditionally focused on improving long-term competitiveness at national or regional level. In recent years, political attention has also been directed at using innovation to address societal challenges; environmental issues for example.

Economists tend to prefer “technology-neutral” performance standards, but these risk favoring marginal improvements to existing technologies whilst discouraging more radical, long-term solutions.

Preparation of new products in the face of competition from rivals is one way to win competition through product innovation. Innovation means observing consumers to find and satisfy customers by providing new products, creating innovation in order to have a strategic position in the market and withstand attacks from competitors with the main objective to meet the market demand. As a result, it can be used as a competitive advantage for a business. Therefore, companies are required to provide new thoughts, ideas and innovative products.

Some indicators used to measure competitive advantage are product uniqueness, product quality, and competitive price. The first indicator refers to product uniqueness of a company which combines arts and customer desire. Product quality refers to quality of design from company quality. While competitive price, the last indicator, is an ability of company to adjust its product price to general price in the market (Dirisu et al., 2013). In long term competitive advantage, companies acquire sustainable competitive advantage through their ability in developing a set of main competence so that they can service their targeted customers better than their competitors. The main competence refers to a set of unique competence which is developed in a company in its main fields, such as quality, customer service, team coaching innovation, flexibility, responsiveness so that it can sur-pass its competitors (Srivastava, Franklin, & Martinette, 2013). The existence of innovation or product innovation is basically to fulfill market request. So that innovative product is one of things which can be used as competitive advantage for companies. Product innovation is a way to improve value as a concordance of Business Corporation which can bring companies to achieve competitive advantage and market leader (Schreiber, Ermer, Figuerido, & Zeni, 2016). The finding of the study showed that the higher new product innovation, the higher sustainable competitive advantage, which means that new product innovation really has an effect on sustainable competitive advantage of an organization. Because it is not easily imitated, then

this is a competitive strategy to support the success of a vendor for a long period of time (Kuntjoroadi&Safitri,2014).

4.2 Innovation and creativity

4.2.1 Creativity concepts

Creativity refers to the phenomenon whereby a person creates something new (a product, a solution, a work of art, a novel, a joke, etc.) that has some kind of value. What counts as "new" may be in reference to the individual creator, or to the society or domain within which the novelty occurs. What counts as "valuable" is similarly defined in a variety of ways.

Creativity is very important in businesses: organizations need it to adapt to the fast-changing environment, to develop new products and to improve customer services. Creativity is also a key to the ongoing vitality and survival of organizations. In response to this need, managers have invested in various targeted approaches, such as, creativity training programs, team-building, and leadership development to improve it.

In the context of an organization the term innovation is often used to refer to the entire process by which an organization achieves creative problem solving, generates creative new ideas and converts them into novel, useful and viable commercial products, services and business practices.

Given the globalization of business, which has increased the international mobility of managers and the tendency to expand innovative activity across countries, it has become increasingly important to understand the relationship between the processes of creativity and innovation (Candeias, 2008). Innovation is valued not only for individual and organizational performance but also for economic success and social development at the global level (Westwood & Low, 2003).

Almost all the authors in the science of entrepreneurship thus accept that creativity and innovation are exclusive and that they are differentiating entrepreneurial qualities.

These are prerequisites for the classification of “entrepreneurs”. It is therefore of the utmost importance to indicate the differentiating and integrating characteristics of innovation and creativity.

Creativity can be understood as being a multidimensional construct, involving cognitive variables, personality characteristics, family, educational aspects, and both social and cultural elements. These dimensions interact with each other according to individual thinking and creative styles and are therefore expressed and found in many different ways (Sternberg, 2010; Wechsler, 2008). Therefore, the creative phenomenon has been studied under the most different approaches, sometimes emphasizing the person, or the process or products, the environment, or even the interaction between two or more of these variables, thus implying that creativity has multiple ways to be identified (Alencar & Fleith, 2008; Nakano & Wechsler, 2012).

De Bono (1996) defines creativity as the formulation or creation of something that was not previously available in its present state. Value is continually placed on or added to the new creation.

Torrance in Jalan and Kleiner (1995) defines creativity as follows: ... a process of being sensitive to problems, deficiencies, gaps in knowledge, missing elements, disharmonies, and so on; identifying the difficulty: searching for solutions, making guesses, or formulating hypotheses about the deficiencies: testing and retesting them; and finally communicating the results.

As Gerhard Fischer argues, we have to underline the *social nature of creativity*. *Creativity does not happen inside people's minds, but in the interaction between a person's thought and a socio-cultural context.*

To sum up, creativity contributes in several areas, such as innovation, problem solving, planning and decision-making.

Moreover, creativity has been described as the most important economic resource of the 21st century.

McFadzean (2000) manages to conclude and summarize the traits of the creative person as follows:

- A desire to achieve a goal or winning attitude;
- A high level of motivation, dedication and commitment;
- A high level of self-confidence, not risk averse and accepting of failure;
- The ability to link different (unrelated) elements or entities;
- The assimilation of negativities regarding failed projects or attempts;
- An ability to shift existing paradigms and assess different perspectives;
- Problem and opportunity conceptualization in a different or new frame of mind;
- A “single minded” vision or road map;
- A working style that induces hard work and relaxation in order to enhance incubation;
- The ability to determine whether individual or group creativity should take place;

4.2.2 Creativity tools

“There is no doubt that creativity is the most important human resource of all. Without creativity there would be no progress, and we would be forever repeating the same patterns”

(Edward de Bono).

There are many definitions of creativity. A number of them suggest that creativity is the generation of imaginative new ideas (Newell and Shaw 1972), involving a radical newness innovation or solution to a problem, and a radical reformulation of problems. Other

definitions propose that a creative solution can simply integrate existing knowledge in a different way. A third set of definitions proposes that a creative solution, either new or recombined, must have value (Higgins 1999). A novel idea is not a creative idea unless it is valuable or it implies positive evaluation. Also, according to Ogilvie (1998), imagination, which involves the generation of ideas not previously available as well as the generation of different ways of seeing events, is important to achieve creative actions.

According to Boden (1998), there are three main types of creativity, involving different ways of generating the novel ideas: a) The “combinational” creativity that involves new combinations of familiar ideas. b) The “exploratory” creativity that involves the generation of new ideas by the exploration of structured concepts. c) The “transformational” creativity that involves the transformation of some dimension of the structure, so that new structures can be generated.

Davis (1986) distinguishes the different meanings of the creative process by means of the three different views.

The first meaning involves the successive steps from identifying a problem up and till the novel solution thereof.

