**Impulses and Types of Innovations**

# Innovation

Innovation consists of the generation of a new idea and its implementation into a new product, process, or service, leading to the dynamic growth of the national economy and the increase of employment as well as to a creation of pure profit for the innovative business enterprise. Innovation is never a one-time phenomenon, but a long and cumulative process of a great number of organizational decision-making processes, ranging from the phase of generation of a new idea to its implementation phase. New idea refers to the perception of a new customer need or of a new way to produce. It is generated in the cumulative process of information-gathering, coupled with an ever-challenging entrepreneurial vision. Through the implementation process the new idea is developed and commercialized into a new marketable product or a new process with attendant cost reduction and increased productivity.

Innovation includes both major and minor changes. Extremely major change is called a radical innovation, although it is interpreted as “radical“ in a technological sense. And a cumulative series of minor changes is called and incremental innovation. It is usually the case that in the early stages of a new industry radical product innovation is the prevalent mode of innovation, but it has little if any economic impact, because product design is still in flux and the market is uncertain. (Urabe, Child, & Kagono, 1988)

In other words: Innovation is the application of resources to create value for the customer and the enterprise by developing, improving and commercializing new and existing products, processes and services. (Terziovski, 2007)

Based on the Oslo manual, we are distinguishing four main types of innovation: product, process, organizational and marketing.

## Product innovation

Product innovation consist in the introduction of a product (a good or a service), which is new or considerably improved compared to the original version. The improvements may be related both to the product characteristics (technical specification, components and material used, software, user-friendliness or other functional characteristics) or its new applications and uses. Product innovations may be created through the application of new knowledge or technology used in an unprecedented manner. The invention of a new use for an existing product, minimally modified for the purposes of the new application, is also product innovation. In the case of product innovations in the field of service, one must pay attention to the changes in how the services are provided (e.g. promptness and effectiveness), the addition of new functions or features to existing services or the introduction of entirely new services. The concept of product innovation is associated with the notion of design. The reason for this is that design is an inherent element in the process of creating product innovations. Design changes that do not result in substantial changes of the distinctive features or applications of the product are not considered product innovations, similarly to routine improvements or regular seasonal changes, which cannot be regarded as product innovations. (Dymitrowski, 2014)

## Process innovation

A process innovation is the implementation of a new or significantly improved production or delivery method. This includes significant changes in techniques, equipment and/or software. Process innovations can be intended to decrease unit costs of production or delivery, to increase quality, or to produce or deliver new or significantly improved products stressed that while the introduction of new products is commonly assumed to have a clear, positive effect on the growth of income and employment, process innovation, due to its cost-cutting nature, can have a more hazy effect. (Gunday, Ulusoy, Kilic, & Alpkan, 2011)

## Organisational innovation

Oganisational innovation means the implementation of a new organisational method in the undertaking’s business practices, workplace organisation or external relations. Changes in business practices, workplace organisation or external relations that are based on organisational methods already in use in the undertaking, changes in management strategy, mergers and acquisitions, ceasing to use a process, simple capital replacement or extension, changes resulting purely from changes in factor prices, customisation, regular seasonal and other cyclical changes, trading of new or significantly improved products are not considered innovations; (COMMUNITY FRAMEWORK FOR STATE AID FOR RESEARCH AND DEVELOPMENT AND INNOVATION, 2006)

## Marketing innovation

Marketing innovations are aimed at better addressing customer needs, opening up new markets, or newly positioning a firm’s product on the market, with the objective of increasing the firm’s sales. The distinguishing feature of a marketing innovation compared to other changes in a firm's marketing instruments is the implementation of a marketing method not previously used by the firm. It must be part of a new marketing concept or strategy that represents a significant departure from the firm’s existing marketing methods. The new marketing method can either be developed by the innovating firm or adopted from other firms or organisations. New marketing methods can be implemented for both new and existing products. (OECD, 2005)

# Innovation impulses

Innovation process develops the original innovation impulse that must be in the following stages transformed into the competitive qualities of a new product – its high quality, acceptable price and good timing of its introduction to the market. Sources of innovation impulses can be sought for either inside the company or in the outer environment. Potential sources of innovation impulses are given in table below.

