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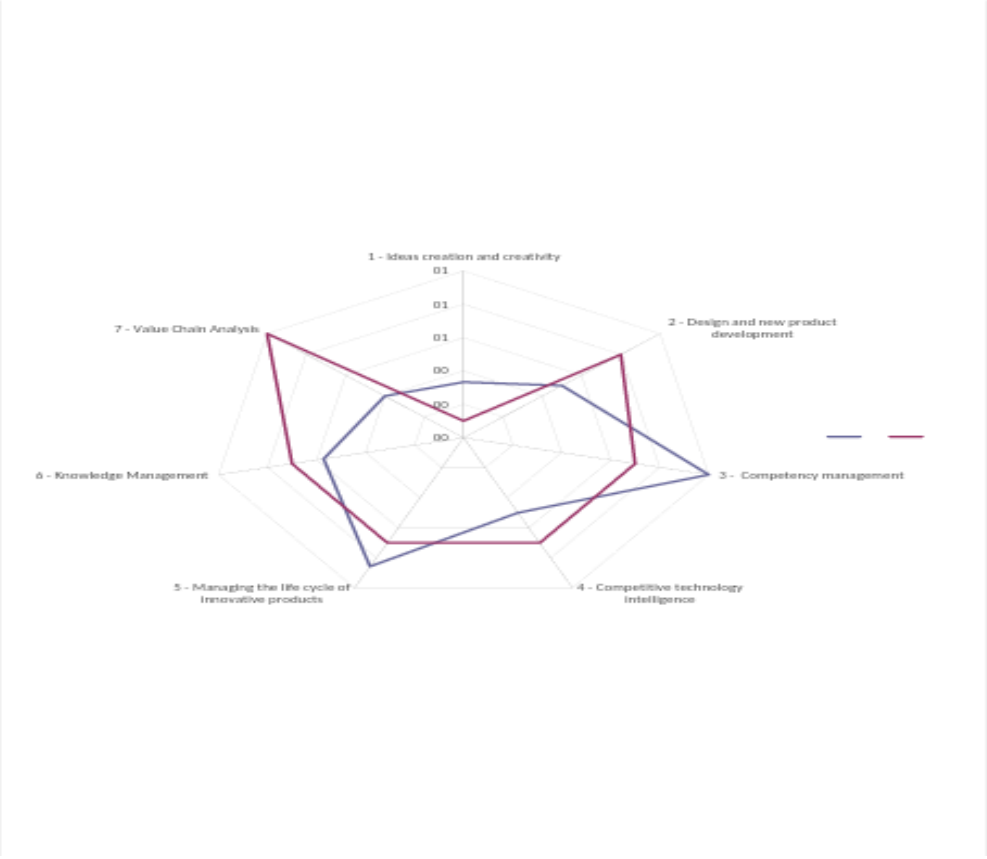
SMEINNOBOOST

Technological audit of Small and Medium Enterprises (SMEs)



December 2018

БЪЛГАРСКААКАДЕМИЯНАНАУКИТЕ

ИНСТИТУТ ПО ИНФОРМАЦИОННИ КОМУНИКАЦИОННИТЕХНОЛОГИИ

1113 София, ул. „Акад. Г. Бончев", бл. 2,Телефон: (02) 979 66 11, (02)870 84 94; Факс: (02) 870 72 73

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IICT
БЪЛГАРСКААКАДЕМИЯНАНАУКИТЕ
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Abbreviations:

- **EU** - European Union
- **FDIs** - Foreign direct investments
- **FTO** - Freedom To Operate
- **GIS** - Geographic Information Systems
- **IP** - Intellectual Property
- **IPR** - Intellectual Property Rights
- **ICT** - Information and Communication Technology
- **IT** – Information Technology
- **ITMS** - Innovation Technology Management System
- **IVC** - Innovation Value Chain
- **KPI** - Key Performance Indicator
- **MOT** - Management of Technology
- **NDAs** – Non-disclosure Agreements
- **NESTI** - National Experts on Science and Technology Indicators
- **NGO** - Non-governmental Organization
- **OECD** - Organisation for Economic Co-operation and Development
- **PLC** - Product Life Cycle
- **R&D** - Research and Development
- **RTOs –** Research Technological Centers
- **SME** - Small and Medium Enterprises
- **SWOT** - Strength, Weakness, Opportunities and Threats
- **TAM** - Technology Audit Model
- **TIEC** - Technology Innovation Entrepreneur Center
- **TMAP** - Technology Map
- **TQM** - Total Quality Management
- **WPSTI** - Eurostat Working Party on Science, Technology and Innovation Statistics

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1. Reseach of company technology types to create innovative ICT clusters
1.1. Reseaching the types of enterprise technologies

One of the objectives of the European Union's Innovation Strategy is to develop new cross-sector industrial value chains across the EU by relying on the innovation potential of SMEs. The EU must support the development of emerging industries, which will ensure growth and employment in the future. The industrialization of the EU's industrial base must focus on the development of long-term internationally competitive goods and services that require a combination of different competences and innovative solutions. The development of new value-added industrial chains requires the cooperation and integration of different actors in the field of innovation, including large enterprises and, in particular, SMEs in different sectors, in order to achieve a common vision.

However, to achieve this vision, SMEs need help to generate, borrow and better exploit all forms of knowledge, creativity, craft and innovation, including the application of existing cross-border or emerging technologies, advanced production, ICT, environmentally and resource-efficient solutions, new business models, as well as innovative services and design. The potential of clusters - which are favorable ecosystems for innovation and entrepreneurship - should be better used in this respect and will support SME development.

The aim of the curent project is to create a specialized tool for the conduction of a technological audit and assessment of innovation capacity of SMEs aimed at reviewing applied company technologies and deciding on their development. The result of the company's technology audit is the solution for:

- Failure of a technology;
- Acquisition of new technology;
- Development and improvement of existing technology;
- Entering new niches / segments in local and international markets.

1.1.1. The Opportunities Created by Clusters

In this section we will review the role of individual actors, as well as their role in the successful development of clusters, like policy makers, Universities and firms.

Clusters are geographic concentrations of interconnected businesses, suppliers, and associated institutions. They can contain anchor institutions, small firms, start-ups, business incubators, and accelerators.

The key driver in the formation of clusters or districts is that firms and researchers benefit from being located near each other, which is an extensively researched phenomenon in economic development literature. The value placed on geographic proximity is high given that innovation is a deeply human and creative endeavor that requires personal networks and trust that can be built between diverse and talented people. Clusters have been found to increase the innovation levels, efficiency, and productivity with which participating companies can compete both nationally and globally.

This report will examine and analyze the nature of clusters and innovation districts and draw conclusions for policy makers and local participants involved in developing the clusters, such as universities, businesses, and local leaders. Michael Porter and colleagues at the Harvard Business School have been instrumental in bringing the study of clusters to the fore and in identifying drivers of their success. Brookings has played an important role in both the theory and practice of small clusters and innovation districts. The Metropolitan Policy Program at Brookings has not only written extensively on the subject but has also been involved in developing the plans that many cities and states have adopted to develop their economies. Their work is an essential component of this study.

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Clusters and innovation districts are key sources of productivity growth in an economy.

Productivity, which is the most important determinant of the long term growth of living standards, has experienced a significant slowdown globally in recent years. It could speed up innovation and rapid economic growth and can increase collaboration between firms and universities which is important for the diffusion of knowledge in an economy and is a potential part of the productivity solution.

Governments can use policy to take advantage of productivity growth opportunities presented by clusters to help clusters form and grow more rapidly. Porter's analysis of clusters deals primarily with the conditions in the private sector that gave birth to each successful cluster. He has also found that government policies can play a powerful role in encouraging the development of industries and companies.

Policy makers who wish to increase the growth of their economies, promote employment and the creation of well-paid jobs must understand the significance of location and incorporate this understanding into their policy decisions.

Universities who wish to commercialize their research and businesses that wish to be more innovative can also take advantage of location and geography.

It was found that strong leadership from policymakers and local leaders such as University presidents can develop local capabilities and technology knowledge to build successful clusters of innovative start-up companies (like New work from Sasan Bakhtari of DIIS and Robert Breunig of Australian National University supports findings from other countries of the benefits of clustering). They have found the "positive effect of clustering on R&D expenditure" by companies and that geography plays an important role in the extent of spillovers from R&D of the new products in the field of the companies' sector.

Economists emphasize that the density of economic activity appears to confer a productivity advantage on the firms within a cluster. Nobel Prize winner Paul Krugman is a leading figure in this group. He and others have found statistical evidence linking density to economic performance, and most notably - productivity.

The Porter Diamond.

As shown below, the main private sector drivers of successful clusters in Porter's analysis form a four-point diamond pattern on Fig.1. Factor conditions include human resources as well as natural resources.

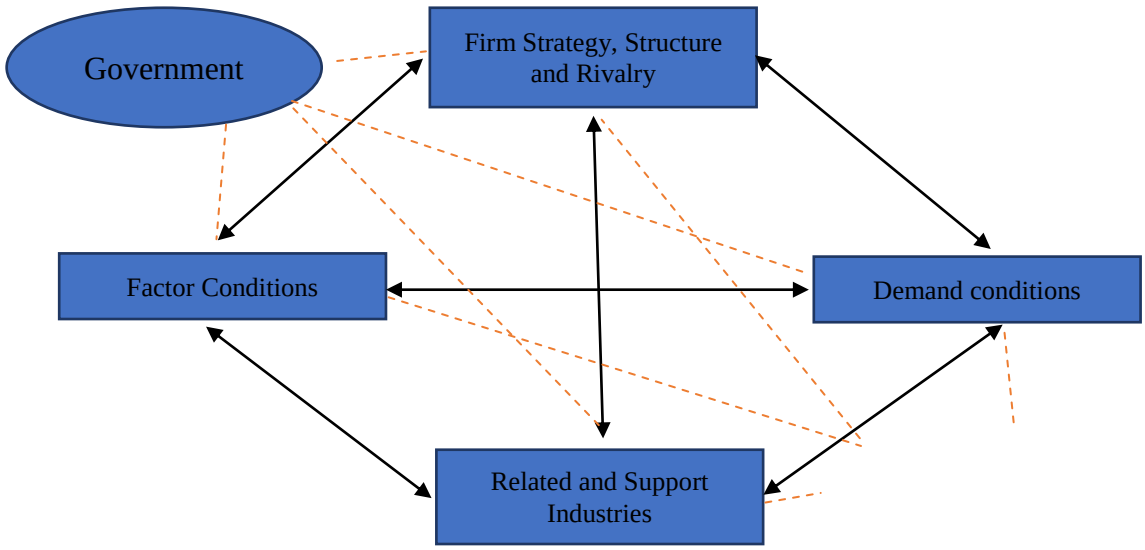

Fig.1 The Porter Diamond Model

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Demand conditions look at the size and scope of the internal market. Strategy, structure, and rivalry represent how companies are managed, how they compete, and what their business culture is like. In addition, Porter highlights the role of government as an external facilitator of cluster performance and he notes that chance factors can be important.
Chance factors might include, for example, having the appropriately skilled people available when a new technology takes off. However, pure chance should not be overemphasized. Like the Greek god, Caerus, informed leadership can recognize and seize economic opportunities when they present themselves.

Three main circles of assets have influence for successful clusters' formation: economic assets, physical assets, and existing links within and cross sectors of the economy.

The economic assets in the first circle are:

- Innovation drivers, such as high value research-oriented sectors анд creative fields like design and graphics, media and architecture, and specialized small-scale manufacturing;
- Innovation cultivators, such as incubators, technology transfer offices, accelerators, proof of concept centers, and job training facilities; and
- Neighborhood-building amenities such as medical offices, stores, restaurants, and hotels.

The key ***physical assets*** in the second circle consist of public assets such as parks, plazas, and streets, and private assets such as lab spaces, office buildings, retail stores, and so on. Housing and the universal availability of WiFi connection are getting increasingly important as physical assets.

The third circle highlights ***networking assets***. Innovation districts have used formal and informal meetings as ways of fostering interactions among researchers in an innovation cluster.

For example, Eindhoven in the Netherlands holds "tech regular" meetings where research problems or breakthroughs are presented and discussed. Workshops and training sessions were established along the waterfront in Boston. Barcelona has created cluster

- specific meetings, industry;
- specific conferences, and monthly meetings.

A recent Brookings report highlighted the role of mayors in developing and supporting innovation districts in the United States. Local governments have become more important as higher levels of government reduce their engagement and funding in cities.

This puts more of the responsibility on mayors and their administrations to design, finance, and deliver economic initiatives. The case study of Seaport (Boston) provides an example of a mayor capitalizing on one such opportunity.

The Importance of Leadership and Culture

In their book, „The Smartest Places in the World", Bakker and van Agtmael stress the importance of a strong leader or leadership group in order to get an innovation cluster started. The view that culture is vital to the success of technology districts and clusters derives from Anna Lee Saxenian's classic study titled "Regional Advantage: Culture and Competition in Silicon Valley and Route 128". The book explores why Silicon Valley won the race against Boston's Technology Corridor to become the hub of high tech innovation. It emphasizes the differences in culture between the two locations. Her diagnosis focused on the existence of a

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more freewheeling, network-based economic system in California, more open labor markets, a lot of informal communications which provides greater flexibility and a culture based on cooperation rather than secrecy.

Success Factors

Based on these frameworks, listed below is a set of success factors that describe the characteristics of successful clusters and districts. Not all success factors have to be present in every cluster, but enough must be there to allow the positive dynamics of a successful cluster to develop. The success factors are as follows:

1. **Core Competency**. There must be an economic rationale for the clusters—something that it is good at so that it can develop competitive strength.
2. **People**. There are three elements to people requirements for a successful cluster: strong leadership, highly qualified researchers, and a skilled workforce.
3. **Culture**. There are two elements to the culture needed to develop a cluster. First a business and research culture that supports the sharing of ideas. Second, a lifestyle that attracts talented people to the cluster.
4. **Business Capabilities**. Successful start-up tech companies in a cluster must not only have good innovative ideas, but they must also acquire the business skills needed to develop companies.
5. **Sophisticated Demand**. Innovative products and services must find a market. Ideally this market should come from within the cluster (a hospital center that provides demand for medical and biotech products, for example). Otherwise, the companies in the cluster must find a way to access such a market nationally or globally.
6. **Access to Funding**. Start-Up companies require financial support. Funding is also needed for the infrastructure of clusters, offices, labs, and so on.
7. **Infrastructure Provision**. Physical assets and public amenities such as airports, highways, housing, and building stock are the foundation of a cluster. Zoning rules must allow or encourage the development of start-up companies and labs.
8. **Regulatory Environment**. Cumbersome permitting processes can hinder or stop the development of a cluster.

Role of Government and other participants

Clusters are critical because they may include leading universities, research labs, and high-value companies, as well as generate outsized economic output.
Local leadership is a key success factor that allows clusters to harness and build upon competitive strengths. Strengths can be a combination of local research and education institutions and firms, physical assets, and infrastructure. Place and amenity for the community is also important to facilitate both interactions and industry and research engagement.
Regions that are progressing and transitioning have successfully developed clusters or districts.
Based on all known case studies up to now, we can form conclusions on how government and other actors can help promote successful clusters:

- Local leadership is essential. Successful clusters generally have a strategic plan that identifies a strong and capable leadership team. In turn, this team identifies a core competency around which the cluster will be built. Successful plans build on a genuine business capability. Unsuccessful plans are driven by aspiration without any real economic foundation.
- Start-Up funding from governments is important and may be essential. As the cluster evolves it is vital that it is able to attract private funding.

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- Local and regional government funding is helpful for investments in the infrastructure such as incubators, transportation linkages and WiFi service. A successful cluster is an attractive place for talented people to work and live and fosters a sharing community. It is best for the private sector to be involved in the infrastructure creation process.
- Access to skilled professionals is important for nascent technology clusters, which may require government supported university programs. As a cluster grows, it will require more skilled blue-collar workers and technicians, thus creating the need for training programs.
- All levels of government from the federal to the local level should support collaboration and cluster development. It is beneficial to have clarity and transparency around the roles of the different levels of government and coordination among them.

There are several factors that may influence the geographic proximity of innovation activities and manufacturing:

- **Government decision makers generally regard it as desirable to co-locate manufacturing with innovation clusters**. The perceived benefits of manufacturing include the creation of jobs, attraction of new industries, and increased tax revenue. For example, the advance of ethanol manufacturing in Brazil created and supported local ethanol supply chains all the way from farms to distribution. Germany and the Great Lakes region both encouraged wind manufacturing to collocate with their innovation clusters.
- **Manufacturing tends to co-locate with innovation clusters when product design and manufacturing process technology require integration**. This is often during the early stages of development and commercialization. Solar PV innovation and manufacturing were initially clustered together in California, but much of the manufacturing moved elsewhere as the technology matured. The development and commercialization of next generation cellulosic technology requires the co-location of manufacturing with innovation activities in both the U.S. Midwest and the state of São Paulo in Brazil.
- **Governments with overlapping jurisdiction over regional clusters can coordinate (or not) their policies to the benefit (or detriment) of the technology's development**. The states and province of the Great Lakes wind cluster each implemented separate policies to encourage wind manufacturing. In the worst case, the various entities were competing amongst each other to attract manufacturing. In the best case, the lack of coordination probably failed to maximize the development of manufacturing.
- **In capital-intensive clean energy technologies, the scale of production and an extensive domestic supply chain appear to be more important than intrinsic factors, like the cost of labor or for locating manufacturing**. For example, labor costs are a very small fraction of the costs of capital-intensive manufacturing. Germany has relatively high labor costs, yet it is a major global manufacturer of wind turbines benefiting from research advancements and serving the European market. Although the cost of labor in China is now higher than other developing Asian countries, the province of Jiangsu continues to be a major global manufacturing center of solar PV because of its huge scale of production and domestic supply chain.

The concept of a cluster is a concentration of innovative-active organizations of a state. The innovative activity counts the practical focus of firms on innovative development (which, in turn, is regarded as a continuous improvement of competitive advantages due to the different types of innovations as follows: technological, organizational and marketing) (Arzhakov and Silnov, 2016).

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The degree of innovative activity is the most often determined by the indices of R&D expenditure level and number of granted patents (filed applications for a patent). The high potential of innovative activity also requires the involvement of the scientific and educational community in the activities of a company, and firms combined into a single innovation cluster.

It is relevant to implement the effective cluster policy because it is most important to have an innovative type of education in the field of Bulgarian economy and to maintain the high level of competitiveness due to the unstable international business situation (Zeitlin, 2004).
Execution of cluster projects is one of the strategic objectives of many territorial entities in Bulgaria, as it contributes to the economic development of regions and increases the level of innovative development of enterprises which form a cluster.

The benefits of clusters, factors and problems

Increasing competitiveness through cluster initiatives is becoming a basic element of the vast majority of countries' development strategies. Analysis of more than 500 cluster initiatives implemented over the last 10 years in twenty countries shows that the high competitiveness of these countries is due to the strong positions of individual clusters – competitiveness locomotives.

At present, the process of cluster formation is most actively going on in Southeast Asia and China, in Singapore (in the field of petrochemicals), in Japan (automobile) and in other countries ("The Benefits of Clusters, Factors and Problems," 2014). Nowadays in China, there are more than 60 special zones clusters in which there are about 30 thousand firms with 3.5 million employees. The sales amount to approximately $200 billion USD per year.

Studying the experience of developed countries shows that innovation clusters have a greater ability to innovate due to the following key advantages:

- Unlike traditional industrial innovation clusters, they represent a system of close relationships not only between companies, their suppliers and customers, but also to institutions of knowledge, including research centers, universities, scientific research institutes. As a generator of new knowledge and innovation, they provide a high level of competitiveness. The innovation process includes suppliers and consumers, as well as companies from other industries, and as a result of inter-firm cooperation on R&D, costs are reduced;
- Subjects of companies – participants of the innovation cluster, especially SMEs, are able to more accurately and more quickly respond to customer needs. The participant's cluster facilitated access to the new technologies used in various areas of economic activity;
- Cluster structures create positive effects not only for the cluster association and its members, but also for the home regions such as an increase in employment, the growth of wages and profits, intensification of entrepreneurial activity, etc (Press, 2006). Cluster structures provide economic growth for the region as a whole, not only for cluster members, for example, by improving the welfare of the entire population, the acceleration of regional scientific and technological progress, the improvement of the regional innovation system, etc;
- The subjects of the firm in the cluster are under intense competitive pressure, which is usually further increased by the constant comparison of their own business activities with those of similar companies;
- Ability to coordinate efforts and financial resources to create new products and technologies, and putting them on the shelf (Nafziger, 2012). Within the cluster, the alignment of the supply chain is possible, from product creation to its production and to market;

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- The creation of primarily export-oriented products and technologies within innovation clusters, i.e. intra-cluster competitive advantages are significant on an international scale;
- State participation in the formation of cluster strategies. If the initial clusters are formed only due to the "invisible hand of the market", many governments began to "grow" their own initiative in the framework of public-private partnership, giving this process tangible material and moral assistance;
- Creating a sustainable distribution system of new technologies, knowledge, products, so-called technological network, which is based on a joint scientific base;
- Ability to carry out internal specialization and standardization, thus minimizing the cost of innovation;
- The presence of the system of innovation clusters of flexible business structures – small businesses, competing in the production of creative ideas that allow them to come into contact with the innovative points of growth of the regional economy;
- Regional and local clusters of small firms provide a high degree of specialization in servicing a particular business niche because it provides access to capital for industrial enterprises, other resources, an ongoing exchange of ideas, as well as knowledge transfer from scientists to businessmen.

This amount of innovation has allowed Silicon Valley to become the leader of the country's exports, and accounts for 40% of export trade in California. All around the world technology attempts to reach the success of the valley by adopting a similar name: Silicon Plateau in Bangalore (India), Silicon Island in Taiwan, Silicon Swamp in Israel.

The analysis shows that the cluster model of organization of innovation leads to the creation of an innovative product. This innovation is the product of joint activities of business entities, which allows them to speed up dissemination of network relationships in the regional economic space. In addition, a variety of different sources of technological knowledge and relationships facilitates the combination of factors in achieving a competitive advantage and becomes a prerequisite for innovation.