Secondly it shows the expeditious “perceptual” changes that take place when new idea creation occurs in a short time frame.

The third meaning encompasses all the techniques that are used when new ideas or solutions are generated.

Davis describes the basic process as one that starts with problem recognition, a solving phase and the final solution phase.

Creativity and innovation have been highlighted as essential skills for the 21st century, especially if we consider that both skills can promote human potential by eliciting positive aspects of the individual.

A creative technique is a tool that may be used by groups of creative practitioners to move from a broad concept to a defined idea for implementation. Indeed, they may help a group find or frame a

problem to solve and they are intended to give shape and form to the intended solution or offering.

Creativity techniques may be applied in almost any functional area of the company: strategic planning, corporate business strategy, product development, improvement of services, functional strategy, finance, human resources, marketing, management of collection of information, product design, software design, quality management, etc.

4.2.3 Differentiation

“The ability to create and innovate has been observed throughout history and even though the fundamental tools may have changed the ability has been prevalent in every civilization” (Hisrich, Peters and Shepherd, 2005, p. 8).

The main difference between creativity and innovation is the focus. Creativity is about unleashing the potential of the mind to conceive new ideas. Those concepts could manifest themselves in any number of ways, but most often, they become something we can see, hear, smell, touch, or taste. However, creative ideas can also be thought experiments within one person’s mind (Business insider).

Creativity is subjective, making it hard to measure, as our creative friends’ assert.

Innovation, on the other hand, is completely measurable. Innovation is about introducing change into relatively stable systems. It’s also concerned with the work required to make an idea viable. By identifying an unrecognized and unmet need, an organization can use innovation to *apply* its creative resources to design an appropriate solution and reap a return on its investment.

Organizations often chase creativity, but what they really need to pursue is innovation. Theodore Levitt puts it best: “What is often lacking is not creativity in the idea-creating sense but innovation in the action-producing sense, i.e. putting ideas to work.”

Michael Kirton suggests that there are two types of creative persons in organizations: *Adaptors*, who work within the system to improve things and *Innovators* who ignore or challenge the system and come up with more radical proposals for change.

The characteristics of both types are summarized in the table below:

Adaptors	Innovators
<ul style="list-style-type: none">• Prefer to do things better;• Seek professions that encourage stability and order such as accountability and production;• Formulate ideas without changing much the initial data of the problem;	<ul style="list-style-type: none">• Prefer to do things differently;• Seek professions such as marketing that demand interaction with changing environments (who deal with incertitude);• Would rather produce ideas introducing new elements and changing the relation-ship between elements of a problem;

Once an idea is possible, innovation tends to be an easier challenge for more players to achieve. Creativity is the novel step of being the first to identify that something might be possible in the first place. But innovation is the action of putting things into practical reality, despite challenges and resistance, rather than just contemplating. Both are necessary in business, but only one of them translates to real revenue and profits.

Business leaders frequently interchange creativity and innovation without understanding what separates the two.

"Creativity isn't necessarily innovation," Hunter told Business News Daily. "If you have a brainstorm meeting and dream up dozens of new ideas, then you have displayed creativity, but there is no innovation until something gets implemented."

In the table below (www.pediaa.com) we found a clear differentiation of Innovation and creativity.

Innovation	Creativity
Innovation is the introduction of new or improved goods, services, processes etc.;	Creativity is the use of imagination or original ideas to create something;
Related to implementation;	Related to imagination;
Can be measured;	Cannot be measured;
Follows creativity;	Proceeds innovation;

4.2.4 New product development (NPD)

Successful new product development (NPD) is a critical cornerstone of firm success. Significant incentives exist for firms to continuously introduce viable new products to the markets they serve. The financial payoff from successful new product introductions can help many firms overcome the slowing growth and profitability of existing products and services that are approaching the maturity stages of their life cycles.

New product development can also be a potential source of significant economies of scale for the firm. New products may be able to use many of the same raw material inputs as the firm's existing products, and may be able to be sold by the firm's existing sales force – resulting in substantially lower unit costs (and in turn higher margins) for the firm. Furthermore, new product development can be an important source of leverage for the firm to use in its relationships with its distribution channel partners. Firms that have multiple successful products in their portfolios can command greater attention and priority treatment, such as preferred shelf space and payment terms, from wholesalers and retailers. This is a particularly important consideration given the fact that large retailers, such as Wal-Mart and Target, have evolved into positions of significant channel power and influence. Furthermore, the image and reputation of the firm and its brands is heavily influenced by the

number and caliber of successful products in its portfolio. Nike has enhanced its overall brand reputation, well beyond the realm of athletic footwear, as a result of its successful introduction of golf equipment and supplies, swimwear, soccer equipment and apparel, as well as numerous successful products that appeal to tennis, basketball, and baseball enthusiasts.

New product development cannot be managed successfully without a clear understanding of customers and their changing needs.

The launch of the new product follows 5 steps: 1) Opportunity Identification and Idea Generation, 2) Concept Development, 3) Concept Testing, 4) Design and Engineering, and 5) Prototype Development and Testing.

One of the best ways to help people maximize their creative potential is to allow them to do something they love; with *freedom* and *self-leadership* comes high creativity. In the workplace, employees should be encouraged to explore ideas that are *personally exciting*. Furthermore, the organizations should eliminate unnecessary layers of management and barriers, provide generous rewards for creative behavior and encourage the use of cross-functional work groups.

To cultivate innovation/creativity in the workplace certain ***leadership behaviors*** should be practiced:

- Encouraging employees to challenge the status quo;
- Having an open attitude towards risk taking;
- Being able to use mistakes as learning opportunities;
- Using and sharing knowledge and information;
- Focusing on continuous learning;
- Conducting fair and informative evaluations;
- Rewarding creative performance;
- Practicing participatory management;
- Being self-reflective;

4.2.5 Time management is also important at the workplace. As Runco affirmed “individuals should be given sufficient time, if they are expected to do creative work”. Creativity is negatively related to time pressure.

Stages	Requirements
1. Awareness and interest	<ul style="list-style-type: none"> • Recognition of a problem or situation; • Curiosity;
2. Preparation	<ul style="list-style-type: none"> • Openness to experience; • Analysis of how the task might be approached; • Tolerance of ambiguity; • Willingness to redefine concepts; • Divergent thought processes (explore many possibilities); • Intuitive ability;
3. Incubation	<ul style="list-style-type: none"> • Imagination; • Absorption; • Seeking ideas, possible answers and Solutions; • Independence; • Psychological freedom;
4. Illumination (Insight)	<ul style="list-style-type: none"> • Ability to switch from intuitive to analytical patterns of thought; • Eureka!
5. Verification	<ul style="list-style-type: none"> • Critical attitude; • Analytical ability; • Testing;

(Source: Adapted and integrated from Williams (1999) and Nystrom (1979))

Innovation refers to the process of developing a new product, process, method or service that provides value-added to its users, by

providing a function that is better and/or cheaper than previous options.