**Table 1 - Sources of innovation impulses**

|  |  |
| --- | --- |
| Inner environment | Outer environment |
| * Own R&D
* Technical divisions – design, technology
* Production divisions (production, provision of services)
* Marketing and sales
* Logistics (purchase and supplies)
* Guarantee and post-guarantee service
* Owners
 | * Customers
* Suppliers
* Competitors
* Consultants, R&D institutions
* Schools, universities
* Professional publications, Internet
* Exhibitions, fairs, specialized seminars and conferences
* Advertising agencies
* Investors
* Media
* Authorized testing laboratories, certification agencies
* State institutions, public sector
* Legislation
* Globalization, accession to the EU
 |

Source: SEEKING AND IMPLEMENTATION OF INNOVATION OPPORTUNITIES

Drucker states seven sources of innovation impulses. With regard to the company or institution, the first four of them are **internal**. They are relatively reliable indicators of changes that have already occurred or they can be initialized with only small effort. Those are:

* *Unexpected events* – unexpected success or failure, unexpected external event
* *Contradiction* – between the reality as it is and the reality we would like to have
* *Innovation based on the change of work process*
* *Change in the structure of industry or market* for which nobody is ready

Further three sources of innovations are **external**:

* *Demographic changes*
* *Changes in the world view*
* *New knowledge* (Vacek, a další, 2011)

## Sources of impulses

### Unexpected events

No other area offers richer opportunities for successful innovation than the unexpected success. In no other area are innovative opportunities less risky and their pursuit less arduous. Yet the unexpected success is almost totally neglected; worse, managements tend actively to reject it. One reason why it is difficult for management to accept unexpected success is that all of us tend to believe that anything that has lasted a fair amount of time must be “normal” and go on “forever.” Anything that contradicts what we have come to consider a law of nature is then rejected as unsound, unhealthy, and obviously abnormal. (Druckner, 2006)

### Contradiction

Contradiction is a discrepancy between the reality as it is and reality as we would like to have it. Its sources can be found in:

* Non-compliance with economic reality: if a demand for a certain product increases we would expect that its economic results would also improve. If it is not like that, it indicates a certain contradiction. It often is a macroeconomic phenomenon and opportunity for the emergence of a new company, introduction of a new production process or service. The innovator who uses such contradiction can usually operate for quite a long time before the existing producers or suppliers realize what a serious competitor has occurred.
* Contradiction between reality and anticipations about it. Bad targeting of effort often results from misinterpretation of the reality. This type of discord characterizes the industry as a whole and the solution must be simple and specific.
* Contradiction between the anticipated and real behavior of customers and their values. Producers often do not understand what, which values the customers actually purchase. If the producer complains that customers act irrationally and do not buy things that are the best according to the producer, it proves the misunderstanding of values that the customers prefer. And it is the producers who should change.

### Change of process

We understand the change of process as an improvement of the existing process, replacement of its bottlenecks, accommodation of the old process to new knowledge. Sometimes introduction of a new process is allowed by discovery of a “missing element” without the existence of which it was not possible to implement the process earlier.

To be able to use this source of innovation opportunities, the following conditions must be met:

* We need to realize the necessity of change, identify the weak point of the chain
* We do not need to know what exactly needs to be done but we must be convinced that if something does not work the way it should, then it is necessary to attempt a change
* The solution must be convenient for those who will implement it. It must place moderate and feasible requirements.

### Change in the structure of industry and market

It may appear that the industry and market are completely stable. Sometimes they do not change for many years. In reality their collapse is often caused by a small change. And then it is necessary to react quickly because continuing of the previous activity guarantees a failure. Only those companies maintained their position on the car, motorcycle, fashion, perfume etc. markets that managed to modify their strategies and to find specialized market segments that are willing to pay luxurious prices for luxurious products. On the other hand many companies aimed at the “traditional” customer disappeared. Those companies that managed to make their services as available to the customers as possible anytime and anywhere achieved success – see the massive development of credit cards and telecommunication systems.

The main change indicators are:

* Rapid growth of the industry
* Identification of new market segments
* Convergence of technologies (e.g. use of computers in telecommunications)
* Rapid change of the industry and resulting need of a structural change

Innovations using the change in the industry are particularly effective if several large producers or suppliers control the industry and the markets.

### Demography

From the external influences the demographic changes are the easiest to describe and to predict. They influence what will be bought, who and in which amounts will purchase. Changes of birth rate and mortality, level of education, labor structure, mobility of people etc. are factors affecting the economics and politics to a higher degree and much earlier then, we often admit. Entrepreneurs who can in time react to the demographic changes, as for example wave of increased birth rate or on the other hand shift of the age structure towards higher age groups have always been and will be successful.

### Change of attitudes

From a mathematical point of view, it makes no difference if we say “the glass is half- empty” or “the glass is half-full”, but we can feel the distinctive difference in the interpretation of these statements. Change in the approach to health causes changes in all industries related to the health-care, food, and manners of spending the leisure time and opens up new opportunities at the market. Existence of the “upper-middle class” provides a chance to offer non-standard services at non-standard prices. It is necessary to consider the increasing migration and such phenomena as feminism, regionalism etc. Timing is essential for innovations based on the change of attitudes. It is necessary to be the first. However, as it is not sure if the phenomenon is temporary or long-lasting, such innovations must start on a small scale and need to be very specific.

### New knowledge

Innovations based on new knowledge are often considered to be the “proper” innovations. Not only new scientific and technical knowledge but also social-based innovations are source of this type of innovations.