In recent decades, many governments develop a "cluster model and strategy," the purpose of which is the realization of the benefits of its national economy, and not copying other people's achievements. Formation and development of national clusters contributes to the effective integration of intellectual and financial resources, both inside and outside the cluster. The cluster model combined not only industrial, but also a new generation of innovative businesses. The points of growth are not only companies, but also centers of innovation and knowledge, research institutes and universities, service and infrastructure entities (Burtenshaw, 2006). It is important that the cluster is achieved primarily through the synergistic effect of a business relationship, science and government support.

Clusters contribute to the development of regional and national economies, due to:

- The relationships within the cluster lead to new methods of competition that contributes to the creation of innovation.
- Clusters create the conditions for the formation of regional innovation systems.
- Clusters act as "growth points" of the domestic market and international development for the whole country or the region's economy. The presence of a cluster of industries accelerates the creation of competitive advantage factors and the process of joint investment in the development of technology, information, infrastructure, and education.
- Relationships within the cluster ensure the development of outsourcing, where small and medium-sized enterprises produce products, works and provide services for key stakeholders in the cluster, thus contributing to the business development in the region.

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- The competition between producers in the cluster leads to greater specialization, finding new niches and expansion of the cluster, results in the formation of new businesses, increases the profitability of regional production, solves the employment problem and reinforces the integration potential of the region.
- Clusters are one of the forms of institutional provision of cross-border cooperation in trade, agriculture, tourism, transport, infrastructure, which contributes to the economic development of border areas.

Clustering of the domestic economy is not an entirely new mechanism of innovative development and is more a prototype of the territorial-production complexes built in command economy.

The clustering process is becoming particularly important and is considered to be a formation mechanism of the regional innovation systems which generate a national innovation system.

The mechanism of the cluster's formation in a region is implemented on the basis of the joint efforts and competences of different participants, among which there are industrial enterprises in production and processing of raw materials, commercial sales, marketing organizations, service companies in the field of logistics, finance, consulting, scientific-research and educational institutions, management and regulatory organizations. The isolated actions of all members in a cluster, involving a significant level of competitiveness in the domestic market, are focused on one thing in order to obtain the best results.

Clusters conduct business not only by means of the effective mechanisms for regional development, but they also create the conditions for effective cooperation between business, science and government. Experience shows that the highest level of domestic market competitiveness is achieved because of the innovation cluster formation.

The main role in the innovation cluster organization plays the integrative cooperation of scientific and educational enterprises with industrial enterprises backed by a government agency support. The most effective clustering process is carried out in the regions which actively create the innovative infrastructure to support the industrial potential of scientific-innovative and educational potential.

Consequently, if innovative clusters are present in a country, region, territory or any other formation, it changes the content of economic policy, when efforts are directed towards the development of a system of relationships between active participants of the economy and state institutions rather than to support individual enterprises.

Economic policy should be directed towards the competitive advantages and the development of innovation clusters as an effective implementation mechanism.

Innovative cluster policy is a master plan for innovation development, where not only the initial industrial configuration, which is based around new key regional technologies, should be shown, but also a particular system of developing industrial and technological schemes. Resources, infrastructure, and market conditions have to be taken into account, though. An innovation cluster is a dynamic system which provides self-development on the basis of performance of the synergistic effect.

Promoting the development of the initial net system in a state to get innovative production, the cluster policy should determine the character of technological progress at certain stages, creating conditions for the research base development and increasing educational potential. One of the priority directions of innovation cluster development should be the creation of an innovative business that can implement breakthrough technologies, both in domestic and foreign markets.

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1.1.2. Strategies used by SMEs and government support to SME clustering

The various stakeholders in national innovation systems are interested in clustering for different reasons. The relationship between Bulgarian firms has been evolving through complex organizational partnerships. These partnerships seek either to increase competitiveness or avail themselves to funds for the formation and development of clusters. Policymakers mimic trendy EU or global policies, and utilize funds to support favorable regions, sectors or party allies. Some business associations or business leaders promote themselves by rebranding their activities through clustering discourse. Academic entrepreneurs see clustering as a fast track to research commercialization and so on. However, little attention has been paid to the actual practice of finding business partners and the evolution of productive partnerships that later mature into sustainable organizational networks.

The Bulgarian enterprise sector is double-natured (Peev 1995, 1999, 2002) and as such, breeds profound differences in the way firms do business, find business partners, receive government support and manage their business relationships. The first set of enterprises would have singular owners or controlling shareholders and/or managers belonging to inherited pre-1989 networks of security officers, party and business nomenclature. Although small in number (less than a thousand families), they control between 10 and 30 percent of GDP according to different estimates, and more than half of public resources.

The second set of enterprises consists of normal de novo start-ups and some private firms that behave similarly to western de novo enterprises by being more or less exogenous to regulation and law enforcement.

That these two sets of companies/owners behave differently is a theoretical fact backed up by anthropological observations from Bulgarian economists. The prevalence of incomplete contracts, the absence of predictable and fair conflict resolution, and a dysfunctional judiciary significantly increases the volatility of inter-firm relations and represents a crucial risk to the competitiveness of firms and the economy as a whole. Companies endogenous to regulation and law enforcement would behave differently from those that are exogenous, as the former would manage these risks easier and cheaper than the latter. Likewise, the former could selectively enforce regulation on their competitors from the second group.

Business partnerships vary from long-term, strong and dense (i.e. leading to complex clusters), through mid-term and focused (i.e. leading to innovation or outsourcing), to short-term contracts (i.e. technology transfer). Low trust in institutions would translate into little partnerships (atomized firms). In fact, most ad hoc and short-term partnerships in Bulgaria are rooted in personal, rather than institutional relationships. The horizon of overall planning and partnerships, as well as innovativeness would extend with the geographical distance of partners (outside Bulgaria, but also outside the Balkans) and their localization in more innovative countries.

1.1.3. Innovation partnerships in Bulgaria

Let us begin by exploring the ways in which Bulgarian SMEs engage in partnerships for innovation. We will use the National Innovation Surveys that are mirrored on Community Innovation Surveys to compare the enterprises' perception of different partners for innovation with their development of innovative products or processes, as well as the importance of sources and channels of information for innovation projects. Innovative SMEs and their innovation intensity (type and novelty) vary throughout the years (between 35% in 2005 and 70% in 2014), but their partnership pattern remains unchanged both in survey data (green bars – 2008, grey – 2005) and in in-depth interviews (2009-2014). The percentages do not add up to 100%, as "don't know" responses are not included in charts.

The vast majority of innovative SMEs (60-70%) developed their innovative products and processes by themselves. This leads to a lot of repetitive effort and low efficiency. Compared to the EU-27 average, Bulgarian firms cooperate significantly less with universities and other public or private research institutes, and the government as procurers of innovation (Figure 2). This is partially because academia has a very

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limited potential to address market demands. Academic and business superiority has shifted so much in the last 25 years that even in cases where business and academia are in partnership, it is rarely institutionalized through official contracts and is more often the personal appointment of professors and PhD students in firms. This practice leads to de-capitalization of academic assets, and limits the knowledge flows to close social networks. Additional motivation for the industry-academia relationship is the battle for talents. Companies, especially in engineering and Information and Communications Technology (ICT) tend to develop partnerships with academia by either the so-called head-hunting approach for the best and brightest or through professors, who use their technology in classes, thus preparing the students to work later with it.

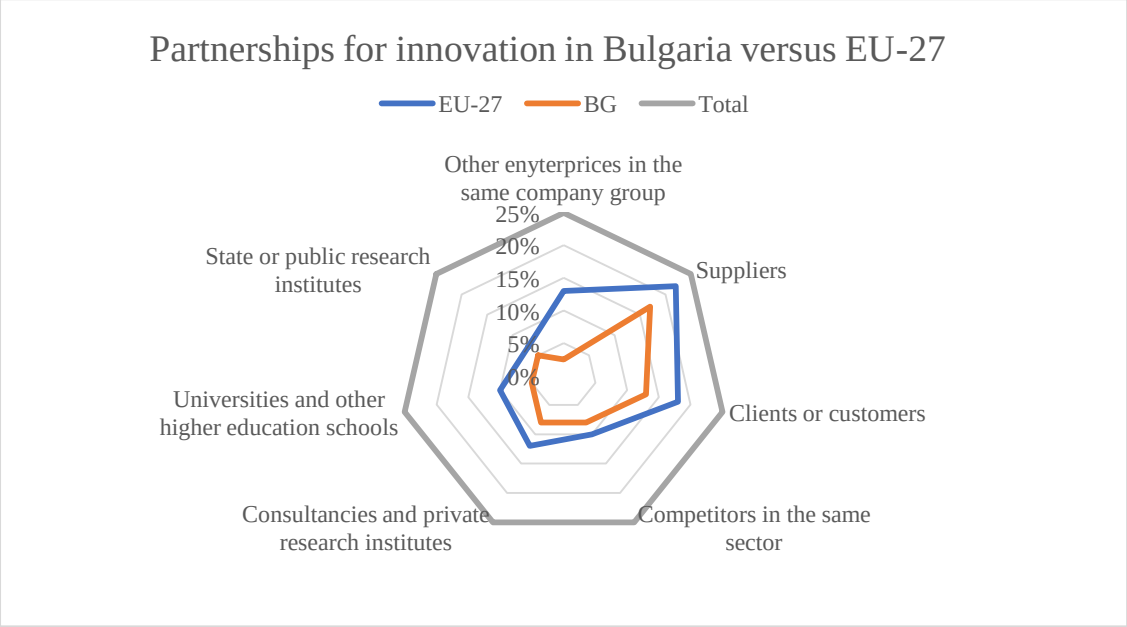

Figure 2: Partnerships for innovation in Bulgaria versus EU-27

One particular form of innovation is changes in the way the firm works with business partners. This includes how firms search and find business partners, assess their credibility and reputation, sign contracts with arbitration clauses (a growing trend in Bulgaria is to sign up for out of court arbitration due to judicial inefficiency), employ third parties to help with enforcement of contracts (debt collectors, for instance) and so on.

Roughly a third of all companies (32% in 2009 and 32.8% in 2014) engage in such activities on an annual basis. Despite the slightly conservative situation and close innovation models applied by companies in the previous years (2005-2008), these changes in the innovation periphery (in 2009-2014) have generated new product and process innovation for 2015-2020. This means that public support for firms' clustering is needed. Enterprise Europe Network (EEN) – Bulgaria is currently the major service provider in that it helps companies find new business partners, and offers continuing support on contracting and managing the partnership. EEN provides a fully-fledged portfolio of services targeting internationalization of firms, technology transfers (inward and outward), R&D and innovation support. It also facilitates participation in framework programmes and Horizon 2020, brokerage, matchmaking and representation of firms at major innovation fairs. So far, more than 6,000 firms have benefited from ARC Fund's services, but less than 1% have gone through the whole

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process and achieved a long-lasting partnership following an outward technology transfer with long-term support from a service provider.

The majority of successful cases of partnership facilitation (estimated at around 20%) resulted from joint participation of the firm and service provider at industry fairs, large international brokerage business-to-business (B2B) matchmaking events such as CeBIT (in Hannover and Istanbul), Mobile World Congress (in Barcelona) and small-scale focused start-up events, hackathons and business conferences combined with sector missions. Helping Bulgarian companies join international consortia for framework programme 5 (FP5), framework programme 6 (FP6), framework programme 7 (FP7) or Horizon 2020 projects, is another way of finding business partners for these companies.

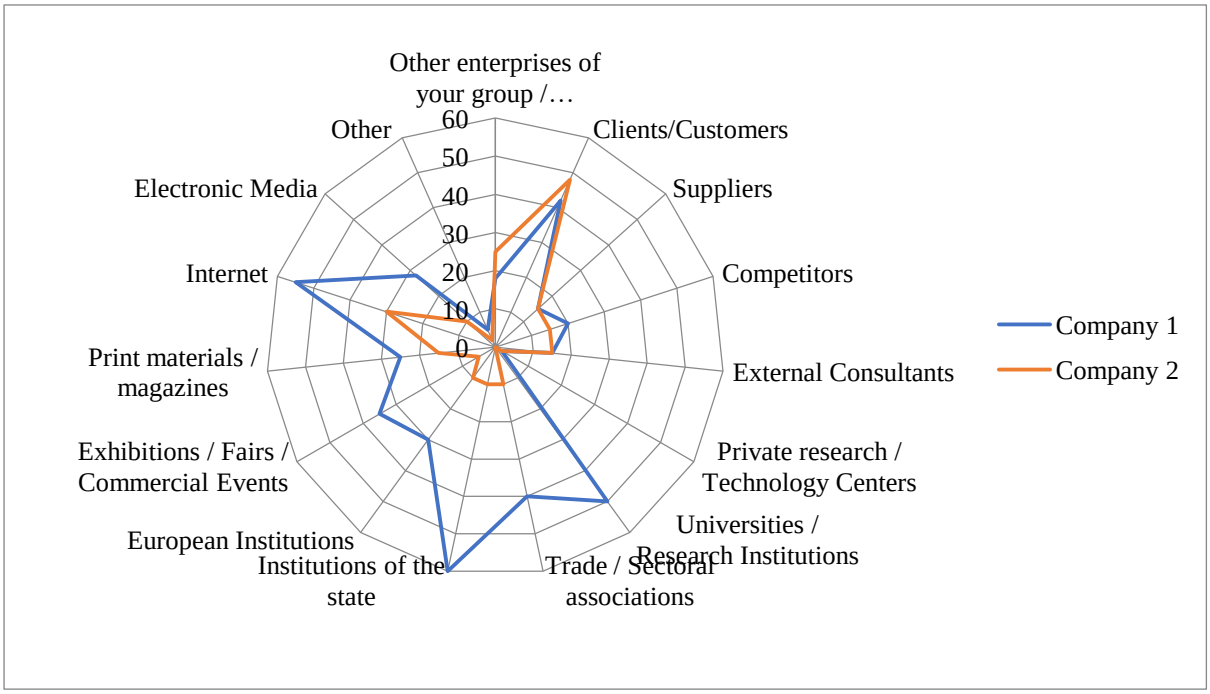

Figure 3: Importance of sources and channels of information for innovation projects

Very rarely do firms rely on the electronic service, even though it is backed up by two EEN partners. In cases where the lead contact was obtained through the internet, a meeting between the partners is organized at an upcoming EEN brokerage event. These findings correlate with data from national innovation surveys (Figure 3), where exhibitions, fairs and commercial events are the third most important source and channel for information for innovation. As can be seen in Figure 4, exhibitions, fairs and commercial events are next in popularity to use of existing clients and consumers and internet. There are various cases, where new business partnerships and innovation were sparked during large business exhibitions and shows.

For instance, Datecs is an exemplary case of Bulgarian academic entrepreneurship that made a break-through deal at one such show. This occurred after 1989, with the commercialization of academic research (when Western printers could print using Cyrillic fonts). A device capable of transforming a Blackberry phone into a mobile point of sale was presented at that show. Apple was interested it and commissioned Datecs' R&D to develop a similar device compatible with iPhones and iPads. It resulted in Linea Pro, which abolished the old

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Motorola technology (running on Microsoft) at Apple stores and led to a wide diffusion of mobile point of sales in US retail shops. Datecs was the sole manufacturer of the device for Apple, only losing the battle recently to Verifone.

Clients are very important to innovation at firms. This is evident in many examples, including Datecs when it ventured into geographic information systems (GIS) while working for a small German company that was later acquired by the Bertelsmann Group. This acquisition provided room for unlimited growth based on unique vector algorithms, and Datecs was responsible for digitizing most of the maps and cadastre in Germany, Egypt, Thailand and other countries. The business unit was later acquired by Nokia and recently returned to German owners in the automotive manufacturing cluster. Another example of world-class innovations conceptualized hand-in-hand with its clients is Ontotext (semantic web technologies) working for the British Broadcasting Corporation (BBC).

Similarly, firms learn and innovate whilst working with their suppliers. Innovation hubs in Bulgaria (like TechnoLogica and its CAD/CAM centre, AMK – Gabrovo, Point-L, etc.) shorten the product development process through fast prototyping, unique production line development or digitalization of management and production equipment through various sensors and automation. Such innovation hubs are responsible for 14-17% of innovation processes. This indicates that Bulgarian economy has the potential to grow naturally. Hubs can either create new production lines for particular new products or optimize existing processes. Sectors of application vary from ICT to food processing, sport equipment to environment protection and many others. In this particular niche, there are no brokers and the predominant means of finding a proper partner is through word of mouth, as well as through the National Innovation Forum and its competition for the most innovative enterprise of the year, which popularizes such partnerships and hubs.

1.1.4. Clusters in Bulgaria

Although there are various discussions and viewpoints as to when clusters emerged in Bulgaria, there are several different types of organizational networks that can be called clusters. The first type is a complex network of firms (that eventually included other entities such as NGOs or research institutes) linked in vertical and horizontal partnerships in the value chain, without any formal registration as a cluster. Such networks emerged quickly after 1989 around real estate, which was available for rent due to the bankruptcy, restructuring and optimization of previous state enterprises. They were competitors who had to cooperate in case they had a client but could not deliver all their services on time. Due to their common working experience, they trusted each other enough to cooperate. Similarly, when independent SMEs have grown sufficiently to compete on a larger scale, their owners may realize that everybody will be better off if they cooperated and produced goods/services together for larger clients than aggressively competing. Various clusters in the garment, furniture, tourism, construction and transportation industries were formed in this way, even though they are not officially called clusters and do not refer to their partnership as a cluster. Some of these partnerships are stable, while others dissolved quickly after the first big deal. A few scholars claim clusters were formed well before 1989 and were known as “stopanski obedinenia” (business units). However, these were not true clusters as they resembled holding structures with diversified control rights.

At the beginning of the twenty-first century, cluster policies were developed through external consultancy under the PHARE programme. The Cluster for Furniture Manufacture in Troyan (a town in central Stara Planina, Balkan Mountains) and the Rhodope Cluster for Tourist Services (formed in 2003) were the pilot clusters, and they had a budget of EUR 800,000.

Despite the fact that the cluster in Troyan was based on existing commercial cooperation by SMEs in furniture production; despite the fact that the Smolyan District’s cluster participants were also carefully selected and

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trained; and despite the fact that funding was available, these clusters did not exist for years. Two years later, PHARE support continued in 2005 through another project that granted over €1 m to 10 newly established clusters. Out of these 10 clusters, only three are currently active:

- The ICT cluster, which benefited from the USAID Competitiveness Programme prior to PHARE and is not deemed to be a real cluster by Porter and other external observers (Porter 1998).
- The Mechatronics and automation cluster comes closest to the definition of a cluster.
- The Marine cluster in Varna.

Even though a new programme with a budget of €15 m was launched in 2010 to combat the lacklustre public support for clusters in 2003-2007, the situation for clusters did not improve. There were various media reports that organizations, which had nothing to do with clusters applied for and obtained funding in the first round (2010) and second round (2013).

The programming of the measure within the Structural Funds created an opportunistic environment where consultants drafted projects to receive funding, even though neither the government nor the respective authorities were interested in publicly accepting that the programming was wrong. The only possible way out of the situation was to fund some other organizational networks with internationally competitive companies of good reputation; this was done in 2014 through an additional €5 m and actively engaging the Association of Business Clusters to help. It also brought together some of the strongest clusters and companies with good reputations to map and evaluate existing clusters.

There are about 220 legally registered organizations with “cluster” in their name and many more using “association” instead of clusters, which competed and won funding for cluster activities. Yet, only 9 Bulgarian clusters have achieved the bronze level of efficiency. The bronze level of efficiency is a good approximation of the real number of clusters in this country. Some of them are dominated by “truly” Bulgarian companies, while others have strong joint ventures as leaders, and a third would have majority foreign direct investments (FDIs) on top.

New clusters emerged recently around two venture funds (co-funded by the EU) – Eleven and LAUNCHub. These funds serve as incubators and accelerators, and they operate large networks of start-ups, both inside the accelerators (already invested in them) and outside (potential companies) through events or trainings. Although they do not comply with Porter’s definition of a cluster, they entertain similar benefits of effective knowledge sharing and management, higher levels of trust and cooperation in product design, and open innovation.

Bulgaria should adopt EU regulations and best practices in pre-commercial procurement. Pre-commercial procurement could be an effective, transparent and competitive method of stimulating the “demand side” for cluster formation, as opposed to funding the “supply side”. Pre-commercial procurement should be regulated through the overall procurement regulation in consultation with research, development and innovation (R&D&I) specialists.

The Bulgaria Investment Agency should also promote outward foreign direct investments (FDIs) as a sustainable growth channel for innovative companies, including clusters. As existing outward FDIs could be used as a framework/infrastructure for subsequent roll-outs and in the search for partners, the government could design internationalization programmes for SMEs based on domestic companies’ existing network of investments abroad.

Many successful new partners find each other and form joint ventures at international fairs. Therefore, an instrument to support SMEs attending such major industry fairs could have significant impact.

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Academic entrepreneurship has a proven track record in the last 25 years, while the practice of university-industry research schemes has attracted significantly more criticism. Better regulation protecting the interests of both academia and the individual researcher is needed before international property rights (IPR) and academic entrepreneurship (both individual and institutional) can take place. This should also regulate business-academia relationships in general, as they are fully liberal (contrary to many EU universities). Venturing risk funds for academic entrepreneurship, similar to those existing in other universities (i.e. Cambridge), would be a good idea. The European Commission (EC) should "push" national governments to partner with the European-wide networks and instruments for SME support such as EEN. Although some governments are nominally members of EEN, they are not effectively participating in activities.

The European Commission should engage in ex ante governance risk assessments, as functioning mechanisms in the EU (such as the LEADER approach) often fail in countries with bad overall governance and poorly functioning law enforcement.

1.1.5. Expected outcome of the company's technology audit

Innovation is a difficult concept to understand and implement. Given the current understanding of the innovation process, establishing an adequate and accurate measurement system right away is complicated case; instead starting an initial set of measures is a better approach to begin measuring innovation.