Economists often think of innovation as a production process, where knowledge is transformed into a new product that takes the world by surprise. We measure R&D investment, relating these to outcomes in the form of patents, new products, GDP growth and so on.

It is not always the original innovator who ultimately draws the longest straw. Being first to innovate can be important in building a market share and thus affecting the standards that are set. However, it is the ability to consistently identify and realize needs and opportunities that creates winners.

Today the relationship between research and innovation is far more complex. Science based technologies such as microelectronics and biotechnology could not have developed without scientific understanding. However, neither could modern science have evolved without modern technology in the form of ever more sophisticated instruments.

Moreover, the extreme performance requirements of such instruments can, in turn, drive further technological developments. It is of course difficult to apply research findings that do not yet exist, or distribute products that are not yet manufactured. However, as discussed above, research into innovation processes show that this conceptual model gives a poor description of the relationship between research and innovation, in a number of ways:

- Most innovation processes start from a market idea. A small section originates in a new technological opportunity, and an even smaller proportion is based on new research.
- An innovation is not just application of a scientific principle. It combines knowledge from many different sources and the difficulty lies in combining these competences and striking the right balance between conflicting requirements of the product.
- Research contributes to the innovation process in many ways but product ideas are not the most important contribution.

- Science and technology are interdependent. The direction of research is often determined by what instruments technology can offer. An important role of science is also to explain how and why existing technologies work (which can in turn indicate how they could be improved).
- Practical problems sometimes lead to fundamental insights. In 1964, Penzias and Wilson were looking for sources of interference to radio communications at Bell Laboratories (an industrial laboratory) when they discovered cosmic background radiation.

However, the distinction between creativity and innovation may involve two types of risk, emphasized by Isaksen et al. (2001). The first is to place too much emphasis on the product to be obtained, leading to the misunderstanding that other factors important for innovation are not needed, such as the person, the process and the environment. Indeed, most organizations that failed to achieve innovation forgot about the importance of the human element as well as the processes or operations needed to achieve innovation or environmental context for this to happen. The second risk is to limit creativity to a mythological view, understanding it only as the generation of different ideas, without any concern with its adequacy and solution of real problems, erroneously indicating that creativity only involves the production of new ideas (Runco, 2009). However, it must be remembered that creativity involves the realization of something different and meaningful, and thus innovation must be seen as a subset or a result of creativity. Therefore, innovation needs creativity in order to happen, and it is not possible to generate something new and useful for society without an earlier creative process (Dionne, 2008).

Another distinction between creativity and innovation was proposed by Clydesdale (2006), who suggested that creativity is driven by intrinsic motivation, whereas innovation results from extrinsic motives, or the need to overcome standards of thinking or

practicing. Another distinction refers to the fact that creativity must be investigated at the individual level, whereas innovation must be analyzed in terms of a team or organizational level (Cerne et al., 2013). Thus, many steps occur between having an idea and putting it into practice, running the risk that there may be a failure of communication between these two moments (Wechsler & Nakano, 2018).

CHAPTER 5

5.1 Open Innovation

5.1.1 *Definition*

Open innovation (OI) is a business paradigm that assumes that firms grow stronger by being open with their ideas and on-going development work. The openness enhances the possibility for value creating cross-pollination between different kinds of ideas and knowledge. A firm that is open with its development ambitions has a better chance to be a magnet for constructive feedback, competent collaborators and to attract employees with a true interest in what the firm actually is trying to achieve.

To catalyze relevant open dialogue, it is vital to mobilize sufficient concerted “investments” in “real life experiments” with new creative ideas.

Open innovation is an innovation management model as developed by Chesbrough (2003a; 2003b; 2004), which assumes that innovation is based on firms’ need to combine their internal and external technological developments to produce a successful innovation that creates added value for the firm. Chesbrough contrasts a supposed closed innovation followed by some firms with an open innovation, which would be a desirable achievement.

Chesbrough (2003a; 2003b) thus presents six principles of innovation, so-called ‘closed innovation’, countering them with the principles of so-called “open innovation”.

The ideas proposed by Chesbrough (2003a; 2003b; 2004) with respect to the concept of open innovation have prompted considerable interest among academics and users. His dichotomous view of innovation, together with a simplistic view of the processes of innovation has helped to spread the concept (Vanhaverbeck, Vrande & Chesbrough, 2008). However, several issues have been raised recently in the literature (Trott & Hartmann, 2009, p. 715) that depict this idea as a false question which at most means ‘old wine in new bottles’.

5.1.2 *Open vs. closed innovation*

Closed innovation	Open innovation
<ol style="list-style-type: none"> 1. All the smart people work in our organization; 2. To profit from R&D we have to discover, develop and supply everything ourselves; 3. Only if we discover it will we manage to get it to market first; 4. If our organization is the first to commercialize an innovation, we will beat our rivals; 5. If we create the most and best ideas in our industry, we will win; 6. If we have full control over the innovation process our rivals will not be able to profit from our innovative ideas; 	<ol style="list-style-type: none"> 1. Not all the smart people work in our organization; 2. External R&D can create value for our organization; 3. Internal R&D is needed to grasp that value; 4. We have to be involved in basic research to benefit from it, but the discovery does not have to be ours; 5. If we make better use of external and internal ideas and unify the knowledge created, we will win; 6. We should optimize the results of our organization, combining the sale or licensing of our innovation with the purchase of external innovation processes whenever they are more efficient and economic;

Principles of closed innovation and open innovation Source: based on Chesbrough (2003a; 2003b)

Despite the success of open innovation in the academic environment, in the sale of books and in the number of companies that took it up, this innovation model is not held to be perfect. It seems to be a linear model par excellence, consisting basically of a variation of the 'stage-gate' model (Cooper & Kleinschmidt, 1986), characterized by a funnel with holes that would let ideas be exchanged throughout the process, while the flow takes a forward linear course. This linearity is indicated as a conceptual failing (Trott & Hartman, 2009), with the solution involving the integration of the principles of the interactive model of innovation and learning proposed by Caraça et al. (2009), which states that innovation originates in a cyclical process of feedback from learning, where there are neither fixed points of origin nor of obsolescence, and therefore distancing themselves from the technology-push and market-pull models.