When establishing measures of innovation, establishing a clear objective and purpose for doing so is a must, once the purpose is defined, and the scope of measures is established, then critical inputs, activities and outputs are identified. For example if one is developing a process measure to ensure it effectiveness. Focus would be into inputs, activities and outputs. If developing an innovation index for an organization is of interest, factors such as variation between entities and key selected processes of measures must be considered.

Innovation process sustainability is the only way for companies and sector growth as this will lead to the next level of competitive advantage, and based on our understanding of innovation as an organization process capability that needs to be built and promoted before gaining the output, focus should be given to assess this "process" and its enabling factors in order to ensure sustainability.

The recommended action for innovation measurement would be as follows:

A simple and effective self assessment tool; promoted by some Technology Innovation Entrepreneur Centers (TIEC) in the world that focuses on the innovation process and its enabling factors in particular would be of a great benefit in the current phase for both beneficiaries; companies, and TIEC.

- For a company, it would help in identify the weakness and the bottle necks that may hinder the innovation process from harvesting its expected outcomes.
- For TIEC it would be of great value to get information that provide insight about what can improve and accelerate innovation process and accordingly can advocate policy makers regarding the obstacles that affect the performance negatively, or policies that encourage and expedite innovation process in Egypt on both firm and national level. Also TIEC can tailor some specific programs/ Initiatives to address common weaknesses reported by the beneficiaries.

Based on process capability perspective, the key dimensions that should be assessed are innovation strategy, innovation life cycle, Innovation culture, Innovation results and the enabling factors such as human resources and knowledge management (this would include linkage to another entities for knowledge acquisition assessment). These dimensions are covered in the diamond model and are emphasized as the key aspects for innovation assessment. Each dimension could be assessed by a set of questions that directly address the main

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indicators for that dimension. A company profile could be depicted accordingly to identify the organization level of innovativeness.

Such a multi-dimensional view will assist policymakers understand the dynamics of innovation, highlight policy implications and better inform those who must make decisions impacting the innovation process. It is requires more attention to the demand for innovation, customer value creation and global markets; and, to related determinants such as knowledge process flows, inter-firm linkages, government policy environment and the infrastructure for innovation.

1.2. Tools and best practices research for conducting a technological audit (TO)

When deciding on a technological audit, it should be based on the objective of creating competitive advantages for companies providing conditions for their survival and development. Different business technologies affect to varying degrees the competitive capabilities that should be considered in the technology audit. In this context, company technologies can be divided into:

- **Base,** which are widely used by all companies in the industry and which do not provide competitive advantages to any of them;
- **Key -** ownership of a firm gives it significant competitive advantages over other companies in the industry;
- **Developing,** which at some point are not widely disseminated and applied, but some of them are likely to become key in the future.

Innovation is a very wide concept and has many dimensions. Measuring Innovation is a very difficult task to perform. The purpose of this document is to provide information that may help organizations to understand innovation concept and how it can be viewed and measured from many perspectives.

This document is by no means a comprehensive guide to innovation measurement concept. Rather, it is intended to serve as a guide on how the innovation process can be viewed and accordingly how different innovation metrics are developed.

Topics such as innovation definition, innovation activities, measurement models and innovation will be discussed here.

Innovation has long been recognized as an important driver of economic growth. Most empirical research and surveys of firms show that innovation leads to new products and services that are higher in quality and lower in price. Measuring innovation is an important issue, as business growth and profitability in the knowledge age depend on innovation. Sustainable growth requires sustainable innovation, which requires that innovation be institutionalized and its output made predictable. Sound policy analysis and decision-making also requires credible, timely and relevant measurements as well.

The leading consultancies - Boston Consulting Group, McKinsey & Company, and Booz Allen Hamilton, to name just a few—examine innovation and ways to nurture it within firms and other organizations.

This study aims to provide an overview on how to measure/ assess innovation capability of an organization. The main objective is to enrich our understanding of the innovation process; with an intention to come up with an integrated, convenient, effective, and accurate measure for innovativeness in **ICT** organizations.

Why the need for Innovation measures (rational)?

- Assist companies in understanding their current innovation practices/ capabilities, and clarifies where the organization needs to focus to maximize innovation success;

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- Assist **TIEC** to tailor programs to address areas of weakness in order to enhance innovation process capabilities for ICT organization as well as advocate policy makers with polices that promote the innovation;
- Identifies areas of strength to capitalize on, and identifies opportunities for increasing innovation;
- Assist **TIEC** to identify and control the barriers that stifle creativity and innovation;
- Developing Firm-level Innovativeness Index for the sector companies;
- Benchmarking organization with international top innovative companies;
- Spreading the awareness of the importance of innovation concept and fostering the innovation culture in the organization

1.2.1. Methodology for research:

1. Literature review on Innovation process models and measurement frameworks

- Diamond model
- Innovation Funnel
- Innovation Value Chain – IVC (Hansen and Bikinshaw's Innovation Value Chain, 2007)
- OSLO Manual Innovation measurement Framework

2. Literature review for some innovation metrics/ innovation audit white papers/ working papers and other literature.
3. Investigating some top firm-level innovation indexes, and their corresponding methodologies as well as reviewing different innovation audit/ management tools, studying different innovation dimensions of focus, and analysis techniques such as:

- 1-InnoCERT;
- Inno-Biz assessment;
- NESTA;
- IMP³rove;
- Europe Innvoa;
- Innovation radar;
- Innovation for Growth;
- The TAM Model.

4. Review of some white papers for innovation.

1.2.2. Definitions

It is important to address some definitions here:

- **Innovation definition**

According to the definition adopted by some **TIEC**, Innovation is "the introduction of a new product, service, or process through a certain business model into the marketplace, either by utilization or by commercialization". Hence, it encompasses: product innovation, service innovation, Process innovation, and business model innovation, and all contribute to strengthen the competitive advantage of a certain company. This definition respects the fact that innovation is a complex and multidimensional activity that cannot be measured directly or with a single indicator, and hence the need to have a composite measure that reflects the organization innovative capability for the purpose of benchmarking, diagnoses, and supporting building up innovation culture and practices in **ICT** firms.

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- **Innovation Activities definition**

Innovation activities are all scientific, technological, organisational, financial and commercial steps which actually, or are intended to, lead to the implementation of innovations. Some innovation activities are themselves innovative, others are not novel activities but are necessary for the implementation of innovations. Innovation activities also include R&D that is not directly related to the development of a specific innovation (Oslo Manual Ver.3).

1.2.3. Attributes of Innovation

Before discussing innovation measurements, it would be of value to learn about the innovation attributes. Innovation has a number of attributes discussed in the literature (Stone et al., 2008). The key attributes are summarized below:

Attribute 1. Innovation involves the combination of inputs in the creation of outputs.

Something novel is created during innovation. Certain crucial inputs must be available for innovation to occur, and the exact nature of those inputs differs depending on the desired outputs and outcomes.

Attribute 2. Inputs to innovation can be tangible and intangible. Innovation activities draw on a variety of inputs, which can be both tangible and intangible. Tangible inputs have a physical embodiment and cost. Intangible inputs do not have a physical embodiment but may have a cost. Intangible inputs are commonly referred to in economic literature as "knowledge assets" and in business management literature as "intellectual assets." Inputs are considered assets if they engender future benefits.

Attribute 3. Knowledge is a key input to innovation. Innovation involves the application of knowledge in creative activities. Innovation cannot take place without an understanding of the resources, tools, technologies, materials, markets, and needs in the situation at hand. In recognition of the tremendous importance of knowledge to the innovation process, innovating organizations willingly spend significant amounts of resources on research and the acquisition of knowledge (e.g., intellectual property)

Attribute 4. The inputs to innovation are assets. Most innovation inputs are considered assets because they are used repeatedly after being created for a single innovation pipeline or are used in a pipeline in a way that results in a different product (Arundel, 2007).

Intangible assets - which typically are not reported on balance sheets because they are difficult to measure—are increasingly being recognized as critical to the innovation process.

Attribute 5. Innovation involves activity for the purpose of creating economic value. Fundamental to the concept of innovation is the innovator's intention to create something of economic value—something that offers benefits to consumers and provides economic returns to the innovator. Commercialization—the mechanism through which the consumer obtains the benefits of innovation and the innovator obtains the return—is therefore critical to the innovative process.

Attribute 6. The process of innovation is complex. Innovation is a complex process not easily reduced to measurable elements (e.g., R&D dollars spent; number or value of patents obtained). Nor is it linear. Instead, it is often iterative - the outputs of early activities become the inputs for later processes. Innovation is also not a linear combination of component factors or limited within the boundaries of firms. Non-linear dynamics characterize the entire innovation value chain end-to-end at the national level and at the firm level.

Attribute 7. The outputs in innovation are unpredictable. The inputs to innovation are easy to characterize; they will always be resources and assets. The outputs, however, are difficult to characterize, especially before the process is complete. The outputs are unpredictable because innovation is complex, nonlinear, and risky; responds to opportunities; and inherently includes aspects of serendipity.

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Attribute 8. Knowledge is a key output of innovation. Whatever the outputs of innovation may be, they incorporate the firm's knowledge at the time. Every tangible and intangible (i.e., product and process) output reflects the firm's knowledge of its resources, technologies, markets, and consumers.

Attribute9. **The drive for innovation** must include consideration of the demand side which determines the rate of investment and diffusion (take-up) of new products and services.

1.2.4. Innovation Metrics –Historical Development

There are two broad streams of research on measurement of innovation. One stream seeks to measure innovation through innovation inputs, such as R&D intensity, as well as through innovation outputs, such as patents and patent-related index. These measures capture a narrow subset of all possible innovation activities. However, the linkage between such measures and organizational innovativeness and economic growth are unclear. Empirical evidence suggests that R&D spending has no significant relationship with nearly all measures of business success, based on an analysis of the top 1,000 global innovation spenders (Booz, 2005). Gittleman (2008) also strongly argues that the value of using patents as indictors of innovation is very limited at the micro level. The other stream on innovation measurement takes a macro level view. For instance, efforts in the European Union have been made to measure country innovation capabilities through objective economic measures, such as Oslo Manual (2005), European Community Innovation Survey (CIS-4), and the European Innovation Scoreboard (EIS 2007).

National measurement of innovation today is based on an old paradigm of an industrial economy and for the most part measuring inputs to innovation (R&D expenditures, education expenditures, capital investment) and intermediate outputs (publications, patents, workforce size and experience, innovative products). For a long time, innovation has been perceived an activity involving almost entirely individual actors, including inventors and firms. Innovation was viewed linearly, starting with fundamental research and proceeding successively to applied research, development, prototyping, pilot production, market entry, and continuing through the diffusion of new products and production processes. Services were conspicuously absent in traditional approaches. Accordingly, innovation measurement tended to be focused on products and related production systems. More recently there has been significant progress in delineating the multiplicity of resources required for innovation, the non-linearity of the innovation process, the quite different and variegated meaning of innovation in service sectors, and the innovators' connection to and dependence on the global competitive market forces and their immediate socio-economic and institutional environment.

Innovation indicators can be roughly categorized into four generations, progressively becoming more complex and meaningful. Table 1 illustrates the development of these generations.

The first generation of metrics reflected a linear conception of innovation focusing on inputs such as R&D investment, education expenditure, capital expenditure, research personnel, university graduates, technological intensity, and the like.

Table 1. Evolution of Innovation Metrics by Generation

First Generation Input Indicators (1950s-1060s)	Second Generation Input Indicators (1970s-1080s)	Third Generation Input Indicators (1990s)	Fourth Generation Input Indicators (2000 plus emerging focus)
● R&D expenditures	● Patents	● Innovation surveys	● Knowledge
● S&T personnel	● Publications	● Indexing	● Intangibles
● Capital	● Products	● Benchmarking innovation capacity	● Networks
● Tech intensity	● Quality change		● Demand

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			• Clusters
			• Management techniques
			• Risk/return
			• System dynamics

Source: Center of Accelerating Innovation, George Washington University (2006)

The second generation complemented input indicators by accounting for the intermediate outputs of S&T activities. Typical examples include patent counts, scientific publications, counts of new products and processes, high-tech trade.

The third generation is focused on a richer set of innovation indicators and indexes based on surveys and integration of publicly available data. The primary focus is on benchmarking and rank ordering a nation's capacity to innovate. A main difficulty at the moment is the validity of international data comparisons and incorporating service sector innovations (where the process is the product) into the surveys.

Relevant **fourth generation** metrics currently at an embryonic stage include:

- **Knowledge indicators**. Account for the knowledge that underlies innovation creation and the ways it is developed and diffused. A multi-layered concept like knowledge, however, can only be captured by composite indicators that may include composite knowledge investment indicators and composite performance indicators.
- **Networks**. A striking feature of contemporary innovation is that hardly any organization can innovate alone. Most innovations involve a multitude of organizations. This is especially the case for the most knowledge-intensive, complex technologies. We can only hope to get a handle on a knowledge-based, networked economy if we can understand networks. This is possible only through composite network indicators accounting for both contractual agreements like strategic partnerships, intellectual property licensing and for informal collaboration and knowledge exchange such as working relationships of individuals across organizations (e.g., clusters). Such networks are not just regional, but also national and global.
- **Conditions for innovation**. Economic demand, public policy environment, infrastructure conditions, social attitudes and cultural factors are critical for successful innovation.

What is called for here is building systemic innovation metrics that capture the context in which organizations form and match expectations and capabilities to innovate. Hundreds of such indicators could be imagined, of course, but what is called for primarily are indicators that 'intelligently' (a) describe the main characteristics of the innovation system and its dynamics and (b) look forward in anticipation of likely broad developments (e.g., balanced scorecards, mapping of general purpose technologies, monitoring demand shifts and global innovation patterns, technology option accounting, etc).

1.2.5. Measurement Frameworks

The following subsections will shed the light on some examples of different measurement frameworks/ models for measuring innovativeness. These frameworks represent the foundation upon which the measurement instruments were built.

1.2.5.1 Diamond model

The innovation audit framework is the one Proposed by Tidd, Bessant, and Pavitt (TBP) in their book entitled 'Managing Innovation'. The Innovation Diamond considers the following 5 dimensions for innovation assessment:

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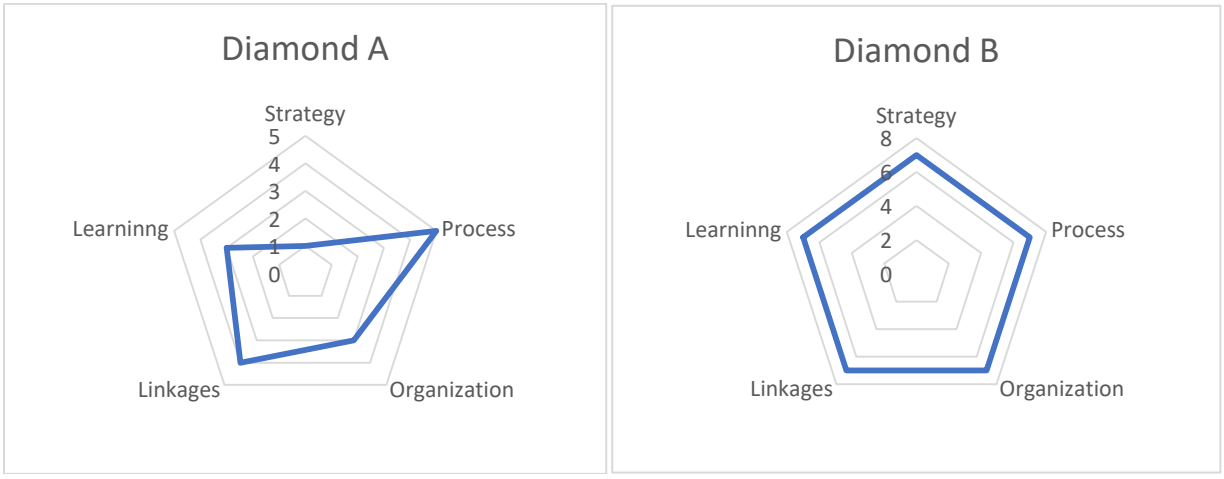
- **Strategy**– In this the dimension, three major areas are identified. First is whether the company has a well-managed strategic planning process in place. Second is whether innovation is appreciated by the entire organization and thus incorporated within the corporate strategy. Third is whether the company has put in place mechanisms that will effectively implement the corporate strategy.
- **Process** - This dimension considers the robustness and flexibility of the organization's new product development (NPD) process and whether it brings the attention of everyone involved to the customer's need (as opposed to just marketing focusing on the customer's need). In this dimension, organization's ability to manage its internal processes is also considered.
- **Organization**– In this dimension, two major areas are considered. The first would be whether the organizational structure encourages, rather than stifles, innovation through effective top-down, bottom-up, and lateral communication and coordination within the firm. Second, and just as important, is whether management has put in place a system that encourages employees to bring forth new ideas.
- **Linkages**– In this dimension the focus is on the firm's ability to create healthy relationships with external entities such as suppliers, customers, the academe, firms from other industries, specialist individuals, as well as competitors. With a look at the potential of these links to provide knowledge/information to the firm.
- **Learning**–Four major areas in this dimension. First, it tries to gauge the organization's commitment to the training and development of its employees. Second, the organization's ability to gather knowledge/information from its linkages. Third, the firm's ability to learn from its successes and failures. Finally, the firm's ability to share these learning to the entire organization.

Each of the above mentioned dimensions is measured by a set of questions to assess the organization performance along the corresponding dimension. The figure below shows the results of assessment based on diamond models for two different companies



Diamond A
Ex. of a firm that needs to foster innovation in many dimensions

Diamond B
Ex. of highly innovative firm

Figure 4. The Innovation Diamond according Tidd, Bessant, and Pavitt

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1.2.5.2. Innovation Funnel

The funnel model is portraying end to end innovation process. It consists of nine elements, or stages for innovation process (represented in the figure below). Stage -1: Strategic Thinking, Stage 0: Portfolio Management & Metrics, Stage 1: Research, Stage 2: Ideation; Stage 3: Insight, Stage 4: Targeting; Stage 5: Innovation Development; Stage 6: Market Development; Stage 7: Selling.

The model can be also divided into three distinct parts. Part 1 includes Strategy and Portfolio & Metrics, the Inputs that define the scope, context, and structures for innovation. Part 2 is the Innovation Process itself as we have classically thought about what it means to innovate, which includes Research, Ideas, Insight, Targeting, Innovation Development, and Market Development. Part 3 is the Output, Selling, where the innovation process earns economic value for the organizations that create and manage them.

The proposed metrics are of two quite different types. The 'soft' metrics are qualitative, sometimes in the form of provocative questions that are intended to get people to think more deeply and effectively about the work they're doing. The 'hard' metrics are quantitative, and amenable to statistical analysis.

Tabl.2 Stages for innovation process

Input		**Process**						**Output**
-1	0	1	2	3	4	5	6	7
Strategic Thinking	Portfolio Management + Metrics	Research	Idea	Insight	Targeting	Innovation Development	Market Development	Sales

1.2.5.3 Innovation Value Chain – IVC (Hansen and Bikinshaw'sInnovation Value Chain, 2007)

Hansen and Birkinshaw (2007) recommend, in their Harvard Business Review article, to view innovation as a value chain. The innovation value chain view presents innovation as a sequential, three-phase process that involves idea generation, idea development, and the diffusion of developed concepts. The Table 3 below depicts the proposed IVC, and provides some examples of the questions and KPI to measure each phase along the value chain.

Tabl.3 Innovation Value Chain as proposed by Hansen and Bikinshaw's

	IDEA GENNERATION		CONVERSION		DIFFUSION	
	INN-HOUSE Creation within a unit	CROSS-POLLINA-TION Collaboration across units	EXTERNAL Collaboration with parties outside the firm	SELECTION Screening and initial funding	DEVELOP-MENT Movement from ideas to first result	SPREAD Dissemina-tion accross the company
KEY QUESTION	Do people in our unit create good ideas on their own?	Do we create good ideas by working across the company?	Do we source enough good ideas from outside the firm?	Are we good at screening and funding new ideas?	Are we good at turning ideas into viable products, business and best practices?	Are we good inn diffusing developed ideas across the company?

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KEY PERFOR-MANCE INNDICATORS	Number of high-quality ideas generated within a unit	Number of high-quality ideas generated across units	Number of high-quality ideas generated from outside the firm	Percentage of all ideas generated that end up being selected and funded	Percentage of funded ideas to revenues; number of months to first sale	Percentage of penetration in desired markets, channels, customer groups; number of months to full diffusion

This framework provides an end to- end view of the commercial benefits to the firm from accessing and creating knowledge, building innovation and commercializing those innovations. A further advantage of the framework is that it provides an effective structure for more in-depth research and analysis. While developed initially by Hansen and Birkinshaw12 as a diagnostic tool for corporations to assess innovative capabilities, the IVC framework has the advantage that it can be readily scaled to a sectoral level. This brings in the potential for different distributions of innovation activity within individual sectors and also the potential for inter-sectoral comparisons.

Roper et al (2008).extended and formalized the work of Hansen and Birkinshaw through econometric modeling. This formal modeling approach provides a practical interpretation and modeling framework reflecting three innovation activities.

Accessing Knowledge. The collaborative process of knowledge sourcing or creation for innovation which may involve firms' in-house R&D and design activities alongside and either complementing or substituting for, external knowledge sources. Accessing knowledge can highlight the sectors' level of engagement with open innovation activities.

Building Innovation, which involves knowledge transformation to develop codified innovations, i.e. new products, processes or organizational forms. This element of the IVC may include the use of multi-skill teams within the company, as well as different forms of external partners in the process of building new innovations. In the building innovation stage the framework captures rates and intensities of different types of hidden innovation such as organisational and marketing activities.

Commercializing Innovation. This is the process of exploitation through which new innovations are translated into productivity or sales gains. This link in the IVC may include different forms of customer involvement as well as internal spending on reputation and branding and the use of intellectual property protection. As with accessing knowledge, the study highlights the degree of openness that exists within sectors.

1.2.5.4. OSLO Manual Innovation measurement Framework

The Oslo Manual provides guidelines for collecting and interpreting innovation data in an internationally comparable manner. The manual is prepared under the joint guidance of the **OECD** and the European Commission (Eurostat), the third edition of the Oslo Manual is the result of a three year collaborative process that has involved the OECD Working Party of National Experts on Science and Technology Indicators (**NESTI**) and the Eurostat Working Party on Science, Technology and Innovation Statistics (**WPSTI**) as well as a number of outside experts. The framework provided in the Manual represents an integration of insights from various firm-based theories of innovation with those of approaches that view innovation as a system

- Innovation in the firm.

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- Linkages with other firms and public research institutions.
- The institutional framework in which firms operate.
- The role of demand.

Many assessment tools have been developed based in this framework due to it comprehensiveness and for the purpose of international benchmarking. Examples for these tools are 1-InnoCERTused by Malaysian government and Inno-Bizused by Korean government. Both tools would be discussed in the next section.

1.2.6. Innovation management/Audit tools

In the following section, some innovation management tools/ innovation audit developed by prominent market consultants will be revised.

1.2.6.1.1-InnoCERT

The 1-InnoCERT is a program aimed at fostering innovative enterprises in Malaysia through harnessing and intensifying home-grown innovation as well as research and development. The certification awarded under the program identifies and verifies innovative companies through a compliance process and their ability to follow certain innovation standards. The certification process is developed from similar process practiced in Korea. The certification is based on online innovation self-assessment and verification through on-site physical audit and evaluates 4 basic dimensions:

1. Innovation Ability;
   - R&D Activity Index
   - Technology Innovation
   - Technology Innovation Administration
   - Technology Accumulation System
   - Technology Analysis Ability
2. Commercialization Ability;
   - Technology Manufacturing Ability
   - Ability to develop products
   - Marketing ability
3. Innovation Management Ability; and
   - Management's innovation Ability
   - Ability to respond to changes
   - CEO sense of values
4. Innovation Result.
   - Outcome of technology
   - Competitiveness Progress
   - Technology Management results
   - Technological Achievements (forecasting)

The innoCERT Innovation Assessment adapts the Korean Innobiz innovation evaluation system which is based on an internationally-recognized innovation assessment standard i.e. the Oslo Manual by OECD and the European Commission (Eurostat), 2005. 1-innoCERT certification is open to all enterprises (SMEs and Large enterprises), who would like to be recognized as a 1-InnoCERT or innovation-certified company, covering 8 industrial sectors, which are: Manufacturing, Services, Biotech, Design, Software/ICT, Agriculture, Environment, Green Technology, Renewable energy and Construction.

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***Process Details*:**

- The 1-InnoCERT certification process involves a two-stage assessment. Potential innovative companies are required to conduct an on-line self-assessment to gauge on their preparedness to be certified as a 1-InnoCERT company. Upon completing the self-assessment, the on-line system will generate a Technology Innovation System Evaluation Index, ranging from 0 to 1,000 scores. A scoring of higher than 700 is an indication that the company's internal innovation system and processes are readied to comply with the requirement.
- Companies with difficulties in scoring higher than 700 can attend regular sessions of pre-certification training to understand the 1-InnoCERT criteria, and how to become innovative. Upon reaching a score of more than 700, the company can apply for an on-site innovation audit to be conducted at their premise. On-site innovation audit is compulsory to ensure that companies applying for the 1-InnoCERT certifications are indeed innovative and complies with the requirement of the 1-InnoCERT criteria
- Upon a successful passing of the on-site audit, the company can then officially apply to be certified as a 1-InnoCERT certified company. However, the approval is still subject to acceptance by the approval committee, who oversees the overall program.

1.2.6.2. Inno-Biz assessment

Korea has been implementing a technology innovation certification system since 2001 to support SME innovation. The assessment is based on 'Oslo Manual' developed by OECD. The assessment goes in two phases; online self-diagnosis, and on-site assessment.

Online self-diagnosis (preliminary assessment)

Assessment of technology innovation system (full mark: 1,000 points): 650 points or more.

The assessment system consists of four fields (technology innovation capability, technology commercialization capability, technology innovation management capability and technology innovation achievements) and about 60 items.

On-site assessment of technology guarantee fund

Assessment of technology innovation system (full mark: 1,000 points): 700 points or more

- Apply assessment indices at the time of self-diagnosis (preliminary assessment) and assessment by specialized assessors of the Kibo Technology Fund

Assessment of individual technology levels (10-grade system): B class or higher

The individual technology level assessment consists of four fields (management owner's technical capability, technological viability, marketability, business viability and profitability) and about 44 items Individual technology level assessment consists of 10 classes, AAA, AA, A, BBB, BB, B,CCC, CC, C and D.

1.2.6.3. NESTA

NESTA is the National Endowment for Science Technology and the Arts. The aim is to transform the UK's capacity for innovation. They invest in early-stage companies, inform innovation policy and encourage a culture that helps innovation to flourish. **NESTA** has launched "innovation index project" since 2008. The purpose of this project was twofold. First, it aims to identify a series of metrics which can be used to reflect

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the strength of innovation capability in each sector. Second, the project aims to develop a framework which can be used to compare levels of innovation capability between sectors to identify priorities for policy and strategy development.

Since the cross-sectors comparisons was the focus of the project, structured end-to-end view of the innovation process in each sector is adopted, linking firms' knowledge investments to innovation and ultimately value creation. To provide the end-to-end perspective the conceptual framework provided by the Innovation Value Chain (IVC) proposed by Hansen and Birkinshaw (2007) was adopted. This provides a general framework within which firms' innovation activities can be considered: "a sequential, three-phase process that involves knowledge investment, innovation process capability and value creation capability" (Hansen and Birkinshaw 2007). According to the practical modeling framework of these phases, three innovation activities were identified; Accessing Knowledge, Building Innovation, and commercializing innovation. Table 3 illustrate innovation metrics for IVC, however Table 4 provided some information regarding the Innovation metrics (description and the purpose).

Table 4. Innovation metrics for IVC

<table>
<tr><th></th><th>Accessing Knowledge</th><th>Building Innovation</th><th>Commercializing Innovation</th></tr>
<tr><td rowspan="2">Cross-sectoral</td><td rowspan="2">A1. Proportion of externally sources ideas (C)

A2. R&D intensity (C)

A3. Design intensity (C)

A5. Use of external partners in accessing knowledge (C)</td><td>B1. Process innovation intensity (C)

B2. Percentage of sales from new products (C)

B3. Diversity of innovation (C)

B6. Use of external partners in building innovation (C)</td><td>C2. Spending on reputation and branding (C)

C4. Use of external partners in commercialization (C)</td></tr>
<tr><td>B4. Multi-functionality (I)

B5. Team-working (I)</td><td>C1. Type of customer relations (I)

C3. Multi-functionality (I)

C5. Use of IP protection (I)</td></tr>
<tr><td>Specific Sector</td><td>A4. Multi-functionality (I)</td><td></td><td></td></tr>
</table>

Sixteen firm-level metrics were identified. Five of these metrics relate to Accessing Knowledge; six to firms' Building innovation; and, five to their Commercialization activities. In some cases the metrics defined are purely cross-sectors – i.e. reflect the same indicator in each sector –and are denoted (C) in Table 4.

Table 5 Detailed description of the Innovation indicators for the IVC

Name of metric	Description of metric	Purpose of metric
Accessing Knowledge		
A1. Proportion of externally sources ideas (%)	Proportion of new products or services typically coming from ideas initially developed outside the firm	Reflects the openness of firm's knowledge gathering activities
A2. R&D intensity (%)	R&D expenditure as a percentage of sales	A measure of firms' commitment to technological innovation
A3. Design intensity (%)	Design expenditure as a percentage of sales	A measure of firms' commitment to design as

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		part of their innovation activities
A4. Multi-functionality in accessing knowledge (%)	Firms score 100 per cent if all of the five or six identified skill groups were involved inn accessing knowledge	An intensity index intended to reflect firms' use of multiple skill groups in accessing knowledge
A5. External knowledge sources for accessing knowledge (%)	Firms reporting all eight potential external partners as either "very important" of "fairly important" score 100 per cent	An intensity index to reflect firms' engagement with external knowledge sources for innovation
Building Innovation		
B1. Process innovation intensity (expenditure per sales) (%)	Expenditure on process development as a per sales	A measure of firms' commitment to process innovation
B2. Percentage of sales of innovative products (%)	Percentage of firms' sales derived from new or improved products or services over the last three years	Ann output measure of how successfully the firm "build" innovative products and services
B3. Diversity of innovation (%)	Takes value 100 if a firm engaged in all six types of innovation activity, 50 if the firm undertook three different forms of innovation etc.	An intensity index designed to reflect the range of innovative activities carried out by the firm
B4. Multi-functionality in building innovation (%)	As A4 for building innovation	
B5. Embeddedness of team-working in building innovation (%)	Takes value 100 if firms engaged in all five different attributes of firms' team working activity	Intended to reflect the extend of commitment to team-working
B6. External knowledge sources for building innovation (%)	As A5 for building innovation	
Commercializing Innovation		
C1. Type of customer relations (%)	Ann intensity index. Firms using all of the models of customer interaction score 100 per cent etc.	Reflects the range of customer interaction that firms employ
C2. Branding, marketing intensity (expenditure per sales)	Expenditure on branding, marketing as a percentage of sales	A measure of firms' commitment to commercialization through their spending on branding and marketing
C3. Multi-functionality in commercializing innovation (%)	As A4 for commercialization	
C4. External knowledge sources for commercialization (%)	As A5 for commercialization	
C5. Use of IP protection (%)	Firms using all six forms of IP protection score 100 per cent etc.	Reflects the diversity of firms' use of different forms of legal IP protection

1.2.6.4. IMP³rove -Europe Innvoa

The project IMP3rove was established by the European Commission with the aim to IMProve Innovation Management Performance of small- and medium-sized enterprises (SMEs) in Europe with sustainable impact. The project began with an analysis of existing best practices in Innovation Management and self-assessment tools that are applied in Europe. The assessment is systematically assessed along all dimensions of the "A.T. Kearney House of Innovation". It measures the performance of the key factors for successful Innovation Management shown in the figure below (in percentage). It involves innovation strategy, organization and culture, and life cycle management (including idea management, product development, launch processes, and continuous improvement).

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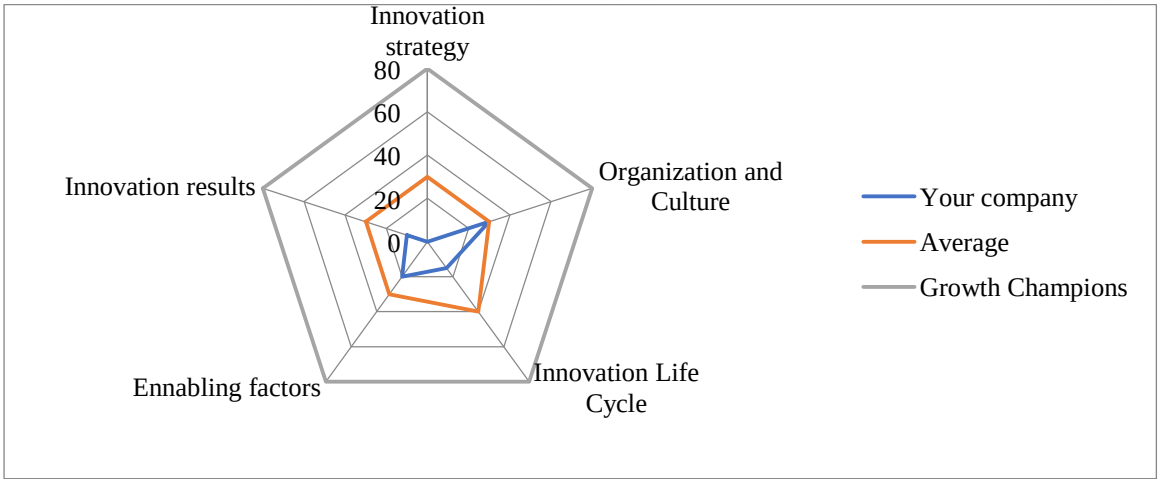

Figure 5 Key Factors for Successful Innovation Management

Innovation Dimensions

1. Innovation Strategy
   - Vision and strategic focus on innovation
   - Implementation of strategy
2. Organization and Culture
   - Roles and responsibilities
   - Organizational structure
   - Organizational culture and climate
3. Innovation life cycle process
   - Idea management
   - Product/ Process and Service Development
   - Launch and continues improvement
4. Enabling Factors
   - Project management
   - Human Resources and incentives
   - IT and knowledge management
5. Innovation Results

IMP³rove takes a holistic approach to the assessment of Innovation Management as a key driver for competitiveness. Almost 3000 enterprises have benefited already from the IMP³rove Assessment. IMP³rove integrates the online assessment, the benchmarking, consulting services and continuous improvement of the SME's Innovation Management.
IMP³rove offers two types on Innovation Management assessment: The IMP³rove Assessment and the IMP³rove Root/Cause Analysis. Thanks to high quality benchmarking the benchmarking reports provide valuable insights on the company's competitiveness, strengths and weaknesses in leveraging Innovation Management for sustainable growth.

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1.2.6.5.Innovation radar

The Innovation Radar is a tool, developed by the Kellogg School of Management's researchers; Mohan Sawhney, Robert C. Wolcott and Inigo Arroniz. Based on his research into the innovation habits of FORTUNE 500 companies such as Boeing, Microsoft and DuPont, Mohanbir Sawhney, director of Kellogg School of Management's Center for Research in Technology and Innovation, in collaboration with Kellogg fellows Robert C. Wolcott and Inigo Arroniz, is developing a new innovation management tool known as the Innovation Radar. The tool was first described in the Spring 2006 MIT Sloan Management.

This tool had already been tested and been statistically documented among 40 companies in the US. More importantly the Innovation Radar gives a holistic view of innovation, and it supports the empirical evidence of companies that take a business model perspective on innovation outperforms companies that focus more narrowly on only product or process innovation.

The radar features four major dimensions that serve as business anchors:

- Offerings a company creates (WHAT)
- Customers it serves (WHO)
- Processes it employs (HOW) and
- Points of Presence it uses to take its offerings to market (WHERE).

Spread over these 4 main dimensions, companies can innovate their businesses far broader in scope than product or technological innovation: a company can actually innovate along any of 12 different dimensions. The innovation radar can help to broaden the innovation focus in companies and to show that "innovation is about creating new value, not about creating new products.

Table 6. Twelve Dimensions of Business Innovation

Dimension	Definition	Examples
Offering	Develop innovative new products or services	• Gillette mach3Turbo razor • Apple iPod music player and iTunes music service
Platform	Use common components or building blocks to create derivative offerings	• General Motors OnStar telematics platform • Disney animated movies
Solutions	Create integrated and customized offerings that solve end-to-end customer problems	• UPS logistics services Supply Chain Solutions • DuPond Building Innovations for construction
Customers	Discover unmet customer needs or identify underserved customer segments	• Enterprise Rent-A-Car focus on replacement car renters • Green Mountain Energy focus on "green power"
Customer Experience	Redesign customer interactions across all touch points and all moments of contact	• Washington Mutual Occasio retail banking concept • Cabela's "store as entertainment experience" concept

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Value Capture	Redefine how company gets paid or create innovative new revenue streams	• Google paid search • Blockbuster revenue-sharing with movie distributors
Processes	Redesign core operating processes to improve efficiency and effectiveness	• Toyota Production System for operations • General Electric Design for Six Sigma (DFSS)
Organization	Change form, function or activity scope of the firm	• Cisco partner-centric networked virtual organization • Procter & Gamble front-back hybrid organization for customer focus
Supply Chain	Think differently about sourcing and fulfillment	• Moen ProjectNet for collaborative design with suppliers • General Motors Celta use of integrated supply and online sales
Presence	Create new distribution channels or innovative points of presence, including the places where offerings can be bought or used by customers	• Starbucks music CD sales in coffee stores • Diebold Remote Teller System for banking
Networking	Create network-centric intelligent and integrated offerings	• Otis Remote Elevator Monitoring service • Department of Defense Network Centric Warfare
Brand	Leverage a brand into new domains	• Virgin Group "branded venture capital" • Yahoo as a lifestyle brand

1.2.6.6. Innovation for Growth

Built on Innovation Value Chain Model, with innovation process depicted below, and considering 5 main dimensions in measuring innovativeness

- Innovation Strategy - Why, What, Where, When;
- Idea Generation (creativity);
- Selection – Which;
- Implementation;
- Organization (How).

1.2.6.7. The Technology Audit Model (TAM)

Technology can be defined as 'the way we do things' and it consists of the means by which we achieve objectives (Khalil 2000). The notion of Management of Technology (**TAM**) is continually evolving (Van Wyk 2004b, Dolinšek 2006). Within this contribution, technology can be defined as: theoretical and practical knowledge and skills which can be used for development of products or services, their productive and providing systems, and which can be incorporated in processes, materials, equipment, and systems employed in the creation of goods or in providing services (Khalil 2000, Dolinšek 2004, Thamhain 2005). Technology, as being identified by Porter (1998), is one of five forces that drive industry competition. **TAM** is an interdisciplinary field concerned with technological development, utilization and the impact of technology on companies and society. **TAM** can address the strategic and operational needs of the management system in the following ways by:

- Integrating business and technology strategies.
- Expanding utilization of quality standards, excellence models and Total Quality Management (TQM) philosophy into the field of MOT.

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- Integrating the technology audit model into generic internal auditing practice of the company.
- Gaining support and benefits from the internal technology audit (Khalil 2000, Karapetrovic, Wilborn 2000, 2002).

The challenge to managers is to continuously and consciously manage their knowledge assets for the growth of technological capabilities of the company (Leonard 1998). In respect of that, the technology audit is defined as a tool to evaluate and identify the strengths and weaknesses of the technological capabilities of the company. The **TAM** model (developed by Garcia-Arreola in 1996) is supportive in the sense of determining current technological status, surviving areas of opportunity, and taking advantage of the company's strongest capabilities (Khalil 2000). One of the main goals is also to establish the technological position of the company in regard to its competitors and the state of the art. After the audit and assessment a company can develop objectives that form the core of its strategy (Khalil 2000). Technology strategy should be a part of the company's overall strategy. According to M.E. Porter (1996) a proper link between strategy and manufacturing operations is a key to developing sustainable competitive advantage.

Companies while implementing the system of quality management are regularly practicing quality audits. However, there are no standard requirements about evaluating technological capabilities like quality audits that are one of the integral requirements of the ISO 9000 series. One of the important areas of a company's generic audit should be an evaluation of their technological capabilities by an internal technology audit. We can assume that many companies are developing 'their own' MOT model through preparation of audit, accomplishment of audit and audit report with recommendations and corrective measures.

Some companies have already adopted and included the **TAM** evaluation practice in their generic audit system.

TAM Methodology

The methodology approach was a survey which consisted of a **TAM** evaluation form. Respondents were answering to the evaluation form, which consists of twenty assessment areas and a five-point Likert scale. The results on a five-point Likert scale are an average for most categories. Companies from both industries are evaluated as relatively equal but with some advantage for the manufacturing industry. From the results it is evident that further improvements are needed, above all in the categories of innovation processes, acquisition and exploitation of technology. Qualitative and quantitative analysis indicates the general applicability of the **TAM** model in both industries and a new viewpoint for some respondents and users. Although the paradigmatic orientation of this research is quantitative by its nature, it is too early to constitute if the research will further develop in a qualitative (e.g. ISO 9001) or quantitative model.

The internal audit is in general intended for evaluation, determination, and providing a position statement of existing status in a company. Evaluation, gained through the internal technology audit, can be used for encouragement of technological development in the company. The internal technology audit is a tool for a gap determination between the existing and the desired technological situation and, respectively, offers an evaluation about possibilities for upgrading technological capabilities. The main reasons for having an internal technology audit are:

- Positioning of the technological development.
- Estimation of probabilities for change of the existing status.

The applicability of the **TAM** model was tested, for purposes of the internal technology audit, in more than fifty Slovenian service and manufacturing companies. That is expressed in percentage, 50% of the service companies and 50% of the manufacturing companies. The majority of these already have implemented quality system management and are certified according to the requirements of at least one of the following standards;

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ISO 9001, ISO 14001, CEN/TS 16555-7; ISO/IEC 17025, ISO TS 16949, QS 9000, etc. Our interest was in testing if this instrument (TAM) gives any useful answers about technological capabilities of the companies and it can be used for purpose of the internal audit like in case of the ISO 9001. The methodology approach was an inquiry which consisted of a MOT evaluation form and a review of the company's documentation (e.g. annual reports, AJPES, web pages).

The **TAM** evaluation form includes important areas of technological capabilities of the company and is a holistic process oriented tool for the internal technology audit process. At the same time it makes possible a quantitative evaluation of the technological capabilities. The respondents were very different employees who are performing this function.

They were responding to the quantitative evaluation form, which consists of twenty assessment areas and a five-point Likert scale. A score of 5 is outstanding, 4 is good, 3 is average, 2 is below average, and 1 is poor (Khalil 2000). They also presented their comments as well.

Main benefits of the internal **TAM** evaluation are:

- Arrangement and review of existing relevant documentation of the quality system management and supportive key technologies.
- Identification of the technological assets and capabilities of the company.
- Determination of the key company competencies for strategy review and change support.
- Technology mapping support and portfolio of technology development projects.

1.2.6.8. Comparison between Innovation measurement models

Table 7 illustrates a summarized comparison between different innovation measurement models and their respective focuses, and dimensions. How to measure organization Innovativeness?