Another problem is the flight of knowledge. Open innovation view favors the sharing of information, but this openness can lead to the flight of sensitive knowledge, both commercial and technological. The challenge proposed is how to strike a balance between an exchange of knowledge that is enough to develop R&D and yet remain in control of these flows (Trott & Hartman, 2009).

Another problem is related to the opening up to the flows of knowledge and learning with respect to the global economy, which led firms like Procter & Gamble, and Philips to establish internal frontiers with limits on the free flow of information between their departments (Hacievliyagil, Auger, Maisonneuve & Hartmann, 2008; Meer, 2007). If this is confirmed, then obviously there is an incompatibility that the model does not explain.

The final problem concerns the strong influence of market and customers' needs as sources of innovation in global economy (Caraça et al, 2009). These are critical factors to product, process, organizational and market innovation. Chesbrough view ignores this reality.

5.1.3 *Open innovation in a knowledge economy*

The term “knowledge economy” conjures up images of Silicon Valley, hi-tech start-ups and people tweeting from Wi-Fi-enabled cafes. But those are just some aspects of a concept that covers a wide range of activities that foster growth through innovation. The knowledge economy can be defined as one marked by technological dynamism, including in those sectors not always associated with cutting edge innovation, such as agribusiness or heavy industry. In order to thrive, the knowledge economy relies on an adequate institutional framework, good education, strong communications infrastructure and a supportive financing environment.

Knowledge management plays a central part in open innovation collaborations where new knowledge and insights are supposed to be developed by combining and sharing knowledge between different actors in the collaboration.

Open innovation (OI) is the use of purposive inflows and outflows of knowledge to accelerate internal innovation, and expand the markets for external use of innovation, respectively. This paradigm assumes that firms can and should use external ideas as well as internal ideas, and internal and external paths to market, as they look to advance their technology Chesbrough, H. (2006). Open innovation: researching a new paradigm Chesbrough (2003) emphasizes that companies cannot solely rely on using in-house capabilities and resources in order to innovate. Thus, firms have to open up their boundaries to exploit and explore knowledge beyond the firm’s borders. Moreover, Dahlander and Gann (2010) state that in order for a firm to stay competitive it cannot innovate in isolation but has to continuously involve the external environment in its innovation processes. Open innovation has since then been a popular topic in research (Gassmann, 2006).

The key to effective use of knowledge in innovation is that knowledge has to be shared across functional or organizational boundaries (Gibbons, 1994), and hence, an understanding of how

knowledge sharing occurs and what factors may enhance or hinder knowledge sharing is necessary.

It's all about productivity. Innovation enables businesses to produce more and better-quality goods and services while consuming fewer natural resources and enabling more efficient use of human resources. This is particularly important in the EBRD's countries of investment as many of them have a legacy of energy waste, labor-intensive production processes and an over-reliance on natural resources. In order for the Bank's region to compete successfully on the world stage, it needs to harness the power of technology and embrace innovation in all areas of economic activity.

Innovation determines in a great part the competitive advantage of a firm (JiménezJiménez et al., 2008) According to Huxham (1993), collaborations between organizations may lead to collaborative advantage, and hence, the creation of synergy effects. This occurs when something new and extraordinary creative is produced, which could not be achieved by the organizations themselves. Organizations need to be capable of continuously create, acquire and transform new knowledge into competitive advantage (Foong et al., 2004) and thus the possibility of achieving collaborative advantage may be a motive for an organization to pursue collaboration in an open innovation environment.

The utilization of knowledge affects a firm's performance. Pham and Swierczek (2006) state that organizational knowledge can be regarded as a strategic asset that is critical in order for firms to achieve innovation performance. According to Carayannis et al. (2012), knowledge matters more than ever in ways that are unpredictable and uncontrollable. One central aspect in open innovation is how knowledge is utilized to create something new (Chesbrough et al., 2014). As market changes, competition becomes fiercer and product life cycles shorter, organizations that are constantly creating new knowledge and continuously innovate are those that become successful (Nonaka, 1991). As knowledge resources constitute key strategic assets for organizational

performance (Moustaghfir & Schiuma, 2013; Pham & Swierczek, 2006), knowledge management becomes critical for the competitiveness of a firm (Nonaka, 1994).

Knowledge management aims to develop awareness of ideas existing outside an organization's boundaries and share them internally (Jia & Xia, 2008). It enables individuals and entire organizations to collectively create, share and apply knowledge to achieve their strategic objectives (North & Kumta, 2014) and composes a concept that has recently become popular in management literature (Lundvall & Nielsen, 2007). In order to develop a continuous flow of innovation processes, organizations need to establish knowledge management strategies (North & Kumta, 2014).

5.1.4 Benefits of open innovation (OI)

Part of the advantages of using open innovation (compared to closed innovation) in corporate venturing can be explained by applying the real options approach. Open innovation in risk laden activities such as corporate venturing has the following advantages: (i) benefits from early involvement in new technologies or business opportunities; (ii) delayed financial commitment; (iii) early exits reducing the downward losses; and (iv) delayed exit in case it spins off a venture (Wim Vanhaverbeke, Vareska Van de Vrande and Henry Chesbrough);

There are many OI processes that firms can follow.

Some examples are: (Enkel and Gassmann 2007)

- customer and supplier integration;
- listening posts as innovation clusters;
- applying innovation across industries;
- buying intellectual properties;
- investing in global knowledge creation;

Table. 2 Contrast between Closed and Open Innovation principles (Chesbrough, 2003a)

Closed Innovation Principles	Open Innovation Principles
The smart people in our fieldwork for us.	Not all the smart people work for us so we must find and tap into the knowledge and expertise of bright individuals outside our company.
To profit from R&D, we must discover, develop and ship it ourselves.	External R&D can create significant value; internal R&D is needed to claim some portion of that value.
If we discover it ourselves, we will get it to market first.	We don't have to originate the research in order to profit from it.
If we are the first to commercialize an innovation, we will win.	Building a better business model is better than getting to market first.
If we create the most and best ideas in the industry, we will win.	If we make the best use of internal and external ideas, we will win.
We should control our intellectual property (IP) so that our competitors don't profit from our ideas.	We should profit from others' use of our IP, and we should buy others' IP whenever it advances our own business model.