Table 7. Comparison between different innovation measurement models

Model	Ex. of tools	Focus	Dimensions	Remarks
Diamond Model	• Improve	• Innovation process • Enabling factors • Linkage	Strategy, process, organization, Linkage and learning	Adequate when innovation process on its infancy. It highlights key dimensions of innovation process as well as its enabling institutional factor
Funnel Model		• Tech. innovation or • product innovation focus • R&D process as the core activity	Strategic Thinking, portfolio Management & Metrics, Research, Ideation; Insight, Targeting; Innovation Development; Market Development; and Selling.	Adequate model when there is a due innovation process in the organization Innovation value chain (IVC)
Innovation value chain	• NESTA • Innovation	• Idea Management • Output	Generation, Conversion , Diffusion	Emphasizes the assessment of the

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(IVC)	for growth	performance	Knowledge acquisition, Building Innovation, commercializing Innovation	output of innovation process.
Oslo Manual	• InnoCert • InnoBiz	• Innovation • linkage • output in certain duration	Innovation, Linkage, Demand, Infrastructure and institutional framework, and Innovation Policies	Very beneficial when considering country leve international comparison
Innovation radar		Innovation output performance	Offerings, customers, processes, marketing	Does not ensure the sustainability of innovation process
The **TAM** Model	Implementation standards – 9001; 13555-7; Six Sigma, TQM	Integrating business and technology strategies	Identification of the technological assets Determination of the key company competencies	Technology mapping support and portfolio

1.2.6.9. Classifying firms by degree of innovativeness

According to Oslo manual, third edition, firms are classified according to their degree of innovativeness as follows:

The **innovative firm** is one that has introduced an innovation during the period under review. The innovations need not have been a commercial success –many innovations fail.

An **innovation active firm** is one that has had innovation activities during the period under review, including those with ongoing and abandoned activities. In other words, firms that have had innovation activities during the period under review, regardless of whether the activity resulted in the implementation of an innovation, are innovation active.

A **potentially innovative firm** is one type of "innovation active firm", that has made innovation efforts but not achieved results. This is a key element in innovation policies: to help them overcome the obstacles that prevent them from being innovative (converting efforts into innovations).

1.2.6.10. Guidelines for selecting/ developing the required innovativeness measure.

There no standardized framework or measurement tool that meets all of the needs of all relevant players involved in Innovation Management activities (companies, intermediaries, government, VCs, and banks). However, a perfect innovation metric would balance accuracy, longevity, comparability and ease of collection. It would precisely measure what matters according to the current phase of innovation in a particular industry. It would do so consistently over a long period of time, allowing comparisons across companies, and be easy to collect for the purpose of the intended measure. The tool should be designed able to do the following:

- Generate value for the company (using the self-assessment tool - only if the user considers the tool valuable can it increase market acceptance);
- Provide policy makers with information for decision support;

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- Focus on the innovation process capability, and its enabling factors rather than specific focus on a certain type of innovation, to ensure the performance sustainability;
- Provide detailed insight on what hinder innovation within the organization;
- Simple and effective (on line tool);
- The measurement results should be confidential (the tool should be promoted and maintained by a governmental body, **TIEC** or scientific-research Institute for example);
- Firm's capabilities are what mainly allow it to take advantage of market opportunities. The most significant innovation capability is the knowledge accumulated by the firm, which is mainly embedded in human resources, but is also in procedures, routines and other characteristics of the firm. Knowledge about innovation capabilities and the firm's efforts to increase these are key to understanding its present and future performance. Innovation capabilities condition the design of strategies to introduce changes, improvements and/or innovations (innovation strategies). If innovation strategies are at the heart of company' policy interest, innovation capabilities are the most important issue for the design of an innovation survey;
- Many difficulties are involved in measuring innovation capabilities, since it is necessary to measure knowledge that is not codified, but "stored" in individuals' minds or organizational routines. At the same time, it is not easy to obtain reliable data from firms about the exchange of knowledge with other agents or organizations. The priority given to measuring innovation capabilities motivates placing additional emphasis on certain aspects of surveys:
  - Human resources.
  - Linkages.
- Emphasis should be put on measuring linkages. In order to enable the weighting of the firm's different linkages, a proxy measure of complexity can be developed by crossing "type" and "objective" of the linkages. This can be done by establishing a matrix of linkage agents (i.e. universities, technical and vocational training institutions, technological centers, test labs, suppliers, clients, head office, enterprises belonging to the same group, other firms, consultants, R&D firms), and types of linkage (including open information sources, acquisition of knowledge and technology, and innovation co-operation, supplemented by complementary activities, particularly access to new sources of financing and to commercial information);
- In later stages, and after promoting innovation concept and processes, the intended Innovation measurement should produce results comparable to those obtained by developed countries for benchmarking, and involvement in international index.

1.2.6.11. Factors hampering innovation activities

Understanding the factors that affect the innovation performance would be of great benefit to be addressed on the required measure. From the literature study, it is possible to summarize the main factors hampering innovation activities.

Knowledge factors:

- Lack of qualified personnel: Within the enterprise / In the labor market
- Lack of information on technology / markets
- Deficiencies in the availability of external services
- Difficulty in finding co-operation partners for: Product or process development /Marketing partnerships
- Organizational rigidities within the enterprise: Attitude of personnel/ managers towards change, Managerial structure of enterprise

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Institutional factors:

- Lack of infrastructure
- Weakness of property rights
- Legislation, regulations, standards, taxation

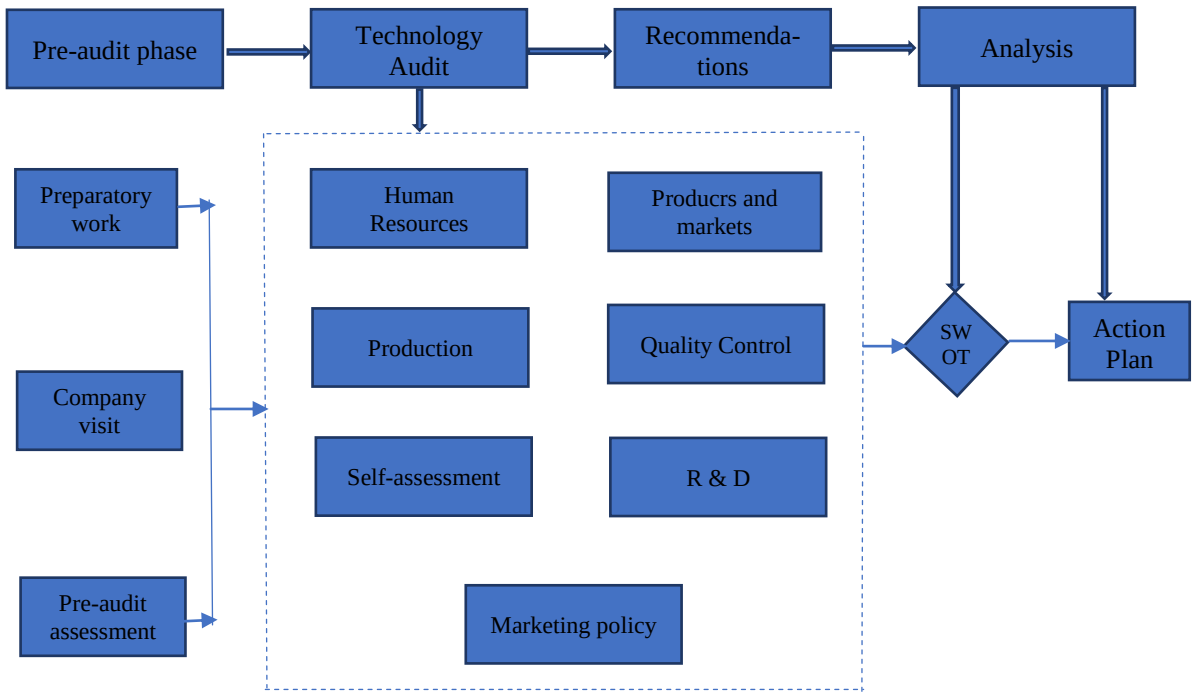
Cost factors:

- Excessive perceived risks
- Cost too high
- Lack of funds within the enterprise
- Lack of finance from sources outside the enterprise: Venture capital / Public sources of funding

Market factors:

- Uncertain demand for innovative goods or services
- Potential market dominated by established Enterprises

Fig.6. Structure of the Technological audit



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2. Questionnaire

2.1. Develop a Potential Innovation Assessment Questionnaire

In order to perform a technology audit of an enterprise, a methodology for assessing the innovative potential of SMEs was developed - a Questionnaire with certain criteria, grades and categorization of enterprises according to the result for their innovative potential – see Annex 1.

It measures the performance of the key factors for successful innovation management. SMEs will receive the following benefits from the Innovation Management Assessment Service:

- Transparency of the competitive position.
- Transparency of the impact of innovation management on the SME's business performance.
- Identified areas for improving innovation management performance and competitiveness.
- Well-structured assessment of the competitiveness and innovation management performance for continuous improvement.
- Insights into the competitive situation of the targeted markets.
- Well-structured documentation of innovation management performance that can be shared within the organization thus boosting innovation.
- Access to trained innovation management consultants and support providers.
- Actionable roadmap to improve the innovation management capabilities and increase competitiveness.

In the present Report two audit tools will be used:

- **Simple questionnaire tool** - simple ***Potential Innovation Assessment Questionnaire*** can be used by firms or by support agencies, consultants;
- **Interview tool** – additional issues that will allow companies to prepare SWOT Analysis and choose an appropriate company' strategy for development.

Potential Innovation Assessment Questionnaire content

The ***Potential Innovation Assessment Questionnaire*** /Annex 1/comprise of seven main sections, with four to six specific questions each. For better understanding of the questions/sub-questions, on-line direction is given to each one.

The structure of the questions is as follows:

1. Ideas creation and creativity

1.1. **Ideas for new product development are gathered or created from staff from R&D and marketing functions** - The question aims to understand whether there is a common practice in the company of involving both R&D and sales staff in defining a new product brief. It is based on the assumption that an innovative product requires a close cooperation and information exchange between R&D and marketing functions bringing in the technical and the market knowledge

1.2. **Do you have formalized procedures adopted to collect ideas within the whole company** - The question aims to understand if the company has adopted a systematic approach to initiate the development of new products by collecting ideas among employees. Research and development usually have access to an idea submission process, but this should be expanded to all departments (e.g. Ideas are mostly collected electronically using a dedicated tool).

1.2.1. **If YES, is there a reward system to encourage new ideas?** - The question aims to understand if the company provides incentives that could sustain the formalized idea generation process in the company. It is based on the assumption that the process based on a volunteer behavior requires a system of clearly recognized rewards to reinforce such behavior

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1.2.2. **If YES, is there a formalized agenda and a scheduled follow-up for the collected or created ideas**? - The question aims to understand the process is backed by a follow-up procedures that enable organization to put agreed agendas into action

1.3. **Dedicated resources are used to keep track of existing and new ideas** - The question aims to understand whether his resources specially dedicated to keeping track of existing and new ideas such as information systems and/or personnel to oversee and/ or run the innovation process. It is based on the assumption that the development of new product ideas requires especially assigned resources

1.4. **There is a formalized assessment process to evaluate new ideas** - The question aims to understand whether the company has adopted a structured approach to evaluate the new ideas assessed. In some instances, the idea review process is a simple matter of a manager reading through a batch of ideas and selecting those he believes will work best for his firm. This is most often the case in smaller firms run by a single owner and manager. In most medium to large business, however, a structured evaluation process is implemented where employees with the appropriate expertise review the ideas.

2. Design and new product development

2.1. **Regular meetings to monitor new product development activities take place** - The question aims to understand if the company has a practice of holding regular project meeting. It is based on the assumption that the project management requires regular updates and progress checks that could be done through face-to-face meeting

2.2. **Top management regularly reviews tasks of all project teams and managers** - The question aims to understand if the company management takes a vested interest in the ongoing project activities and provides a regular feedback to project teams. It is based on the assumption that a regular appraisal of project activities by project owners is required to keep the development inline the changing requirements and expectations

2.3. **Use of formalized design methodologies or tools for new product development** - The question aims to understand if a new product development is underpinned through the use of design methodologies and/or design aided tools that could facilitate the rapid prototyping and the reuse of existing models. It is based on the assumption that the use of design methodologies can significantly shorten the development and testing time and facilitate the new product pipeline

2.3.1. **If YES, do you have customized or specially developed tools to assist specifically with your product development efforts?** - The questions aim to understand if the company has an in-house developed or specially customized design methodology or tool to assist with a new product development. It is based on the assumption that the use of specialized tools is a tell-tale sign that the company has been aiming to benefit from the design process

2.4. **Facilitator groups or individual experts are used by the company** - The question aims to understand if the company users' external experts and other resources for their product development processes. It is based on the assumption that the need for external expertise indicates the potential for the company to develop into a new direction where new resources are needed

2.4.1. **If YES, do they have to sign non-disclosure agreements?** - The question aims to understand if the involved external experts sign **NDAs** with a company. If not, it is perhaps a sign that their involvement does not relate to R&D tasks which are the most sensitive area for a high-tech SME

2.5. **Prototyping facilities (such as a laboratory or a test bed) are available in-house or are readily accessible externally?** - The question aims to understand if the company has access to a laboratory or a test bed in-house or externally. It is based on the assumption that such access is vital to the development of new products

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2.6. **Do you have Quality and assurance processes and procedures have been implemented?** - The question aims to understand if the quality procedures (ISO 9001, CEN/TS 16 555-07) have been put in place. It is based on the assumption that the clearly defined threshold values for quality and assurance are key to implement a new product development.

3. Competency management

3.1. **Technological training is undertaken internally on a regular basis** - The question aims to understand if the staff is being trained in technologies that are key to the company business. It is based on the assumption that a regular training is key to educating a workforce to execute highly specialised tasks.

With technological training is meant the transfer of knowledge to old and new personal (e.g. new software, etc.)

3.2. **Staff is employed according to skills needed, including future projects** - The question aims to understand if the company takes a pro-active approach to HR planning. It is based on the assumption that the innovative companies need to nurture their workforces based on the skills that are expected to be in a shortage to create a competitive advantage over other companies

3.2.1. **If YES, do you host or subcontract consultants and/or researchers from universities and/or research institutes to get the skills needed for future projects**? - The question aims to understand if the company is open to hiring new staff from universities or **RTOs** or consultancies to work on a project-to-project basis. It is based on the assumption that the need for highly specialised staff shows that the company is developing new competence areas

3.3. **Individual competencies are mapped out and used for innovation management** - The question aims to understand if the company is analysing and mapping the existing knowledge pool within the company and uses that for developing competence-specific offerings. It is based on the assumption that most high-tech SMEs are essentially competence-driven businesses

3.4. **Individual competencies are mapped out and used for innovation management** - The question aims to understand if the company fully leverages its human resources by creating project teams staffed with people with different skills and responsibilities. It is based on the assumption that the best performing teams are cross-functional

3.4.1. **If YES, are cross-functional teams managed by a specially designated manager**? - The question aims to understand if the cross-functional teams are actively managed or are just self-help groups or loosely tied virtually connected teams. The assumption is that such teams need a specially designated manager to manage people representing different functions and organisational cultures

3.5. **A human resource manager is available in the company** - The question aims to clarify if the company has a dedicated manager for human resources. The assumption is that the highly specialised high-tech companies that base their growth on unique set of skills and a created knowledge require an active human resource management at the executive level

4. Competitive technology intelligence

4.1. Meetings held to transform collected information into innovation projects- The question aims to understand if the company has a practice of organising meetings for sharing information and knowledge that could have a potential value for the company. It is based on the assumption that the competitive technology intelligence requires an all-company effort

4.2. Data collection methodologies, tools or external paid resources are used for the market analysis - The question aims to understand if the company is using methodologies, tools or external (paid) resources for the market analysis. It is based on the assumption that competitive intelligence requires a constant and systematic monitoring of the market

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4.2.1. If YES, is the collected market information shared within the company? - The question aims to understand if the obtained market data is made available across different functions and organisational level in order to bring the latest information about the changes in the market to each and everyone. The assumption is that the more information is available the more it is shared and cross-fertilized

4.3. There is internal process methodology in place for gathering technology intelligence - Gathering and compiling of technical information, developing technology foresight, monitoring the advancement of science and its anticipated consequences for subsequent technology development (e.g. technology mapping and roadmaps; competitive intelligence aims at following the technical developments of competitors)

The question is aiming to understand if the technology intelligence gathering is pursued in a structured and strategically conceived way in contrast to an ad hoc inputs here and there. The assumption is that the competitive analysis requires a process to support it

4.4. Employees are expected to actively participate in gathering the technology intelligence - The question is aiming to understand if dedicated employees are in charge of technology intelligence within the company

4.5. Visits (such as participations in exhibitions, trade shows etc.) are strategically planned in advance - The question aims to understand if the company is actively planning the participation in the trade shows and similar events. It is based on the assumption that the participation in such events requires a careful planning in advance in order to achieve expected impacts

4.5.1. If YES, is there a dedicated budget for the participation in such events regularly? - The question aims to understand if the company is taking seriously the participation in the trade events by planning and allocating a specially designated budget for covering the related costs

5. Managing the life cycle of innovative products

5.1. Regular progress reports available for each project - The question aims to understand if the project progress is documented through regular reports in a written form. The assumption is that a successful project management requires a documented paper trail to follow up the project progress available to others in the organization to access this information

5.2. Well-defined planning methodology available for tracking project progress - The question aims to understand if the company is using visual planning aids (poster boards or electronic tools) to track project progress and create a better awareness about that among the staff. The assumption is that visualized information keeps to raise the awareness and provides a sense of purpose

5.3. Are project tracking meetings planned on a regular basis? - The question aims to understand if the project meetings are being planned regularly. It is based on the assumption that the project management requires a regular meeting flow

5.4. An initial reference frame established (objectives, responsibilities, budgets) for each project - The question aims to understand if the projects are clearly documented, especially as concerning the initial project brief. The assumption is that without a clearly defined and documented project scope, the project management can go astray being overwhelmed by solving emerging issues while losing a bigger picture or even the initial list of requirements

5.5. Continuous resource monitoring (materials, financial, personnel) assigned to each project - The question aims to understand if the implementation of projects is actively managed by monitoring resources assigned to each project. The assumption is that the lack monitoring can cause budget overruns, especially in high-risk projects

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5.6. Project management and/or task tracking software is used - The question aims to clarify if the company has adopted the software tools for project management which can help to automate the procedures and decrease the number of errors

5.6.1. If YES, is the software used specific, customized according to the company needs? - The question aims to additionally clarify if the adopted software tool has been further customized to meet the company needs. It is assumed that this could indicate that the company is trying to benefit from a process automation and a task replication

6. Knowledge Management

6.1. There is a dedicated system **or tool for recording know-how and re-use of previous knowledge** - The question aims to understand if the company is using a repository for recording and maintaining its knowledge-related files. The assumption is that such approach helps to codify the tacit knowledge created though high-knowledge intensive processes in a firm

6.2. Information is pre-treated (codification, classification) before being stored - The question aims to understand if there is a system that defines the process and the format for storing company data either physically or on a computer system (ISO 27000). The assumption is that the codification of data has to follow a structured approach in order to make the recorded knowledge retrievable and reusable

6.3. **There is a regular staff appraisal procedure at an individual or team level** - The question aims to understand if the company has a policy of regular staff appraisals that can serve as a basis for incentives. The assumption is that through the regular appraisal the staff could be motivated to contribute to the knowledge creation in the company

6.4. There are procedures for creating and maintaining intellectual property - The question aims to clarify if the company has a plan or a strategy for creating and maintaining an intellectual property. The assumption is that the IP has to be part of the company strategy

6.4.1. If yes, does the company have a dedicated person for managing the intellectual property? - The question aims to clarify if the IP is managed, and thus has a dedicated person who takes care of the IP related activities. The assumption is that the IP needs to be part of the executive brief

6.5. Knowledge management tools are used such as shared databases and repositories - The question aims to understand if the company has been using the shared databases, private or public cloud services for knowledge and data management such as file sharing, calendar sharing, etc. The assumption is that the sharing of data creates the environment for constantly updating the knowledge

6.5.1. If YES, is there a dedicated person to update the databases or repositories? - The question aims to clarify if there is a dedicated person overseeing the databases and the related IT infrastructure. It is assumed that the data sharing needs to be managed and facilitated by dedicated personnel.

7. Value Chain Analysis

7.1. Do you have a clear understanding of the Value Chain which encompasses your products, processes, or service? - The question aims to uncover if the company has a clear value chain perspective on its products or services. The assumption is that a clear understanding of a particular value chain is a prerequisite for planning the company growth

7.2. Have you analysed the contributors (research partners, suppliers, advisors) that help you provide your product, process, or service within the previous 12 months? - The question aims to understand if the company has been actively analysing the value chain which would indicate the proactive position of the company in terms of searching for opportunities along the value chain

7.3. Have you identified the different stakeholders who could most effectively benefit from your product, process, or service? - The question aims to understand if the company has a clear

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understanding of the customer and/or the end-user of its products. The assumption is that only by understanding the customer needs one can come up with a solution that could be innovative and marketable

7.4. **The technology readiness level of your product(s) is clearly recognised and understood** - The question aims to understand if the company is clear about the technology level of its product and thus understands the further needs in order to reach the market. The assumption is that the technology readiness perspective helps to better understand and plan the further steps towards the commercialization of a technology product

7.5. **Do you have a systematic approach to identify what part of the value chain has the greatest potential for innovation or development**? - The question aims to clarify if the company can identify the best commercial opportunity along the value chain in terms of the highest gross margins that a particular segment of the value chain commands. The assumption is that the greatest potential for innovation lies where the highest gross margins are.

There are also other general issues that support the technological audit. It should be noted, that in order to determine an adequate picture of the current situation regarding the innovation capacity, the questionnaire must be filled by company' manager with clear awareness of the responsibility and impartiality of the answers. In case of doubt about a correct answer, it is better to use a competent external consultant.

2.2. Web positioning

Thus, the developed tool - a ***Potential Innovation Assessment Questionnaire*** will be positioned on a special web site and will be available to all interested parties.

2.3. Selection of Five IT companies for Case Studies

Consultation and selection of SMEs was provided for conducting a technology audit for innovation management to companies with innovative potential for creating ICT clusters (minimum 5 pieces).

An Internet Survey was conducted among the IT SMEs in Bulgaria on the following criteria:

- Applying truly inspiring innovation strategies;
- The company is ambitious in terms of providing the basis to break away from the competition, beat the competition, and create new spaces;
- Open process of developing the innovative strategy;
- An innovation strategy is specific to the time in which it is developed;
- The company 'innovation strategy is adaptive;
- The company has strong innovation leadership;
- The company is focus and being realistic about how many and which kind of innovation initiatives a company can drive simultaneously.