One of the biggest reasons for the actors to get involved in open innovation collaborations is to get access to external knowledge. In order for external knowledge to be created it is of paramount importance that the actors are willing to contribute with their knowledge to the collaboration. Thus, the participants can be considered to encounter knowledge sharing in two principal situations. First, within the projects itself where participants get together and create new knowledge by sharing their own knowledge. Second, knowledge sharing also occurs when bringing knowledge back to the home organizations. Since it is through the participants that knowledge sharing occurs it is of great interest to investigate in

which manner there might be aspects affecting this sharing of knowledge according to the participants themselves.

Depending on its business model, a firm decides whether or not external and internal knowledge is valuable to be further developed and commercialized into a new business. When the venture project is expected not to be profitable enough or when it does not fit a firm's business model, the firm will not simply abort the project (as in the closed innovation framework), but it will try to license or to sell it to other firms who can use the innovation productively because they have different business models. Comparing closed innovation versus open innovation practices in terms of real options reasoning, there might be several advantages working in an open innovation style in external corporate venturing. (We follow the typology of real options provided by Janney and Dess, 2004.)

First, innovating firms benefit from early involvement in new technologies or business opportunities. Open innovation allows innovating companies to sense developments in a wide range of externally developed inventions by buying minority stakes in (high-tech) startups, participating in venture capital funds, or by providing educational investments in promising projects at universities or research labs. This is an option-creation process in order to get more information and learn about projects or technologies with uncertain payoffs. The advantage of this strategy is that companies learn early on about new technologies: at that stage investments are small and reversible when investing companies exit. Moreover, tapping into externally developed technologies also enhances the upward potential of the real option because the company can scan a broad range of interesting ideas and projects. In real option terms, open innovation allows companies to scan a much wider range of the available technologies or new market developments, instead of just writing options on internal projects alone. The ability to access a broader range of technologies and market opportunities has financial value because there may be more varied opportunities, and some of these may be uncorrelated with internally perceived opportunities.

The result is more alpha, in terms of higher return, and lower beta, in terms of robust diversification, enabling the open innovation firm to build a portfolio of projects that will be more resistant to problems in any one part of the business.

Second, innovating firms also benefit from delayed entry or delayed financial commitment. The staged process in which new technologies are developed and commercialized into new business opportunities can be analyzed as a compound option. In closed innovation, firms can only start with an internally developed idea/invention and pull it through the funnel. Open innovation practices offer firms more flexibility about when to start the internal portion of the innovation process: a company can start exploring the commercial possibilities of a technology outside initially, via relationships with universities, SMEs and other innovation sources.

Third, open innovation offers firms the advantage of an early exit, and the ability to realize some value from projects that do not go forward internally. Open innovation is characterized by the possibility that innovating firms can always license or sell technologies or spinoff ventures that are not promising enough and/or that do not fit with their business model or core competencies.

Fourth, open innovation allows firms to benefit from delaying an exit. The creation of corporate ventures that reside outside the organization allows firms to monitor its developments while delaying the exit decision. While the venture grows further and matures, the corporation can decide whether to spin in the venture or whether to sell it to external capital providers such as venture capitalists.

These four arguments show that the alleged benefits of open innovation – i.e., improved access to other organizations' technological capabilities or higher R&D productivity through the combination of internal and external channels to market – can only be fully explained using a real options perspective that focuses on

the process of how firms cope with high levels of uncertainty through subsequent investments in new ventures.

5.2 Partnerships for innovation

5.2.1 *Collaboration and partnerships*

Collaboration across the value chain as well as within and trans-sectorial appears to be a fruitful open innovation practice. The same applies to participation in external challenge-driven innovation processes as it has been shown that a central part of innovation process is to organize search for new ideas that have commercial potential (Laursen & Salter, 2006).

Amongst the various OI principles identified in research (Chesbrough, 2003a; 2003c) there are some that appear most relevant to our focus.

- Not all smart people work in-house – need to tap into external knowledge;
- External R&D can generate significant value to us;
- A strong business model is more important than first to market;

In trying to solve the problems encountered in the process of developing an innovation, companies primarily search the existing knowledge base. Earlier research is part of this knowledge but has often been codified in review articles, books, etc. Starting a new research program is costly, uncertain and above all takes precious time. New research is often a last resort when existing knowledge is simply not enough. Innovating firms will rely on their existing in-house competences in the first instance. Where these are not enough they will turn to their network contacts with external knowledge sources.

Where the required technology is completely new to a sector they may need external support such a government supported program or a consultant.

The main contribution of universities in this process is to educate scientifically trained people. Their training enables them to navigate existing research and/or have enough understanding to estimate what direction and partners new research will need in order to succeed. They will also be able to make good assumptions about where to seek solutions to problems arising in the development process.

In the earlier stages, academic researchers can also serve as discussion partners to a business in its search for knowledge. This uses the researchers' overall expertise and network of contacts, giving an overview of their field but not necessarily of their research results. A publishing record is an entry ticket to the academic network; this makes academics useful as a guide to the broader research base. It provides access to research networks and thus an overview of what is about to happen within a field of knowledge and so on.

Innovation cannot be created by government actions; they emerge organically and are constantly evolving. Still, with forward-looking measures innovation policies can improve the conditions for such processes by removing administrative obstacles and through programs that increase awareness of the expertise available and demonstrate the benefits of cooperation. Historical studies of how innovations have been created demonstrate that innovation does not occur as a sudden brainwave which is then simply "commercialized". In most cases, innovations have been preceded by a lengthy search process whereby different actors have searched for solutions, tried and failed. Neither are innovations born fully developed. Value is created when the original seed is nurtured and developed.

5.2.2 *Networking*

Networks tend to be informal groupings of organizations that evolve over a period of time with no contractual responsibility to each other.

Innovation Networks are those networks that involve the interplay of people, ideas and organizations to create new, technologically feasible, commercially realizable products, processes and organizational structures. The tri-partite framework captures networks of ideas (Concept Level), people (Individual Level) and social structures (Social-Organizational Level) and the interactions between these levels.

Adding even more heterogeneous actors to the process, innovation networks not only inherit but intensify the problems of collaborative knowledge production (Gibbons et al., 1994). They have, for the most part, no unanimous definition of the key problems, much less of their solutions. This means that the characterization of innovation problems and solutions becomes the characterization of conceptual structures that are only interpretable and intelligible against the experiential Innovation Networks Ahrweiler & Keane.