Five innovative enterprises were selected to perform a technological audit: Diplace Ltd, Technological Center, Sofia; Virtech Ltd.; Gopler EOOD and ABATI AD.

3. Implementation

3.1. Portfolio Techniques (Matrices)

Technological audit is an activity aimed at reviewing and evaluating applied company technologies and deciding on their development. The result of the company's technology audit is the solution for:

- Failure of a technology;
- Acquisition of new technology;
- Development and improvement of existing technology.

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This decision is based on the objective of creating competitive advantages for the company, providing conditions for its survival and development.

Different business technologies affect to varying degrees the competitive capabilities that should be considered in the technology audit. In this context, company technologies can be divided into: **Base, Key** and **Developing** as was mentioned in paragraph 1.2 of this report.

For multi-product companies handling a large number of technologies, technology assessment within a technology audit can be done using portfolio techniques (matrices):

- A matrix for assessing company technologies in terms of potential opportunities and impact on competitive capabilities

Table 8. Potential abilities of the technology according to competition and company' capabilities

Competition' Influence and company' capabilities	**Potential abilities of the technology**	
Developing technologies	Technology 2	Technology ….
Key Technologies		
Base Technologies	Technology 1	Technology N….
	High	**Low**

- A matrix based on the life cycle phases of the innovative technology and the number of companies using this technology

Table 9. Technology' Life Cycle Stages

Technology' Life Cycle Stages					
	Entry	**Development**	**Stability**	**Decline**	**Abandonment**
Limited-owned technologies		Company technology portfolio			
Massively - owned technologies					

To assess technology management processes in the selected companies could use the **TMAP** approach, based on Gregory's (1995) process model for technology management, which consists of five generic process areas (see Figure 7)

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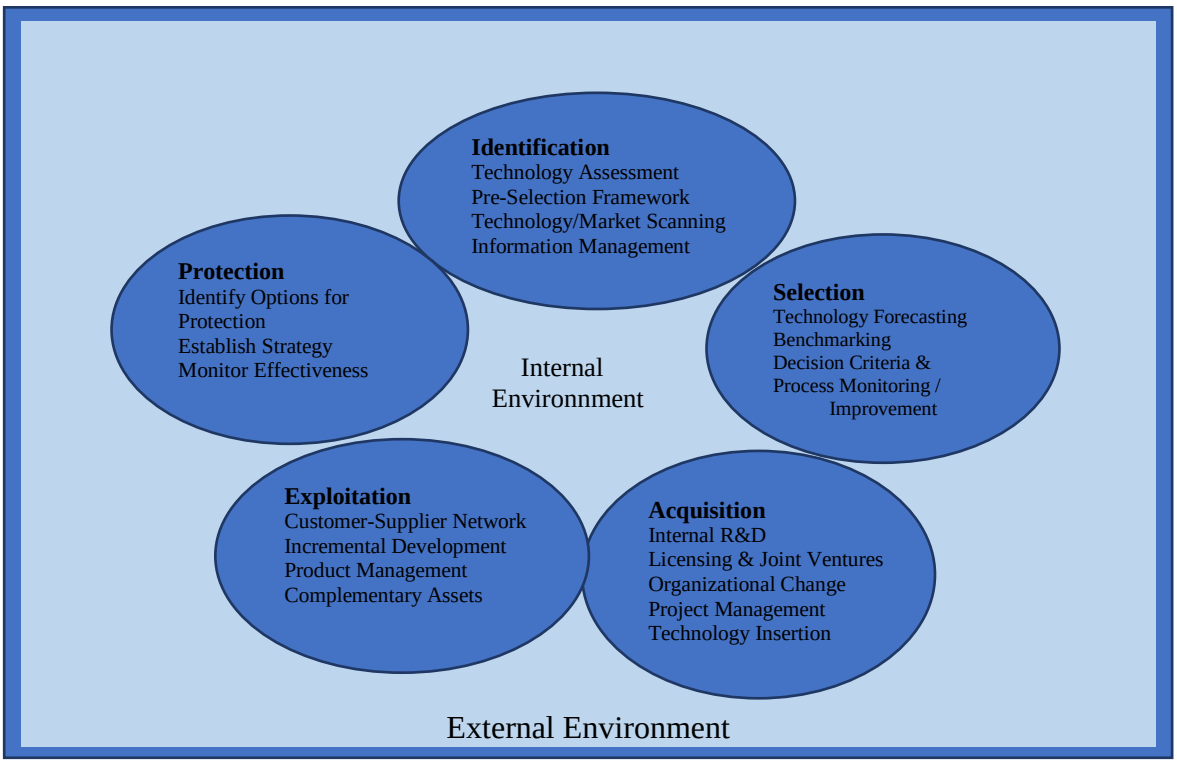

Figure 7. Five-process technology management framework

- **Identification** of technologies which are (or may be) of importance to the business. Example processes include scanning, monitoring, benchmarking and data collection.
- **Selection** of technologies that should be supported by the organisation. For instance, forecasting, portfolio analysis and scenario analysis are associated with selection of technology.
- **Acquisition** and assimilation of selected technologies. Example processes include technology transfer, research and development, corporate mergers and acquisitions.
- **Exploitation** of technologies to generate profit, or other benefits. Example processes include licensing, new product development, incremental developments, process improvements, and supply chain management.
- **Protection** of knowledge and expertise embedded in products and manufacturing systems. These processes include patenting, risk assessment, security management and staff retention.

The aims of the **TMAP** assessment were to 1) provide a framework for linking technology with business needs, identify critical technology management issues in the firm; 2) map and evaluate important technology management processes in the area of interest; 3) identify strengths and weaknesses, and hence areas of best practice for transfer, and areas for improvement; and 4) lead to recommendations for action plans which have cross-functional support and can be clearly justified (Farrukh et al.2000, Phaal et al.1998, Phaal et al. 2001).

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In summary, the innovation and technology management framework can be described as covering three themes and ten areas of significance to technology-based organisations:

- **Strategy**: investigating the innovation and technology strategy and importantly, how it links and supports the organisation's overall business strategy
  - ***Business strategy***: is it sufficiently defined to enable **ITM** strategy (and other functional strategies) to be developed?
  - ***Innovation and Technology strategy***: is there a clear statement in terms of competitive positioning and strategic direction in terms of what is required from the innovation and technology system?
- **ITM System**: examining the fundamental technology and innovation management processes of technology identification, selection, acquisition, exploitation and protection;
  - ***Identification***: how do we identify product or process technologies that are or may be of importance to the business?
  - ***Selection***: how do we know which of these technologies are most appropriate to deliver business and ITM strategies?
  - ***Acquisition:*** how do we successfully acquire, develop and assimilate selected technologies?
  - ***Exploitation***: how do we generate benefits (e.g. licensing, new products, process improvements etc.) from the technologies?
  - ***Protection***: what strategies and processes are in place to ensure that our technology knowledge and capabilities, embedded in our products, processes and systems, are appropriately protected and denied to competitors?
- **People and Organisation**: focusing on the organisation's leadership and management style, organisational culture and the management of competences, and their appropriateness for desired **ITM** and, ultimately, business performance.
  - ***Leadership***: how do we set and communicate clear objectives, manage interfaces and structures within the organisation and empower our personnel?
  - ***Organisational culture***: does 'the way we do things' help or hinder the achievement of our business and ITM objectives?
  - ***Competences***: do we have the skills and capabilities to deliver projects and manage our technology and innovation activities?

3.2. Assessment of the innovation potential for selected SMEs to manage innovation

Regardless of delivery option, the assessment approach is as follows:

- **Deployment and data collection** – this questionnaire, performed normally by middle to senior innovation/technology managers within the organisation.
- **Data evaluation and prioritization** – normally collaborative by consultant, face-to-face (sometimes including workshops) assessment and discussion of data or indicative results, identifying and agreeing on key performance weaknesses and strengths against defined organisational goals. Action prioritisation and planning - identification and definition of improvement steps and projects, which includes a modified application of Mitchell et al.'s (2014) selection approach.

The ***Potential Innovation Assessment Questionnaire*** has 47 questions in the 7 main sections in total. Every question is assessed as: 1 / 0,5 / 0. The total score of each section is calculated as a summary of the scores of the questions in the section, divided into the number of questions.

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Every section receives weights depending of the importance for the innovative capacity from 1 to 10 (from 1 – it is not a priority to 10 – the top priority).

Table 10. Calculation of the Criteria' weights

Section / Criteria	Priority*	Calculation of weight = Priority/10	Weight
1 - Ideas creation and creativity	4	= 4/10	0,4
2 - Design and new product dev.	8	= 8/10	0,8
3 - Competence management	7	= 7/10	0,7
4 - Competitive technology intelligence	7	= 7/10	0,7
5 - Managing the life cycle of innovative products	7	= 7/10	0,7
6 - Knowledge Management	7	= 7/10	0,7
7 - Value chain analysis	10	= 10/10	1

*The Priority could be different for each company

The assessment of the present condition is calculated as sum of the total scores for the present situation of the seventh sections, divided on 7.

The assessment of the innovation potential for development for each section is calculated by popular function **IF** - it allows us to make logical comparisons between a value and what you expect. It is calculated as IF ("Weight" > "Present situation"; "Weight"; "Present situation"). The total score of assessment for potential of development is calculated as a summary of the forecast total scores of the seventh sections, divided by 7.

According to the results, for the purpose of this tool we will classify the companies after using the above function**.** The results could be one of the following:

- **PROACTIVE:** most dynamic firms. They stimulate long-term changes in their environment and adopt an aggressive strategy. In order to achieve these goals, they manage structured innovation processes and permanent innovation piloting organizations (total scores per section > 0,81)
- **PREACTIVE:** these firms are also dynamic. They anticipate changes by adopting a medium-term vision and using a performing survey system. Organization to innovate exists, but these companies do not direct their attention towards activities allowing techno-logical ruptures such as fundamental research (total scores per section < 0,6)
- **REACTIVE:** these firms react to environment changes. They adopt a flexible, adaptable and short-term strategy. At firm level, permanent activities to master innovation are not well defined and investment (financial funds, human resources involvement among other things) in the field of innovation processes is not regular (total scores per section < 0,41)**.**
- **PASSIVE:** adopting a defensive strategy in regard to the changes in their environment, they are in a survival position. Permanent innovation management activities do not exist or are weak (total scores per section < 0,29).

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4. **Five Case Studies: SWOT Analysis of the innovative capacity of the SMEs to manage innovation and Plans for development**

Once a company has completed the questionnaire and is classified according to the above section, it has to determine what paradigm and what measures it will take to achieve the objectives and positioning of the market (s). In order to achieve this, a more in-depth marketing analysis of the market (s) for the particular firm, analysis of competitors, internal and external risks and opportunities to better identify a win-win strategy for development and application of innovative technology or product. One of the most common and accessible methods is **SWOT** Analysis that we will use in this report.

A **SWOT** analysis is one of the methods that is used to evaluate strength (S), weakness (W), opportunities (O) and threats (T) involved in innovative ideas and strategies. Those four factors evaluate both internal and external factors related to a specific project, service or strategy.

The internal analysis includes both strength and weakness factors, while the external analysis includes opportunities and threats factors. Classifying the related factors of product success under the SWOT umbrella helps companies to identify the strong and weak points and subsequently helps to determine the right decision to turn a specific idea into a new product development (NPD) stage.

The organization can form the strategy based on the different factors as following:

- **Strength-Opportunity (S-O)** – strategies target the opportunities that fit well with the innovative product strength.
- **Weakness-Opportunities (W-O)** – strategies targets overcoming the weakness to build opportunities for the new product or service.
- **Strength-Threats (S-T)** – strategies aim to identify the methods to use the product's strengths to reduce the threats and market risk.
- **Weakness-Threads (W-T)** – strategies which build a plan that prevent the product's weakness from being influenced by external threats.

In this section an Analysis of the selected IT companies with the following content will be presented:

- Short Company Introduction;
- **SWOT** Analysis;
- Assessment of the Internal and External Factors and visual presentation;

Methodology for Assessment of the Internal and External Factors:

  - Expert assessment of the presented strength, weaknesses, opportunities and threats – from 1 to 4;
  - Rate of influence to the company (importance) – from 1 to 5;
  - The total assessment is calculated as the expert assessment is multiplying with the rate of influence – total scores: 20.

- Matrix and Strategic Card for Innovation Management (strategies): S-T strategies; W-T strategies; S-O strategies and W-O strategies;
- Plan for company' innovation development.

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4.1. Diplace Ltd

4.1.1. Company introduction

Diplace Ltd is a limited company registered in Sofia and since 2008 operate with the following subject of activity: research, design, implementation and operation of intelligent systems for management of energy and other resources; implementation, operation and maintenance of software and software systems in the construction, industrial, urban environment, etc., development of software, mobile applications; the Internet of Things and Cloud Services; large data processing, digital repositories and large databases, research and innovation, marketing and commerce, training, information and consulting services, publishing, organizing seminars and conferences etc.

4.1.2. SWOT Analysis

Strengths:

- **Competence Management**: the company's team has the skills and experience to build a professional application at responsible cost and high quality of the innovative products;
- **Ideas Development**: the company has a talented design team that can create new products;
- **High reputation** - more than 10 years of successful projects' experience on the market;
- **Customer feedback**: The customers see the strength points in the product and services;
- **Partnership**: Participation in Cluster "Sofia city of knowledge";
- **New product development**: Successfully participate in grant projects, which build the capacity for product development.

Weaknesses:

- **Supply Chain Management**: It isn't good practice to manage the supply chain and high R&D expenditure;
- **IPR**: No patents or brands were issued;
- **Product Life Cycle Management**: Not strong product advantages over similar competitors in market**;**
- **Company Strategies**: The company has not marketing strategy;
- **Market demand**: Low interest for potential Clients;
- **Infrastructure:** Still need to build better infrastructure for the innovative products' development.

Opportunities:

- **Competitiveness**: Due to the economy' growth there is a market for development of new products;
- **Creativity**: The project ideas are unique and innovative which can lead the products to the market;
- **Grant sources**: Participate in new grant projects with foreign partners;
- **Legislation**: The EU legislation for energy management could lead to increasing of market needs for the company' products;
- **Knowledge Management**: The company staff could participate in training and seminars for new products;
- **Standardization:** The company could implement standards, which will increase awareness of innovation management

Threats:

- **Competition**: High competition in the area of operation;
- **Resources**: The company needs more human and financial resources for development of new innovative products;

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- **Market behavior**: Often shifts in consumer behavior or market that affect the product success;
- **Government**: Government has limited resources to support SMEs.
- **Market density**: Many foreign companies have patents/brands for the similar products in the same market area;
- **Legal changes**: Often changes in the legislation and products' requirements which lead to fast adaptation of the innovative products.

4.1.3. Expert Assessment of the Internal and External Factors - SWOT Analysis

Table 11. Expert Assessment of the Internal and External Factors of Diplace Ltd

	Ass	Rank	Total			Ass	Rank	Total
Strengths					**Opportunities**			
Competence Management	**4**	**4**	**16**		Competitiveness	**2**	**5**	**10**
Ideas Development	**2**	**5**	**10**		Creativity	**3**	**4**	**12**
High reputation	**3**	**4**	**12**		Grant sources	**2**	**5**	**10**
Customer feedback	**3**	**4**	**12**		Legislation	**2**	**3**	**6**
Partnership	**4**	**5**	**20**		Knowledge Management	**4**	**5**	**20**
New product development	**4**	**4**	**16**		Standardization	**3**	**4**	**12**
Weaknesses					**Threats**			
Supply Chain Management	**2**	**5**	**10**		Competition	**4**	**5**	**20**
IPR	**4**	**5**	**20**		Resources	**4**	**5**	**20**
Product Life Sycle Management	**3**	**4**	**12**		Market behavior	**3**	**4**	**12**
Company Strategies	**2**	**4**	**8**		Government	**3**	**4**	**12**
Market Demand	**2**	**4**	**8**		Market density	**3**	**5**	**15**
Infrastructure	**3**	**5**	**15**		Legal changes	**3**	**4**	**12**

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Figure 8. Visualization of SWOT Analysis of Diplace Ltd

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4.1.4. Strategic map

Table 12. Strategic map of Diplace Ltd.

STRATEGIC MAP			Internal factors: Strengths							Internal factors: Weaknesses						
			Sc	Core Mar nt	Idea Dev ent	Hig repu	Custo feedb	Partn	Nev proc dev nt	Sc	Suppl Mana	IPR	Produ Sycle Mana	Cor Stra	Mar Der	Infr
External Factors	Scores			16	10	12	12	20	12		10	20	12	8	8	15
	Oppo es	Competiti-veness	10	1.1		1.1	1.1			10						
		Creativity	12		1.2					12					2.5	
		Grant sources	10					1.3		10		2.2				
		Legislation	6						1.4	6		2.2				2.6
		Knowledge Management	20	1.5						20						
		Standardization	12		1.1				1.6	12	2.1		2.3	2.4		2.6
	Scores			16	10	12	12	20	12		10	20	12	8	8	15
	Threa	Competition	20		3.1			3.1		20					4.5	
		Resources	20		3.2					20	4.1		4.3	4.4		4.6
		Market behavior	12				3.3		3.3	12			4.3	4.4	4.5	
		Government support	12					3.4		12		4.2				
		Market density	15				3.5			15				4.4	4.5	
		Legal changes	12						3.6	12		4.2				

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4.1.5. Plan for the company's innovation development

Table.13. Plan for innovation development of Diplace Ltd

№	General goal	To increase the market share of the company' portfolio	● Increase the market share with 10%	Manager	2 years
I	**S-O strategies**				
	Task	**Measure**	**Indicator**	**Responsible**	**Deadline**
1.1	Increase the competitiveness	Increase Staff's Competence; standardization and working over the feedback from Clients to build better reputation	● At least two training for Building capacity for products and standards; ● At least one Reference from a Client ● Zero Claim from Clients	Management	2 years
1.2	Increase the company' creativity	Build creativity through stimulate the staff to create ideas	● At least one new project idea coming from the staff per year	Management	Permanent
1.3	Apply for Grant sources	Find proper funds and find partners	At least one project for funding applied and number of partnerships developed	Management	Permanent
1.4	Cover all legislation	The EU legislation for energy management could lead to increasing of market needs for the new products Up-dating the legal requirements for the product' portfolio	● At least one new product for energy management developed per year ● Appointed personnel, responsible for the updating legal EU and BG requirements for the product' portfolio	Management	1 year Permanent
1.5	Knowledge Management	Participation in training and seminars for new products	● At least one training per year ● At least one seminar per year	Management	Permanent
1.6	Implementation of Standards	Implementation of ISO 9001; ISO 27001; CEN/TS 16 555-7	Certificate for ISO 9001; ISO 27001; CEN/TS 16 555-7 or documentation for implemented standards	Management Project Manager Product Manager	2 years
II	**W-O**				
2.1	**Supply Chain Management**	Manage the supply chain and R&D expenditure	● Implemented CEN/TS 16555 -7 Innovation Management Assessment ● Use 10% of the profit for R&D of innovative product	Management	1 years Permanent
2.2	**IPR**	Search for the patent and trade mark for every new product Check the legislation for every new product	● Number of patents and trade mark viewed in the FTO search ● List of respective lows and normative for the new product	Management	Permanent

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2.3	**Product Life Cycle Management**	● Market feasibility research for the new product ● Technical viability of the innovative product ● Development of Risk Management Procedure ● Reduce the risk of competing products appearance ● Ensure tests of the product ● Ensure secure mobile devices, operating systems and application ● Development of Disaster and Accidents Action Plan ● Development of Administration Management Procedure ● Market feedback after sales	● Market analysis for competition ● Creating and maintaining inn-house rules about access, permissions, passwords and other safety, security rules ● Creating, maintaining and deleting users from the network ● Creating and re-setting the network passwords ● Assessment of deployment security patches ● Downloading anti-virus software and maintain a spam filter on e-mail ● Maintaining physical security over IT equipment, backup disks etc. ● Developed Disaster and Accidents Action Plan ● Maintaining records of software licences, domain names, service contracts for peripherals like printers, liaising with vendor ● Databased administration ● Server Management	Manager Project Developer	1 year
2.4	Development of Company Strategies	Create a company innovation policy	● Created company innovation policy	Management	1 year
2.5	Creation of Market Demand	Use creativity to create market demand	● At least one created demand on the market for new product	Management Project Developer	1 year
2.6	Infrastructure' maintenance	● Development of Procedure for maintaining infrastructure ● Provide the necessary equipment to develop, test and implement the innovative product	● Selected equipment and delivery ● Customizing software ● Deploying existing software to new users, setting up new software or deploying new software to existing users	Manager Project Developer Programmer	1 year
III	**S-T**				
3.1	To diminish the competition	Developing high-quality new products through competitive ideas using/or not partners	At least 1 new product per year with better characteristics than the competition	Management Product Manager	Perma-nent
3.2	Resources Management	Increase the human and financial resources for development of new innovative products	● Involve more staff for new innovative product development ● Use 10% of the profit for R&D of innovative product	Management Project Manager	Perma-nent
3.3	Market behavior	Make a market research for	● Marketing Plan for every new	Management	Perma-

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	observation	every new innovative product	innovative product and preliminary feedback from the market		nent
3.4	Government procurement search	Participate in tenders form government institutions or municipalities and build partnership	● Participate at least in one tender per year	Management	Perma-nent
3.5	Market density search	Make a market research for the similar products of the competition for every new innovative product	● Marketing Plan for every new innovative product	Management	Perma-nent
3.6	Legal changes search	Updating the EU and BG legislation related to the new innovative products	● Appointed personnel, responsible for the updating legal EU and BG requirements for the products	Management	Perma-nent
IV	**W-T**				
4.1	Supply Chain Management	Manage the supply chain and R&D expenditure	● Implemented CEN/TS 16555 -7 Innovation Management Assessment ● Use 10% of the profit for R&D of innovative product	Management	1 years Perma-nent
4.2	IPR Management	Search for the patent and trade mark for every new product Check the legislation for every new product	● Number of patents and trade mark viewed in the FTO search ● List of respective lows and normative for the new product	Management	Perma-nent
4.3	Product Life Sycle Management	See 2.3	.3	Manager Project Manager	1 year
4.4	Development of Company Strategies	Create a company innovation policy	● Created company innovation policy	Management	1 year
4.5	Market Demand Search	Use creativity to create market demand	● At least one created demand on the market for new product	Management Project Developer	1 year
4.6	Infrastructure Maintenance	● Development of Procedure for maintaining infrastructure ● Provide the necessary equipment to develop, test and implement the innovative product	● Selected equipment and delivery ● Customizing software ● Deploying existing software to new users, setting up new software or deploying new software to existing users	Manager Project Developer Programmer	1 year

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4.2. Technological Center Sofia

4.2.1. Company introduction

Technology Center Sofia is a Bulgarian private company, registered in 2010. The experts in the Center have many years of German experience. The Center also supports existing enterprises in order to implement innovative ideas and technologies, to improve processes, to adopt modern practices and to develop new products, to establish contacts with local and foreign companies, organizations, research institutions, state and local authorities, increasing the competitiveness of Bulgarian enterprises on the international market through distinct competent centers in the following areas: metal, biomass, energy efficiency, tourism and Information Technologies.