In recent years, network analysis of innovation networks has become a very vibrant, interdisciplinary research area. Many different aspects of innovation networks have been examined in this work: such as, studies of the binary combinations of possible actors (e.g., university-SME, university-MNC, SME-SME), of the possible links between actors (e.g., R&D alliances - Siegel, Waldman, Atwater and Link, 2003; spinoffs - Smith and Ho, 2006; licensing - Thursby and Kemp, 2002). There have also been extensive studies specifically on university-industry links (cf., Ahrweiler, Pyka and Gilbert, 2011) and on inter-firm networks (e.g., Schilling and Phelps, 2005; Porter, Whittington and Powell, 2005).

“Research by physicists interested in networks has ranged widely from the cellular level, a network of chemicals connected by pathways of chemical reactions, to scientific collaboration networks,

linked by co-authorships and co-citations, to the world-wide web, an immense virtual network of websites connected by hyperlinks” (Powell, Koput, Owen-Smith, 2005: 1132). Networks consisting of nodes and edges (i.e., actors and relations, or units and links) are now seen as ubiquitous, where general insights apply to their topologies, structural properties and measures (Albert and Barábasi, 2002; Newman, 2003; Halvey, Keane & Smyth, 2006; Wasserman and Faust, 1994).

To capture the social and cognitive aspects of innovation networks it seems to be important to think in terms of, at least, three interacting layers of networks representing concepts, individuals and organizations.

Keane (2010) characterizes creativity as emerging when gaps are (cognitively) opened between the World, Language (as a representational medium of describing that World) and Experience (as a conceptualization of that World). Thus, according to this view, creative individuals are people that can use language and experience to create and maintain ambiguity, to abandon previously held understandings and to balance the open and closure of the gaps that lead to creative insights.

5.2.3 *Clusters of innovation*

Globalization is bringing a flat world in which geography is of little importance (Freidman, 2005). Yet paradoxically, local concentrations of firms are gaining importance in the global context. Innovation clusters, i.e. spatial concentrations of innovative activity, emerge everywhere, and modern nations compete to develop such innovative concentrations of firms at national, regional, or even urban scale (Tracey and Clark, 2003; Tan, 2006; Cooke, 2007). Major corporations, SMEs, entrepreneurs, leading research centers, universities, venture capitalists, and government institutions thrive and interact within these clusters, which collectively design,

produce, and export successful products and services with a global scope. The phenomenon of innovation clusters has been approached from different theoretical perspectives. We find their antecedents in neoclassical industrial districts (Marshall, 1920), or in cluster theory (Porter, 1990, 1998). Similar phenomena have been studied from an evolutionary point of view under the labels innovation ecosystems (Edquist, 2005; Adner and Kapoor, 2010; Mercan and Göktaş, 2011), sectoral innovation systems (Malerba, 2002), local innovation systems (Breschi and Lissoni, 2001; De la Mothe and Paquet, 2012) and innovation districts (Clark et al, 2010; Katz and Wagner, 2014). These concepts constitute some of the building blocks of global competitiveness. It is not Apple, Google, or Hewlett Packard, but Silicon Valley as a whole that competes with other innovation ecosystems in the global arena. It is not Baidu or Xiaomi who invade the global market, but the Chinese system of innovation, with its epicenter in Beijing or Shenzhen. It is not BMW, Daimler, Mercedes, or Robert Bosch who try to lead the automotive sector, but the innovative clusters of Bavaria and Baden-Württemberg in South Germany. As globalization standardize the international trade rules, extends the symmetric provision of information, and forces the economic barriers to dissolve, nations and regions are under more pressure to differentiate and specialize to gain comparative advantage (Hunt and Morgan, 1995; Cooke and Leydesdorff, 2006). Creating technology hot spots, and understanding the positive dynamics of innovation inside them, is a key success factor for national competitiveness. Furthermore, the dynamics of creation and growth of innovation clusters appear to be accelerating. According to the World Intellectual Property Organization some of the most powerful innovation clusters in the world, in terms of technological inventive activity, such as Shenzhen-Hong Kong (2nd in the world, behind Tokyo-Yokohama), Seoul (4th), Beijing (7th), Shanghai (19th), Tel-Aviv (22nd), Helsinki-Espoo (34th), and Singapore (35th), are relatively young (Bergquist et al., 2017), and their origins cannot be traced to

historical reasons, as implied by neoclassical economy or cluster theory. Today, nations are involved in a fierce race to develop their national or regional innovation systems as a base of their economic competitiveness and sustained welfare (Cooke, 2001; Lundvall, 2010; McCann and Ortega-Argilés, 2013). Beyond classic economic or cluster theory, there is evidence of the rapid emergence of innovation clusters in specific locations. We propose that innovation itself is strengthened within an innovation cluster, which may be the origin of a further positive feedback effect: more innovative firms increase the innovativeness of the cluster, which in turn enhances the innovativeness of the individual firm. This effect may, at least partially, explain the fast growth of innovation clusters. Boschma (2005) performed a comprehensive assessment about the critical role of proximity in innovation across five dimensions, i.e. cognitive, organizational, social, institutional and geographical proximity. (Petra A. Nylund, University of Stuttgart).

5.2.4 Social Innovation

Social Innovation (Sis) are actions aimed at the - satisfaction of social needs that are not adequately met by market and macro-level welfare policies (content dimension) - through the transformation of social relations (process dimension) which involves empowerment and socio-political mobilization (political dimension linking the process and content dimension).

Innovation policy has been viewed primarily as a means to strengthen the development capability/long-term competitiveness of countries or regions. Over the past few years, increased interest has also developed in using innovation to address other major social challenges. When OECD was commissioned to develop an innovation strategy in 2007, work focused on how increased innovation can meet “grand” societal challenges such as climate, health, access to food and combatting poverty whilst contributing to

sustainable growth. The project was initiated by OECD's highest governing body, consisting of the member states' finance ministers. Innovation as a means of achieving other policy goals is not in itself new. Technology procurement for defense or healthcare are both examples of this. What is new in today's discourse is partly the magnitude and global nature of the challenges, but also the realization that innovation's experimental search processes can sometimes lock us into dead ends that subsequently prove unsustainable.

“Social innovation and collaborative networks must be fully used in order to boost participation by the public and civil society in general in designing and managing EU policies, by means of distributed collective and bottom-up projects that strengthen more direct democracy.” (EESC, 2016, p. C13/104).