4.2.2. SWOT Analysis

Strengths:

- **Competence Management**: The Center' team has the skills and experience to the innovative products in different sectors in the Bulgarian economy;
- **Ideas Development**: The Center have a talented design team that can create new products;
- **High reputation** - 8 years of successful projects' experience on the market with German knowhow;
- **Customer feedback**: The customers see the strength points in the product and services;
- **Partnership**: The Center use German, Bulgarian and other partners;
- **New product development**: Successfully participate in grant projects, which build the capacity for product development.

Weaknesses:

- **Supply Chain Management**: Not very well manage the supply chain and high R&D expenditure;
- **Creativity**: The Center needs to build project ideas which can lead the products to the market;
- **Product Life Cycle Management**: Not strong product advantages over similar competitors in market**;**
- **Technology Center' Strategies**: The company has not marketing strategy for all services portfolio;
- **Market demand**: Low interest for potential Clients;
- **Infrastructure:** Still need to build better infrastructure for the innovative products' development.

Opportunities:

- **Competitiveness**: Due to the economy's growth there is a market for development of new products;
- **IPR**: Using German patents or brands for the new products;
- **Grant sources**: Participate in new grant projects with foreign partners;
- **Legislation**: The EU legislation for economic could lead to increasing of market needs for the Center' products;
- **Knowledge Management**: The Center' staff could participate in training and seminars for new products;
- **Standardization:** The Center could implement standards, which will increase awareness of innovation management

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Threats:

- **Competition**: High competition in the area of operation;
- **Resources**: The Center need more human and financial resources for development of new innovative products;
- **Market behavior**: Often shifts in consumer behavior or market that affect the product success;
- **Government**: Government has limited resources to support SMEs.
- **Market density**: Many foreign companies have patents/brands for the similar products in the same market area;
- **Legal changes**: Often changes in the legislation and products' requirements which lead to fast adaptation of the innovative products.

4.2.3. Expert Assessment of the Internal and External Factors - SWOT Analysis

Table 14. Expert Assessment of the Internal and External Factors of Technological Center Sofia

	Ass	Rank	Total			Ass	Rank	Total
Strengths					**Opportunities**			
Competence Management	**4**	**4**	**16**		Competitiveness	**3**	**5**	**15**
Ideas Development	**3**	**5**	**15**		IPR	**4**	**4**	**16**
High reputation	**4**	**4**	**16**		Grant sources	**3**	**5**	**15**
Customer feedback	**4**	**4**	**16**		Legislation	**2**	**4**	**8**
Partnership	**5**	**5**	**25**		Knowledge Management	**4**	**5**	**20**
New product development	**4**	**4**	**16**		Standardization	**3**	**4**	**12**
Weaknesses					**Threats**			
Supply Chain Management	**2**	**5**	**10**		Competition	**4**	**5**	**20**
Creativity	**2**	**5**	**10**		Resources	**4**	**5**	**20**
Product Life Sycle Management	**3**	**4**	**12**		Market behavior	**3**	**4**	**12**
Technology Center' Strategies	**2**	**4**	**8**		Government	**3**	**4**	**12**
Market Demand	**2**	**4**	**8**		Market density	**3**	**5**	**15**
Infrastructure	**3**	**5**	**15**		Legal changes	**3**	**4**	**12**

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Figure 9. Visualization of SWOT Analysis of Technological Center Sofia

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4.2.4. Strategic map

Table 15. Strategic map of Technological Center Sofia

STRATEGIC MAP			Internal factors: Strengths								Internal factors: Weaknesses					
		Sc	Core Management	Idea Development	High repu	Customer feedb	Partn	New product development	Sc	Supply Management	Cre	Product Cycle Management	Technology Center Strate	Mar Der	Infr
	Scores		**16**	**15**	**16**	**16**	**25**	**16**		**10**	**10**	**12**	**8**	**8**	**15**
External Factors: Opportunities	Competitiveness	15			1.3	1.1		1.1	15					2.5	
	IPR	16		1.2			1.5		16		2.2				
	Grant sources	15					1.3		15						
	Legislation	8						1.4	8						2.6
	Knowledge Management	20	1.5						20						
	Standardization	12						1.6	12	2.1		2.3	2.4		2.6
	Scores		**16**	**15**	**16**	**16**	**25**	**16**		**10**	**10**	**12**	**8**	**8**	**15**
External Factors: Threats	Competition	20					3.1	3.1	20		4.2			4.5	
	Resources	20	3.2	3.2					20	4.1		4.3	4.4		4.6
	Market behavior	12				3.3		3.3	12			4.3	4.4	4.5	
	Government support	12					3.4		12						
	Market density	15				3.5			15				4.4	4.5	
	Legal changes	12						3.6	12						

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4.2.5. Plan for company' innovation development

Table 16. Plan for innovation development for Technological Center Sofia

№	General goal	To increase the market share of the company's portfolio	● Increase the market share with 10%	Manager	2 years
I	**S-O strategies**				
	Task	**Measure**	**Indicator**	**Responsible**	**Deadline**
1.1	Increase the competitiveness	Increase Staff' Competence through Customer feedback and New product development	● Zero claims from Clients ● At least one new product per 2 years	Management Product Developer	2 years
1.2	Increase Idea Development	Stimulate the staff to create ideas through IPR	● At least one new project idea coming from the staff per year	Management	Perma-nent
1.3	Apply for Grant sources	Find proper funds and find partners through good reputation by other projects	At least one project for funding applied and number of partnerships developed	Management	Perma-nent
1.4	Cover all legislation	The EU legislation for energy management could lead to increasing of market needs for the company' products portfolio Up-dating the legal requirements	● At least one new product for energy management developed per year ● Appointed personnel, responsible for the updating legal EU and BG requirements for the products' portfolio	Management	Perma-nent
1.5	Knowledge Management	Participation in training and seminars for new products Sharing good practices with partners	● At least one training per year ● At least one seminar per year	Management	Perma-nent
1.6	Standardization	Implementation of ISO 9001; ISO 27001; CEN/TS 16 555-7	Certificate for ISO 9001; ISO 27001; CEN/TS 16 555-7 or documentation for implemented standards	Management Project Manager Product Manager	2 years
II	**W-O**				
2.1	**Supply Chain Management**	Manage the supply chain trough CEN/TS 16555 -7 and R&D expenditure	● Implemented CEN/TS 16 555-7 Innovation Management Assessment ● Use 10% of the profit for R&D of innovative product	Management	1 years Perma-nent
2.2	**Creativity Creation**	Motivate staff' creativity to study patents and FTO analysis	● At least one idea from the staff per year	Management	Perma-nent
2.3	**Product Life Cycle Management**	● Market feasibility research for the new product ● Technical viability of the innovative product ● Development of Risk Management Procedure	● Market analysis for competition ● Creating and maintaining inn-house rules about access, permissions, passwords and other safety, security rules	Manager Project Manager	1 year

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		● Ensure tests of the product ● Development of Administration Management Procedure ● Development of Disaster and Accidents Action Plan ● Market feedback after sales	● Creating, maintaining and deleting users from the network ● Creating and re-setting the network passwords ● Assessment of deployment security patches ● Maintaining physical security over IT equipment, backup disks etc. ● Developed Disaster and Accidents Action Plan ● Maintaining records of software licenses, domain names, service contracts for peripherals like printers, liaising with vendor ● Data based administration ● Server Management		
2.4	**Company Strategies**	Create a company innovation policy by implementation of Innovation Management System	● Created company innovation policy and make it visible for the interested parties	Management	1 year
2.5	**Market Demand**	Use creativity to create market demand	● At least one created demand on the market for new product	Management Project Manager	1 year
2.6	**Infrastructure**	● Development of Procedure for maintaining infrastructure ● Provide the necessary equipment to develop, test and implement the innovative product	● Selected equipment and delivery ● Customizing software ● Deploying existing software to new users, setting up new software and deploying new software to existing users	Manager Project Manager Programmer	1 year
III	**S-T**				
3.1	Diminish the competition	Developing high-quality new products through competitive ideas using/or not partners	At least 1 new product per year with better characteristics than the competition	Management Product Manager	Perma-nent
3.2	Secure Resources	Increase the human and financial resources for development of new innovative products	● Involve more staff for new innovative product development ● Use 10% of the profit for R&D of innovative product	Management Project Manager	Perma-nent
3.3	Market behavior	Make a market research for every new innovative product	● Marketing Plan for every new innovative product and preliminary feedback from the market	Management	Perma-nent
3.4	Government support search	Participate in tenders form government institutions or municipalities and build partnership	● Participate at least in one tender per year	Management	Perma-nent

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3.5	Market density search	Make a market research for the similar products of the competition for every new innovative product	● Marketing Plan for every new innovative product	Management	Perma-nent
3.6	Legal changes update	Updating the EU and BG legislation related to the new innovative products	● Appointed personnel, responsible for the updating legal EU and BG requirements for the products	Management	Perma-nent
IV	**W-T**				
4.1	**Supply Chain Management**	Manage the supply chain according the company resources	● Expenditure for R&D and suppliers	Management	Perma-nent
4.2	**Creativity Management**	Increase the staff' creativity by encouraging, motivation and studying the competition	● At least one creative idea/ improved product per year	Management	Perma-nent
4.3	**Product Life Sycle Management**	See 2.3	See 2.3	Manager Project Developer	1 year
4.4	**Company Strategies**	Update the company strategies according the resources, market behavior and market density	● Updated company strategies	Management	1 year
4.5	**Market Demand Research**	Update market demand according market behavior and market density	● Updated market study	Management Project Developer	1 year
4.6	**Infrastructure Maintenance**	Manage the infrastructure according the company resources	● 10% from the profit is used for R&D of innovative products and its management	Manager Project Developer	Perma-nent

4.3. Virtech Ltd

4.3.1. Company introduction

Virtech is a research and development company specializing in applications of the advanced information and communication technologies. The **key competences** are: Smart sensors, Cloud Computing and Internet of Things (IoT) services; Project management of large system development with millions of lines of code and large databases over 100 Mio records. Experience with most used project development models; Experience in development of large-scale databases containing bullions of records, Big Data, Data Analytics; Smartphone and tablet applications Development of methodologies and tools for smart semantic based search engines, data mining and business intelligence; Web based knowledge management systems; Experience in design of system architectures including their hardware systems, software platforms and communication protocols; complex Web-based software architectures design and development, etc.

4.3.2. SWOT Analysis

Strengths:

- **Competence Management**: Virtech manages teams of high-skilled computer programmers and engineers, graphic/web designers and e-business consultants. Their broad knowledge and **experience**

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are based on the key staff and experts' competence, providing each customer with the best technological solution;

- **Ideas Development**: Virtech's executives have extensive international experience ranging from management of multi-million European information society technology research and development projects to e-business development and support to virtual technology enabled education;
- **High reputation** - successful projects' implementation on the market;
- **Customer feedback**: The customers see the strength points in the product and services;
- **Partnership**: Virtech has established a wide network of local and international partners within the European R&D project consortia;
- **New product development**: Successfully participate in grant projects, which build the capacity for product development.

Weaknesses:

- **Supply Chain Management**: Not very well manage the supply chain and high R&D expenditure;
- **IPR**: No patents or brands were issued;
- **Product Life Cycle Management**: Needs to improve after sales services**;**
- **Company Strategies**: The company has not marketing strategy for the products' portfolio;
- **Market demand**: Low interest for potential Clients;
- **Infrastructure:** Still need to build better infrastructure for the innovative products' development.

Opportunities:

- **Competitiveness**: Due to the economy' growth there is a market for development of new products;
- **Creativity**: The project ideas are unique and innovative which can lead the products to the market;
- **Grant sources**: Participate in new grant projects with foreign partners;
- **Legislation**: The EU legislation for energy management could lead to increasing of market needs for the company' products;
- **Knowledge Management**: The company staff could participate in training and seminars for new products;
- **Standardization:** The company could implement standards, which will increase awareness of innovation management

Threats:

- **Competition**: High competition in the area of operation;
- **Resources**: The company need more financial resources for development of new innovative products;
- **Market behavior**: Often shifts in consumer behavior or market that affect the product success due to the fast-growing IT technologies;
- **Government**: Government has limited resources to support SMEs.
- **Market density**: Many foreign companies have patents/brands for the similar products in the same market area;
- **Legal changes**: Often changes in the legislation and products' requirements which lead to fast adaptation of the innovative products.

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4.3.3. Expert Assessment of the Internal and External Factors - SWOT Analysis

Table 17. Expert Assessment of the Internal and External Factors for Virtech Ltd

	Ass	Rank	Total			Ass	Rank	Total
Strengths					**Opportunities**			
Competence Management	**5**	**4**	**20**		Competitiveness	**3**	**5**	**15**
Ideas Development	**4**	**5**	**20**		Creativity	**3**	**4**	**12**
High reputation	**3**	**4**	**12**		Grant sources	**3**	**5**	**15**
Customer feedback	**3**	**4**	**12**		Legislation	**3**	**4**	**12**
Partnership	**4**	**5**	**20**		Knowledge Management	**4**	**5**	**20**
New product development	**4**	**4**	**16**		Standardization	**3**	**4**	**12**
Weaknesses					**Threats**			
Supply Chain Management	**2**	**5**	**10**		Competition	**4**	**5**	**20**
IPR	**4**	**5**	**20**		Resources	**4**	**5**	**20**
Product Life Sycle Management	**3**	**4**	**12**		Market behavior	**34**	**4**	**16**
Company Strategies	**3**	**4**	**12**		Government	**3**	**4**	**12**
Market Demand	**2**	**4**	**8**		Market density	**3**	**5**	**15**
Infrastructure	**3**	**5**	**15**		Legal changes	**3**	**4**	**12**

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Figure 10. Visualization of SWOT Analysis of Virtech Ltd.

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4.3.4. Strategic map

Table 18. Strategic map for Virtech Ltd.

STRATEGIC MAP			Internal factors														
				Strengths							Weaknesses						
			Sc	Con ce Mar nt	Idea Dev ent	Hig repu	Custo feedb	Partn	Nev proc dev nt	Sc	Suppl Mana	IPR	Produ Cycle Mana	Con Stra	Mar Der	Infr
External Factors		Scores		20	20	12	12	20	16		10	20	12	12	8	15
	Oppo es	Competiti-veness	15			1.1	1.1		1.1	15						
		Creativity	12		1.2					12					2.5	
		Grant sources	15					1.3	1.3	15		2.2				
		Legislation	12						1.4	12		2.2				2.6
		Knowledge Management	20	1.5						20						
		Standardization	12						1.6	12	2.1		2.3	2.4		2.6
		Scores		20	20	12	12	20	16		10	20	12	12	8	15
	Threa	Competition	20		3.1			3.1	3.1	20					4.5	
		Resources	20		3.2				3.2	20	4.1		4.3	4.4		4.6
		Market behavior	16				3.3			16			4.3	4.4	4.5	
		Government support	12					3.4		12		4.2				
		Market density	15				3.5			15				4.4	4.5	
		Legal changes	12						3.6	12		4.2				

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4.3.5. Plan for company' innovation development

Table 19. Plan for innovation development of Virtech Ltd.

№	General goal	To increase the market share of the company' portfolio	● Increase the market share with 15%	Manager	2 years
I	**S-O strategies**				
	Task	**Measure**	**Indicator**	**Responsible**	**Deadline**
1.1	Increase the competitiveness	Develop competitive innovative products and get feedback from Clients to build better reputation	● At least one new product developed per year ● At least one Reference from a Clients ● Zero Claim from Clients	Management	1 year
1.2	Increase the company' creativity	Build creativity through stimulate the staff to create ideas	● At least one new project idea coming from the staff per year	Management	Permanent
1.3	Apply for Grant sources	Find proper funds and find partners	At least one project for funding applied and number of partnerships developed	Management	Permanent
1.4	Cover all legislation	The EU legislation for economic sectors could lead to increasing of market needs for the company' products Up-dating the legal requirements	● At least one new product developed per year ● Appointed personnel, responsible for the updating legal EU and BG requirements for the products	Management	Permanent
1.5	Knowledge Management	Participation in training and seminars for new products	● At least one training per year ● At least one seminar per year	Management	Permanent
1.6	Standardization	Implementation of ISO 9001; ISO 27001; CEN/TS 16 555-7 at new product development and during the Product' Life Sycle	Certificate for ISO 9001; ISO 27001; CEN/TS 16 555-7 or documentation for implemented standards	Management Project Manager Product Manager	2 years
II	**W-O**				
2.1	**Supply Chain Management**	Manage the supply chain and R&D expenditure	● Implemented CEN/TS 16 555-7 Innovation Management System ● Use 10% of the profit for R&D of innovative product	Management	1 years Permanent
2.2	**IPR Management**	Search for the patent and trade mark for every new product Check the legislation for every new product	● Number of patents and trade mark viewed in the FTO search ● List of respective lows and normative for the new product	Management	Permanent
2.3	**Product Life Cycle Management**	● Market feasibility research for the new product ● Technical viability of the innovative product ● Development of Risk Management Procedure	● Market analysis for competition ● Creating and maintaining inn-house rules about access, permissions, passwords and other safety, security rules	Manager Project Manager	1 year

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		• Reduce the risk of competing products appearance • Ensure tests of the product • Development of Disaster and Accidents Action Plan • Development of Administration Management Procedure • Market feedback after sales	• Creating, maintaining and deleting users from the network • Creating and re-setting the network passwords • Assessment of deployment security patches • Maintaining physical security over IT equipment, backup tapes or disks etc. • Developed Disaster and Accidents Action Plan • Maintaining records of software licenses, domain names, service contracts for peripherals like printers, liaising with vendor • Data based administration • Server Management		
2.4	**Company Strategies**	Create a company innovation policy	• Created company innovation policy	Management	1 year
2.5	**Creation of Market Demand**	Use creativity to create market demand	• At least one created demand on the market for new product	Management Project Manager	1 year
2.6	**Infrastructure Maintenance**	• Development of Procedure for maintaining infrastructure • Provide the necessary equipment to develop, test and implement the innovative product	• Selected equipment and delivery • Customizing software • Deploying existing software to new users, setting up new software and deploying new software to existing users	Manager Project Manager Programmer	1 year
III	**S-T**				
3.1	To diminish the competition	Developing high-quality new products through competitive ideas using/or not partners	At least 1 new product per year with better characteristics than the competition	Management Product Manager	Perma-nent
3.2	Resources Management	Increase the financial resources for development of new innovative products and creation of ideas	• Involve the staff for new innovative product development and ideas • Use 10% of the profit for R&D of innovative product	Management Project Manager	Perma-nent
3.3	Market behavior Observation	Make a market research for every new innovative product	• Marketing Plan for every new innovative product and preliminary feedback from the market	Management	Perma-nent
3.4	Research for Government support	Participate in tenders form government institutions or municipalities and build partnership	• Participate at least in one tender per year	Management	Perma-nent
3.5	Market density Research	Make a market research for the similar products of the	• Marketing Plan for every new innovative product	Management	Perma-nent

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		competition for every new innovative product			
3.6	Legal changes Research	Updating the EU and BG legislation related to the new innovative products	● Appointed personnel, responsible for the updating legal EU and BG requirements for the products	Management	Perma-nent
IV	**W-T**				
4.1	**Supply Chain Management**	Manage the supply chain according the company resources	● Expenditure for R&D	Management	Perma-nent
4.2	**IPR Management**	Use government support to update and study the patent and trade mark for every new product Check the legal changes for every new product	● Apply for government grant ● Update every 6 months or lower the List of low and normative	Management	Perma-nent
4.3	**Product Life Sycle Management**	See 2.3	See 2.3	Manager Project Manager	1 year
4.4	**Company Strategies Development**	Update the company strategies according the resources, market behavior and market density	● Updated company strategies	Management	1 year
4.5	**Market Demand Research**	Update market demand according market behavior and market density	● Updated market study	Management Project Manager	1 year
4.6	**Infrastructure Maintenance**	Manage the infrastructure according the company resources	● 5% from the profit is used for instruments for tests of innovative products and its management	Manager Product Developer	Perma-nent

4.4. Gopler Ltd.

4.4.1. Company introduction

Gopler Ltd. is innovative company for development of web-based systems for public authorities and private businesses. It was established in 2008 in Sofia, Bulgaria. The team consists of young and highly motivated software engineers, ready to meet Client' requirements and expectations. The company has expertise in software systems planning, analysis, documentation, design, implementation and QA, using the latest trends in the software development. All new projects or tasks are examined and analyzed, then documented and discussed with the customer. Documented requirements are then provided for system architecture design and development. All modules are continuously tested, and only fine polished projects are provided back to the customer. The experience is built upon successfully finished projects for customers in the United States and Europe (England, Germany, France, Bulgaria and others). The company flexible working processes allows to meet any customer needs, including working on site, transferring know-how to the customer, educating customer's personnel and final users of the software, etc.