In a review of the *International Handbook on Social Innovation*, Gordon Shockley begins with the bold claim that “Two literatures on social innovation have developed” (2015, p. 152): one grounded in “Anglo-American entrepreneurship studies” and the other in “EuroCanadian social economies”. We can understand this claim in the light of the historical narrative: the “Anglo-American” category essentially refers to Anglophone SI literature based in the business innovation and organizational management sciences, developing since the 1980s (Drucker 1987) but achieving special prominence in the last decade as a preferred response to the accelerated retreat of the welfare state following the global financial crisis, while the “Euro-Canadian” literature is more diverse (both linguistically and theoretically), rooted in the emancipatory ideals of Continental social and solidarity movements, and strongly developed through the new approaches to community and neighborhood development that emerged in the late 1970s – early 1980s.

SI is not reducible to a field of endeavor, nor to a particular sector of the economy. It is a way of understanding a wide range of activities and practices oriented to addressing social problems or meeting human needs.

SI does not separate means from ends, but treats needs and problems as inherent in social relations. It therefore involves changing relations through the adoption of new social practices, institutional arrangements and/or forms of participation.

As a consequence, the effects of SI extend beyond the immediate meeting of needs. For most authors, there is a normative aspect to the definition of SI, in that it has effects that – in a range of different ways – improve society. At the least, social innovations improve long term opportunities for individuals and/or communities, or produce more efficient, effective and/or sustainable means for society to deal with its challenges. Some authors, however, consider that SI should have deeper transformative impact – these different perspectives are described further below.

CHAPTER 6

6.1 IPR as a competitive advantage

6.1.1 *Role of IPR as an intellectual asset*

Intellectual property refers to the protection of the products of human creativity that encompasses the 'originality of new products, the confidentiality of know-how and the distinctiveness of names, trademarks and get-up' (Spoor & Fisher 2001). Intellectual property rights (IPRs) are legal devices that protect creations of the mind which have commercial value, such as inventions. They grant exclusive rights to the creators (right holders) to protect access to and use of their property from unauthorized use by third parties.

Intellectual property rights serve to protect the - often large and highly risky - investments of innovative and creative companies against potential imitators and thereby provide key incentives to undertake such investments in the first place.

Formal IPRs are a policy tool intended to protect innovators from imitating competitors long enough so that they can earn sufficient profits to recover the costs of innovating, while encouraging innovators to make their newly gained knowledge available to the public so that other innovators can build on it. Moreover, being intangible assets, IPRs can in principle be bought and sold or licensed out just like other assets. In this way, IPRs underpin a market for innovations, which is significant because brilliant inventors are not always brilliant entrepreneurs and vice versa. Markets for innovations allow inventors and entrepreneurs to match their talents in successfully bringing innovations to market.

In this regard, effective IPR protection and enforcement can be seen as a quid pro quo between innovators and society: an innovator who, in the process of obtaining IPR protection, discloses to society at large the critical elements of their innovation needs to be confident that their exclusive rights can be enforced. Otherwise, the innovator would be disclosing critical information to potential imitators and other third parties, but these third parties could use this information without permission and without compensating the innovator.

Intellectual property (IP) shares many of the characteristics associated with real and personal property. For example, intellectual property is an asset, and as such it can be bought, sold, licensed, exchanged, or gratuitously given away like any other form of property. Further, the intellectual property owner has the right to prevent the unauthorized use or sale of the property. The most noticeable difference between intellectual property and other forms of property, however, is that intellectual property is intangible. That is, it cannot be defined or identified by its own physical parameters. Consequently, IP must be expressed in some discernible way to be protectable.

6.1.2 Creation of IPR

The ongoing revolution in information and communication technologies (ICT) has dramatically reduced the costs of creating, processing and transmitting knowledge, both nationally and across borders. The pace of innovation has accelerated significantly. These twin developments, of closer international economic integration and more rapid innovation, create new challenges for IP regimes and policymaking.

To be competitive in the globalized economy, the UNECE Member States have to maintain, adapt and create institutional and legal frameworks conducive to the creation of knowledge and its commercialization. Intellectual property rights have a key role to play in this regard.

At the same time, both the innovation process itself, and the production activities of firms are globalizing rapidly. This raises challenges in terms of managing, protecting and enforcing intellectual property rights across borders.

Beyond the design of the legal framework, intellectual property can contribute effectively to knowledge-based economic development only if the key stakeholders in the innovation process have the capacity to actually make optimal use of the intellectual property system. Even in the leading innovative economies of the UNECE region, research time and again finds that by far not all stakeholders have this capacity. The innovation process, i.e. the process of turning inventions and other forms of new knowledge into production processes, product or services which are commercially successful and generate new jobs and economic growth, is far from automatic. It is fraught with business risks and frequently requires massive capital investments over long periods of time.

There are numerous routes to exploit research results, some of which are simplified below:

- The development, patenting and eventual commercialization of a technology together with an industrial partner;

- The development and patenting of a technology for licensing to an industrial/enterprise partner who will then commercialize the technology;
- The development and patenting of a technology followed by the formation of a spin-off company to specifically develop the idea for the marketplace;

To be patentable, an invention must be novel, unique, useful, and nonobvious. A prerequisite to patentability is that the invention must be capable of some practical application. This emphasizes the importance the patent system puts on usefulness. One might say that a patent is a contract between society as a whole and an individual inventor. Under the terms of this social contract, the inventor is given the exclusive right to prevent others from making, using, and selling a patented invention for a fixed period of time in return for the inventor's disclosing the details of the invention to the public. Thus, patent systems encourage the disclosure of information to the public by rewarding an inventor for his or her endeavors.

6.1.3 *Protection and valuation of IPR*

As well as obtaining knowledge from various sources, organizations need to protect their own intellectual property, and patents are the process by which this protection occurs. Patents are legal rights to concepts and ideas; they must be applied for in every country individual. They must also be new ideas and technically should not have been discussed by anyone other than the developers. While patent protection is a major way in which knowledge can be protected, it is worth remembering that a patent is codified knowledge. Codified knowledge is easy to locate; the easier it is to locate the easier it is to transfer. Tacit technology that is held within people's heads is the easiest to protect from copying and can be preferable to explicit patent

protection especially where the technology has been developed in-house.

To protect themselves against imitating competitors, innovators can try to keep the critical elements of their innovations secret, or to stay ahead of the competition by continuously introducing incrementally improved products.

Intellectual Property (IP) is a specialized classification of intangible assets that are created by human intellectual and/or inspirational activity and can enjoy special legal recognition and protection. Patents, trademarks, designs and copyright are examples of IP assets protected by IP rights.