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4.4.2. SWOT Analysis

Strengths:

- **Standardization:** The company has implemented standards such as ISO 9001; ISO 14001 and ISO 27001.
- **Ideas Development**: Gopler has international experience
- **Grant sources**: Gopler successfully participate in grant projects;
- **Customer feedback**: All customers gave positive feedback;
- **Creativity**: The project ideas are innovative which can lead the products to the market**;**
- **Ambitions** – Gopler has potential for fast growth.

Weaknesses:

- **Supply Chain Management**: Not very good to manage the supply chain and high R&D expenditure;
- **IPR**: No patents or brands were issued;
- **Product Life Cycle Management**: Needs to improve after sales services**;**
- **Company Strategies**: The company has no marketing strategy for the products' portfolio;
- **Market demand**: Low interest for potential Clients;
- **Infrastructure:** Still needs to build better infrastructure for the innovative products' development.

Opportunities:

- **Competitiveness**: Due to the economy's growth there is a market for development of new products;
- **Partnership**: Gopler could establish a network of local and international partners;
- **High reputation** - successful projects' implementation on the market will create high reputation;
- **Legislation**: The EU legislation for energy management could lead to increasing of market needs for the company' products;
- **Competence Management**: The company staff could participate in training and seminars for new products;
- **New product development**: Successfully participate in grant projects, which build the capacity for product development.

Threats:

- **Competition**: High competition in the area of operation;
- **Resources**: The company need more financial resources for development of new innovative products;
- **Market behavior**: Often shifts in consumer behavior or market that affect the product success due to the fast-growing IT technologies;
- **Government**: Government has limited resources to support SMEs.
- **Market density**: Many foreign companies have patents/brands for the similar products in the same market area;
- **Legal changes**: Often changes in the legislation and products' requirements which lead to fast adaptation of the innovative products.

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4.4.3. Expert Assessment of the Internal and External Factors - SWOT Analysis

Table 20. Expert Assessment of the Internal and External Factors for Gopler Ltd.

	Ass	Rank	Total			Ass	Rank	Total
Strengths					**Opportunities**			
Standardization	**4**	**4**	**16**		Competitiveness	**3**	**5**	**15**
Ideas Development	**4**	**5**	**20**		Partnership	**3**	**4**	**12**
Grant sources	**3**	**4**	**12**		High reputation	**3**	**5**	**15**
Customer feedback	**3**	**4**	**12**		Legislation	**3**	**4**	**12**
Creativity	**4**	**5**	**20**		Competence Management	**4**	**5**	**20**
Ambitions	**4**	**4**	**16**		New product development	**4**	**4**	**16**
Weaknesses					**Threats**			
Supply Chain Management	**2**	**5**	**10**		Competition	**4**	**5**	**20**
IPR	**4**	**5**	**20**		Resources	**4**	**5**	**20**
Product Life Cycle Management	**3**	**5**	**15**		Market behavior	**34**	**4**	**16**
Company Strategies	**3**	**4**	**12**		Government	**3**	**4**	**12**
Market Demand	**2**	**4**	**8**		Market density	**3**	**5**	**15**
Infrastructure	**3**	**4**	**12**		Legal changes	**3**	**4**	**12**

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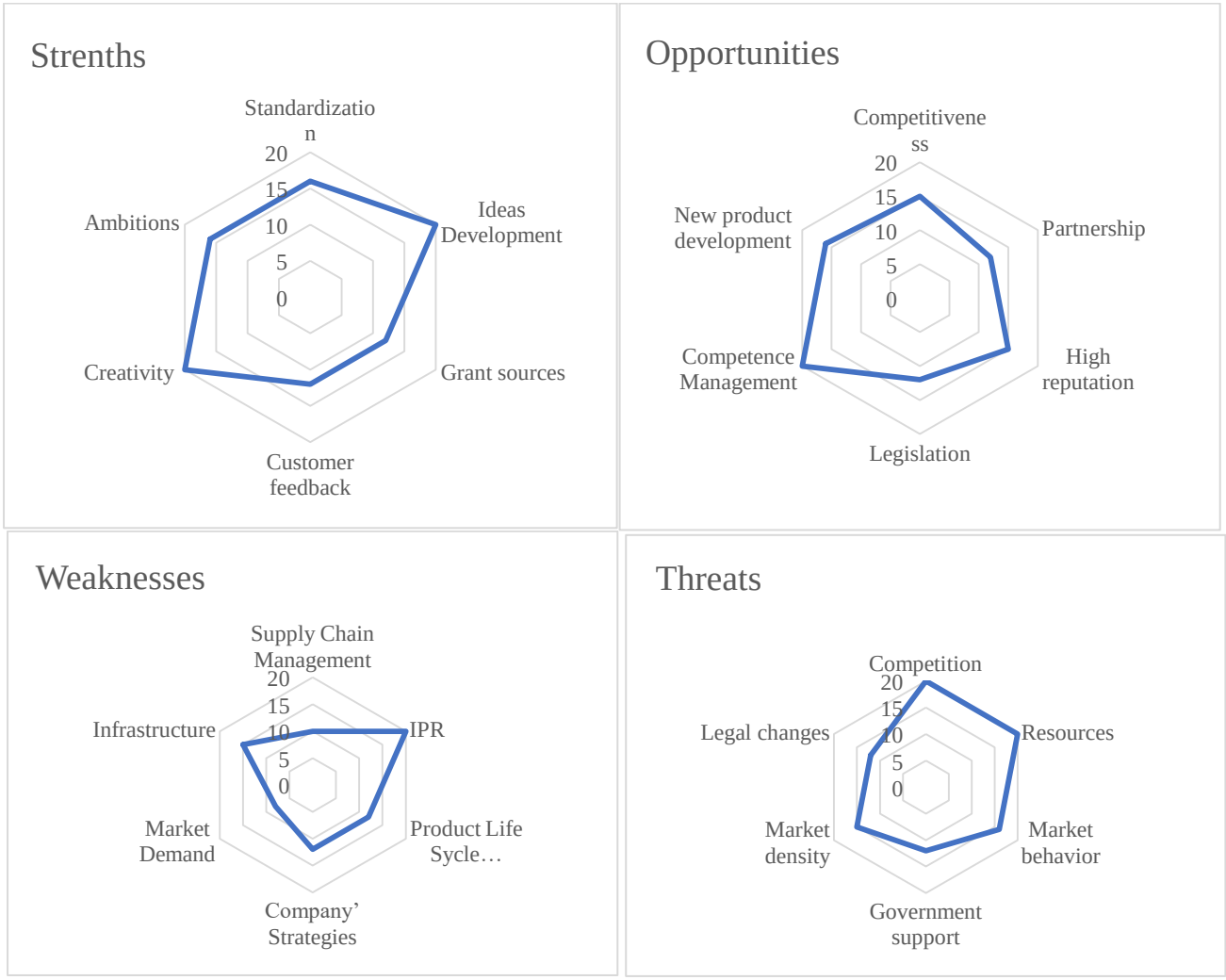
Figure 11. Visualization of SWOT Analysis of Gopler Ltd.



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4.4.4. Strategic map

Table 21. Strategic map of Gopler Ltd.

STRATEGIC MAP			Internal factors														
				Strengths							Weaknesses						
			Sc	Stat atio	Idea Dev ent	Gra sou	Custo feedb	Cre	Am	Sc	Suppl Mana	IPR	Produ Cycle Mana	Cor Stra	Mar Der	Infr
	Scores			16	20	12	12	20	16		10	20	15	12	8	12
External Factors	Oppo es	Competitiveness	15		1.1					15	1.1					
		Partnership	12							12						
		High reputation	15							15						
		Legislation	12							12		2.2				
		Competence Management	20	1.2						20			2.3			
		New product development	16					1.3		16						
	Scores			16	20	12	12	20	16		10	20	15	12	8	12
	Threa	Competition	20		3.1					20				4.1		
		Resources	20			3.2				20			4.2			
		Market behavior	16				3.3			16				4.3		
		Government support	12							12						
		Market density	15							15						
		Legal changes	12							12						

S-O W-O S-T W-T

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4.4.5. Plan for company' innovation development

Table 22. Plan for innovation development of Gopler Ltd.

№	General goal	To increase the market share of the company' portfolio	● Increase the market share with 15%	Manager	2 years
I	**S-O strategies**				
	Task	**Measure**	**Indicator**	**Responsible**	**Deadline**
1.1	Increase the competitiveness	Increase competitiveness through implementation of new innovative products	● At least one new product developed per year	Management Product Manager	1 year
1.2	Standardization	Implementation of CEN/TS 16 555-7 in order to manage better new innovative projects life cycle	Certificate for CEN/TS 16 555-7 or documentation for implemented standards	Management Project Manager Product Manager	2 years
1.3	Increase the company' creativity	Build creativity through stimulate the staff to create ideas	● At least one new project idea coming from the staff per year	Management	Perma-nent
II	**W-O**				
2.1	**Supply Chain Management**	Manage the supply chain and R&D expenditure	● Implemented CEN/TS 16 555-7 Innovation Management System ● Use 10% of the profit for R&D of innovative product	Management	1 years Perma-nent
2.2	**IPR Management**	Search for the patent and trade mark for every new product Check the legislation for every new product	● Number of patents and trade mark viewed in the FTO search ● List of respective lows and normative for the new product	Management	Perma-nent
2.3	**Product Life Cycle Management**	● Market feasibility research for the new product ● Technical viability of the innovative product ● Development of Risk Management Procedure ● Reduce the risk of competing products appearance ● Ensure tests of the product ● Development of Disaster and Accidents Action Plan ● Development of Administration Management Procedure ● Market feedback after sales	● Market analysis for competition ● Creating and maintaining inn-house rules about access, permissions, passwords and other safety, security rules ● Creating and re-setting the network passwords ● Assessment of deployment security patches ● Maintaining physical security over IT equipment, backup tapes or disks etc. ● Developed Disaster and Accidents Action Plan ● Maintaining records of software licenses, domain names, service contracts for	Manager Project Manager	1 year

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			peripherals like printers, liaising with vendor ● Data based administration ● Server Management		
III	**S-T**				
3.1	To diminish the competition	Developing high-quality new products through competitive ideas using/or not partners	At least 1 new product per year with better characteristics than the competition	Management Product Manager	Perma-nent
3.2	Resources Management	Increase the financial resources for development of new innovative products and creation of ideas	● Participate in grant projects for new innovative product development and ideas ● Use 10% of the profit for R&D of innovative product	Management Project Manager	Perma-nent
3.3	Market behavior observation	Make a market research for every new innovative product	● Marketing Plan for every new innovative product and preliminary feedback from the market	Management	Perma-nent
IV	**W-T**				
4.1	**Beat the competition through Company Strategies**	Update the company strategies according the resources, market behavior and market density	● Updated company strategies	Management	1 year
4.2	**Improve the Product Life Cycle Management**	Manage the Product Life Cycle according the resources and market behavior	● Current update of the resources and market behavior at every stage if PLC	Manager Project Manager	1 year
4.3	**Market Demand**	Update market demand according market behavior and market density	● Updated market study	Management Project Manager	1 year

4.5. ABBATI AD

4.5.1. Company introduction

ABBATI is an IT company with 10 years of experience in the IT industry. The company employs nearly 50 talented professionals with extensive experience in designing, developing and implementing complex technology products and services. The core business activities are design, development, implementation and maintenance of large-scale information system for public sector organizations. The company operates Quality Management System in conformity with ISO 9001; ISO 20000-1, ISO 27001 and NATO Allied Publication AQAP 2110 quality requirements for design, development and implementation of IT solutions.

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4.5.2. SWOT Analysis

Strengths:

- **Standardization:** The company implement standards such as ISO 9001; ISO 20001-1, ISO 27001 and AQAP 2110.
- **Ideas Development**: ABBATI developing products for government institutions
- **High reputation** - successful market implementation of projects
- **Customer feedback**: All customers gave positive feedback;
- **Creativity**: The project ideas are innovative which can lead the products to the market**;**
- **Ambitions** – ABBATI has ambitions for fast growth.

Weaknesses:

- **Supply Chain Management**: Not very good to manage the supply chain and high R&D expenditure;
- **IPR**: No patents or brands were issued;
- **Product Life Cycle Management**: Needs to improve after sales services**;**
- **Company Strategies**: The company has no marketing strategy for the products' portfolio;
- **Market demand**: Low interest for potential Clients;
- **Infrastructure:** Still need to build better infrastructure for the innovative products' development.

Opportunities:

- **Competitiveness**: Due to the economy's growth there is a market for development of new products;
- **Partnership**: ABBATI could established a network of local and international partners;
- **Grant sources**: There are possibilities to participate in new grant projects with foreign partners;
- **Legislation**: The EU legislation for industries could lead to increasing of market needs for the company' products;
- **Competence Management**: The company staff could participate in training and seminars for new products;
- **New product development**: Successfully participate in grant projects, which build the capacity for product development.

Threats:

- **Competition**: High competition in the area of operation;
- **Resources**: The company need more facilities and financial resources for development of new innovative products;
- **Market behavior**: Often shifts in consumer behavior or market that affect the product success due to the fast-growing IT technologies;
- **Government**: Government has limited resources to support SMEs.
- **Market density**: Many foreign companies have patents/brands for the similar products in the same market area;
- **Legal changes**: Often changes in the legislation and products' requirements which lead to fast adaptation of the innovative products.

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4.5.3. Expert Assessment of the Internal and External Factors of the SWOT Analysis

Table 23. Expert Assessment of the Internal and External Factors for ABBATI AD.

	Ass	Rank	Total			Ass	Rank	Total
Strengths					**Opportunities**			
Standardization	**4**	**4**	**16**		Competitiveness	**4**	**5**	**20**
Ideas Development	**4**	**5**	**20**		Partnership	**3**	**4**	**12**
High reputation	**3**	**4**	**12**		Grant sources	**3**	**5**	**15**
Customer feedback	**3**	**4**	**12**		Legislation	**3**	**4**	**12**
Creativity	**4**	**5**	**20**		Competence Management	**4**	**5**	**20**
Ambitions	**3**	**4**	**12**		New product development	**4**	**4**	**16**
Weaknesses					**Threats**			
Supply Chain Management	**3**	**5**	**15**		Competition	**4**	**5**	**20**
IPR	**4**	**5**	**20**		Resources	**4**	**4**	**16**
Product Life Cycle Management	**3**	**5**	**15**		Market behavior	**3**	**3**	**9**
Company Strategies	**3**	**4**	**12**		Government	**3**	**4**	**12**
Market Demand	**2**	**4**	**8**		Market density	**3**	**5**	**15**
Infrastructure	**3**	**4**	**12**		Legal changes	**3**	**4**	**12**

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Figure 12. Visualization of SWOT Analysis of ABBATI AD

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4.5.4. Strategic map

Table 24. Strategic map for ABBATI AD

STRATEGIC MAP			Internal factors: Strengths							Internal factors: Weaknesses						
		Sc	Sta zati	Ide Dev ent	Gra sou	Custo feedb	Cre	Am	Sc	Supp Mana	IPR	Produ Sycle Mana	Cor Stra	Ma Der	Infr re
	Scores		16	20	12	12	20	12		15	20	15	12	8	12
External Factors: Opportunities	Competitiveness	20					1.1		20		2.1				
	Partnership	12							12						
	High reputation	15							15						
	Legislation	12							12						
	Competence Management	20		1.2					20			2.2			
	New product development	16			1.3				16	2.3					
	Scores		16	20	12	12	20	12		15	20	15	12	8	12
External Factors: Threats	Competition	20		3.1					20		4.1				
	Resources	16			3.2				16	4.2					
	Market behavior	9							9						
	Government support	12							12						
	Market density	15					3.3.		15				4.3		
	Legal changes	12							12						

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4.5.5. Plan for company' innovation development

Table 25. Plan for innovation development of ABBATI AD

№	General goal	To increase the market share of the company' portfolio	● Increase the market share with 10%	Manager	2 years
I	**S-O strategies**				
	Task	**Measure**	**Indicator**	**Responsible**	**Deadline**
1.1	Increase the competitiveness	Develop competitive innovative products through creativity	● At least one new product developed per year	Management	1 year
1.2	Improvement of the competence management	Build competence management through stimulate the staff to create ideas for new products	● At least one new project idea for new product coming from the staff per year ● At least one training for new products per year ● At least one seminar for new products per year	Management	Perma-nent
1.3	Develop a new product	Participation in grant	● Development of application for grant for Horizon 2020	Management	Perma-nent
II	**W-O**				
2.1	Beet competition through IPR	Search for the patent and trade mark for every new product Check the legislation for every new product	● Number of patents and trade mark viewed in the FTO search ● List of respective lows and normative for the new product	Management	Perma-nent
2.2	Improve Product Life Cycle Management good	● Market feasibility research for the new product ● Technical viability of the innovative product ● Development of Risk Management Procedure ● Reduce the risk of competing products appearance ● Ensure tests of the product ● Development of Disaster and Accidents Action Plan ● Development of Administration Management Procedure ● Market feedback after sales	● Market analysis for competition ● Creating and maintaining inn-house rules about access, permissions, passwords and other safety, security rules ● Creating, maintaining and deleting users from the network ● Assessment of deployment security patches ● Maintaining physical security over IT equipment, backup disks etc. ● Developed Disaster and Accidents Action Plan ● Maintaining records of software, domain names, service contracts for peripherals like printers, liaising with vendor	Manager Project Manager	1 year

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			● Data based administration ● Server Management		
2.3	Improve Supply Chain Management during the new product development	Manage the supply chain trough Implemented CEN/TS 16 555-7	● Implemented CEN/TS 16 555-7 Innovation Management System	Management	1 years
III	**S-T**				
3.1	To diminish the competition	Developing high-quality new products through competitive ideas using/or not partners	● At least 1 new product per year with better characteristics than the competition	Management Product Manager	Perma-nent
3.2	Resources	Increase the financial resources for development of new innovative products and creation of ideas through grant projects	● Involve the staff for new innovative product development and ideas for grant' application	Management Project Manager	Perma-nent
3.3	Market density	Make a market research for the similar products of the competition	● Marketing Plan for every new innovative product	Management	Perma-nent
IV	**W-T**				
4.1	**Beat the competition through IPR**	Use government support to update and study the patent and trade mark for every new product Check the legal changes for every new product	● Apply for government grant ● Update every 6 months or lower the List of low and normative	Management	Perma-nent
4.2	**Adequate use of human and financial sources to manage Product Life Cycle**	Manage the Product Life Cycle according the human and financial resources	● Current update of the resources at every stage if PLC ● Implemented CEN/TS 16 555-7 Innovation Management System	Manager Project Manager	Perma-nent
4.3	**Market Density**	Update company strategies according market behavior and market density	● Updated company' strategies	Management Project Manager	Perma-nent

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5. Conclusion for the sustainability and Impact from the Technology Audit in the companies

From the above analysis for the selected companies, it is concluded that the results are very similar. This is normal, however, given the fact that they are from one sector of industry and operate under the same market and competitive conditions. Therefore, the measures that are proposed are similar, but each company could make adjustments and additions, according to its views for development, and strategies for achieving competitive results.

In any case, the proposed Technology Audit Methodological Tool and the assessment of innovation capacity for SMEs should give many advantages for them, including but not limited to:

- Determining the need of implementation of company strategies and standards for Innovation Management;
- Determining the need for training to introduce innovation;
- Enable the development of innovations that would provide guidance for making effective business decisions;
- Provide and identify companies that are highly innovative to provide additional training, incentives and recognition.

Expected benefits for businesses:

- Technological audit and evaluation will allow to identify the strengths and weaknesses of SMEs and to compare them with the best companies in the relevant sector at world level;
- SMEs will receive recommendations on how to better manage and stimulate the development of innovation;
- Areas identified to improve the efficiency and competitiveness of innovation management;
- An action plan to improve innovation management capabilities and boost competitiveness;
- Access to trained innovation management consultants and maintenance providers;
- Technological audit and evaluation will add value to the reputation of companies;
- The technological audit and evaluation carried out will be an advantage when applying for the Horizon 2020 SME Grants;
- The technological audit would be used as an instrument and tool to facilitate companies to form clusters; for cooperation and interaction of the creative ideas with sustainable impact.

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References:

1. BCG, Measuring Innovation (2009)
2. Booz, Allen Hamilton. Relationship between R&D Spending and Sales Growth, Earnings, or Shareholder Returns (2005)
3. EgilsMilbergs, Innovation Metrics: Measurement to Insight, white paper, National Innovation Initiative 21st Century Working Group
4. Praveen Gupa, Illinois Institute of Technology, Chicago, April, 2007
5. Hansen, M. and Birkinshaw, J.M. (2007) The Innovation, Value Chain. 'Harvard Business Review.' 85(6),(2007)
6. Improve, Assessment of current practices in innovation management consulting approaches and self assessment tools in Europe (2006)
7. Kauffman Symposium on Entrepreneurship and Innovation Data, A proposal to improve our understanding of innovation using Innovation Radar 2.0 (2008)
8. Langdon Morris, Innovation Metrics, The Innovation Process and How to Measure It, White Paper, Innovation Labs (2008)
9. NESTA, "Measuring Sector innovation capability in nine areas of the UK economy", Report for NESTA Innovation Index project (2009)
10. NESTA, "proposal for measures of firm level Innovation performance in 12 Sectors in UK industry", Working paper, September (2008)
11. OECD, Innovation surveys and indicators: an international perspective and emerging issues, CSO Business Statistics Seminar on Innovation Statistics Dublin, Ireland, 23 March (2011)
12. Oslo Manual, third edition, Guidelines for collecting and interpreting innovation data (2005)
13. Roper et al., Modeling the Innovation value Chain.'Research Policy.(2008)
14. Susan Rose, Stephanie Shipp, Bhavya Lal, Alexandra Stone, Frameworks for measuring Innovation: Initial Approaches, Science and Technology Policy Institute, working paper (2009)
15. What are Innovation Audits?, Innovation for growth (2011), www.innovationforgrowth.co.uk
16. Tidd, Bessant, and Pavitt (TBP) – "Managing Innovation"
17. Finding business partners in bulgaria: strategies used by smes and things the government should do to support sme clustering**,** Todor Yalamov, Assistant Professor, Faculty of Economics and Business Administration, Sofia University "St. KlimentOhridski", Sofia, Bulgaria
18. Development of the technology audit model –

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