Well-designed intellectual property rights systems give temporary exclusive rights to inventors and thereby increase their chances to recover the often substantial upfront investments they need to make to generate innovations and to bring them to market. Intellectual property rights systems should also make it possible for innovators to sell, license or give away the rights to their innovations to others, who may be better placed to exploit them. In other words, intellectual property rights are a key prerequisite for intellectual assets to emerge in markets. Well-designed intellectual property rights systems also encourage innovators to disclose their knowledge so that future innovators can build on it, thereby helping to accelerate the rate of innovation.

Several methodologies are used on the quantitative approach, but generally they can be grouped in four methods:

1. Cost-based method: This method is based on the principle that there is a direct relation between the costs expended in the development of the intellectual property and its economic value.
2. Market-based method: The market-based valuation method relies on the estimation of value based on similar market transactions (e.g. similar license agreements) of comparable intellectual property rights. Given that often the asset under

valuation is unique, the comparison is performed in terms of utility, technological specificity and property, having also in consideration the perception of the asset by the market.

3. Income-based method: This method is based on the principle that the value of an asset is intrinsic to the (expected) income flows it generates. After the income is estimated, the result is discounted by an appropriate discount factor with the objective to adjust it to the present circumstances and therefore to determine the present value of the intellectual property.
4. Option-based method: Differently from the other methods, the option methodology takes into consideration the options and opportunities related to the investment. It relies on option pricing models (e.g. Black-Scholes) for stock options to achieve a valuation of a given intellectual property asset.

In recent years, IP valuations have crept into a wide array of business situations, including:

- Evaluating potential merger or acquisition candidates;
- Identifying and prioritizing assets that drive value;
- Strengthening positions in technology transfer negotiations;
- Making informed financial decisions on IP maintenance, commercialization and donation;
- Evaluating the commercial prospects for early stage Research & Development (R&D);
- Valuing R&D efforts and prioritizing research projects;
- Supporting a valuation for loan collateral;

6.1.4 Evaluation and exploitation of IPR

A well-designed and well-performing intellectual property regime is not an end in itself, but a tool to improve the innovative capacity and competitiveness of the economy. Policymakers should therefore ensure that practices and policies targeting improvements in the

intellectual property regime are consistent with and integrated into a larger effort to improve the policy, legal and regulatory framework promoting innovation and competitiveness.

It is relevant whenever an organization is “licensing in” technology in order to commence a new research project, or “licensing out” or assigning (selling) the technology to as part of its strategy for commercialization, or using the intellectual property as collateral for a loan, or securitizing the intellectual property, or raising finance on the capital market (e.g. by means of a bond issue), or donating the intellectual property to write-off taxation, or in a worst case scenario, in cases of bankruptcy or infringement litigation accounting for a loss of revenue. The “paradox of valuation” is that while most organizations are aware of the potential value of their intangible property they invariably neglect to determine its value with any accuracy. Patent protection can only contribute to a successful transaction if the intellectual property is valued with an eye to the market, at a realistic price. Both public and private investors in R&D stand to gain from more systematic valuation of intangible capital. Investors can 86 Intellectual Property Commercialization: Policy Options and Practical Instruments optimize their intellectual property portfolios and increase their returns with more realistic valuations. It allows firms the potential to capture greater market share through better pricing in high-growth, knowledge-intensive segments assuming that is, they value intangible assets efficiently. The value of the patents therefore must be assessed as a prerequisite to investment by third parties.

An intellectual property valuation will assist in making informed decisions concerning the alignment of intellectual property development or acquisitions.

In particular, it is essential to:

- knowing which is the valuable IP (perhaps within a large portfolio) and which needs to be protected fully, and which is

the IP of no significant value, which might be sold or abandoned;

- creating new and diverse revenue streams, especially from underused IP;
- achieving lower overall costs associated with IP development or acquisition, protection and utilization;
- creating a greater awareness among staff of the significance of IP to the financial viability of the organization;
- establishing a realistic price, if you are negotiating a license with a private sector developer. In that case the appraised value can represent the base value around which the buyer/purchaser or licensor/licensee negotiate the final agreed price;
- utilizing the patent for securitization or an IP-backed loan, if you are considering creating a spinout company;
- deciding whether to commence litigation to protect a patent;

There are basically three available methodologies for valuing intellectual property that has been registered or is the subject of statutory protection, such as patents, computer software, databases and trademarks.

1. **Market-based:** the market-based value uses other recent similar market transactions as a reference to obtain the comparable market value of the intellectual property. The basis of the market value is the assumption that if comparable property has fetched a certain price, then the subject property will realize a price something near to it.
2. **Cost-based:** The cost-based methodology attempts to determine the value of the IP by means of determining the actual historical cost of generating the intellectual property or its replacement cost. In the latter case valuation is determined by what it would cost to substitute or “design around” the intellectual property protection.

3. Income-based: The value of IP, particularly a patent, depends on the predicted future cash flow to be derived through the exploitation of that patent. This, therefore, entails the determination of the cost or value contributed by the intellectual property and is often assessed by determining the volume of the product sold and the margin on that product to obtain the total profit made.

6.1.5 Commercialisation models

Commercialization can be defined as the process of turning an invention or creation into a commercially viable product, service or process.

Commercialization may require additional R&D, product developments, clinical trials or development of techniques to scale-up production prior to taking the results of research to market. This is important because not all inventors or creators wish or have the resources, skills and appetite for risk to commercialize their own inventions or creations. Public research organizations (PROs) usually fall into this category.

Resources required Converting an original or new idea, concept or design to a desired product available in the marketplace requires:

- Time;
 - Funds (own or borrowed);
 - Creative effort;
 - Innovative effort (own, of employees and of external collaborators, partners, advisors and consultants);
 - Persistence;
 - Focused management of the entire process from idea to market;
- Spin-offs especially, need to consider the unique market characteristics with regard to the business concept and concept implementation (Nerkar and Shane, 2003).

Conditions necessary to obtaining a commercial return to obtain commercial returns from IP, certain conditions must exist.

These include inter alia:

- The existence of a customer or the ability to create customers; and
- An entity controlling the manufacture and sale of the resulting products;

In entering into an intellectual property transaction, one of the most important assessments to be made relates not only to the validity and market-relevance of the asset but also the capacity to protect and enforce the IP. Once the new product is offered for sale and if it is successful in the market, it is likely that competitors will attempt to make a competing, cheaper product with identical or similar features. This may lead to undue financial pressure, particularly if the organization or partners have invested significantly in R&D for creating the product. This is where, in order to sustain a burgeoning enterprise, it is so important that the parties have recourse to the effective enforcement of IPRs.

CHAPTER 7

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