For these innovations, the time between the new discovery and its application in practice is the longest. They are usually based on convergence or synergy of various kinds of knowledge and their success requires

* Thorough analysis of all factors. Most of all it is important to identify the “missing elements” of the chain and possibilities of their supplementing or substitution;
* Focus on winning the strategic position at the market. With this kind of innovation, it is necessary to succeed at the first attempt, the second chance usually does not come. On the other hand, in case of success it is probable that the company will control the relevant market segment for some time;
* Entrepreneurial management style. Quality is not what is technically perfect but what adds the product its value for the end user.

Innovations based on new knowledge usually bring about a high rate of risk that is a price for the fact that it can considerably influence not only the change of products and services but the whole view of the world and our position in it. ( (COMMUNITY FRAMEWORK FOR STATE AID FOR RESEARCH AND DEVELOPMENT AND INNOVATION, 2006)

**Innovation process**

Anyone who has been responsible for managing the introduction of innovation in an organization will know that there is much more involved that taking a single decision to adopt and implement change. Commonly, it requires a range of activities prior to and following the adoption decision, including fact finding, political manoeuvring, formal and informal discussions and negotiations, and so on. [NIGEL KING AND NEIL ANDERSON, 2001]

Innovation refers to the introduction of a new good or a new quality of a good, method of production, market, source supply, and/or organization in an industry. It also refers to improving on an existing concept or idea using a step-wise process to create a commercially viable product. Innovation is stereotypically viewed to be the wheelhouse of small and star-up companies since they tend to be very dynamic, but as we shall see, it is also a vital and viable aspect in big companies.

Innovation is a process of improving a product service from its current state. Innovation is not limited to the size of business or the business venture you are dealing with.

 The most fulfilling thing about an innovation is being able to actualize an idea into a successful concept. To do this, you need to go through a long and complex process. For you to succeed you must understand the process well and must have the support needed. This is what differentiates a successful innovation process form and unsuccessful innovation process.

 Innovation is a process of improving product service from its current state. Already from the definition, you can tell that innovation is not limited to the size of business or the business venture you are dealing with. Hence, innovation is open for everyone in business. It adds value to the services or goods that you provide and so you should seek to be innovative in your business. [The Innovation Process]

 To succeed, every organization – large or small – needs structured innovation process steps, a model for managing innovation. In fact, research from the performance factory shows that every successful innovation process has three distinct steps. The Search step, The Incubation step and the Execution step. Each step in the process has different attributes for success and therefore requires a specific approach.

 The Search step – this is what most people would call innovation or disruptive innovation. It is very often the only step they see. It is the step where you look for new ideas to offer more value to your existing customers or come up with a value proposition for a new set of clients. The Search step requires a solid understanding of the industry and your target client segment. Very often, the closer you are to the action, the better insight you have. Unfortunately, the first step if often centralized, which is not that smart. Searching for new ideas should be done if the field, by local resources that have the time. The larger your organization, the more future earnings an idea needs to potentially offer to be retained. If your current business brings in one billion a year, you won’t to waste your time on ideas with a future earning potential of 25 thousand euro. But if you are a company with significantly lower turnover, it could be great to pursue this. As success is not guaranteed, you want to reward effort rather than results. You want to encourage revolutionaries, people who dare to think differently, those individuals that ask questions that others won’t.

 Incubation step is the second step in the innovation process and is all about testing a growing idea. Just because an idea looks promising on paper doesn’t mean that it will deliver the expected value. The incubation phase is crucial but often overlooked or poorly attended to by organisations that want to boost innovation. Incubation demands a trial and error approach and mindset. If you cannot handle failure and start over again, you will never succeed. The aim of the Incubation phase is to test value, to find out in the real world if customers are willing to pay for a certain value that you are offering. It is crucial to test this with the right client. When you come up with a disruptive idea, one that targets a different client group with needs different to your current client segment, you need to manage the lack of enthusiasm from existing customers and not let that stop the execution. Think about the research by Christensen (1997) when you define your target group. “Disruptive strategic innovations offer a different value proposition from what the established players offer. As a result, they attract customers that are different from the customers that the established players focus on. As a result, if you ask your own customers if they want them, they will lead you astray.” So, whether an idea makes it to next phase – the Execution phase – depends on the test results and their translation into an honest business care.

 The third and final step of this article is the Execution step. This step is all about growing the identified value of a specific idea. Your tests show that the customer target group is willing to pay for the value offered and your honest business case indicates that the earning from the idea will be large enough – in terms of earning potential compared to your company size and relative to the other options you have. The goal is to reproduce the success of the test and turn it into a factory approach, a streamlined day-to-day activity that brings in the expected returns. The key word is “streamlining”. You want to turn this into business as usual, a factory that grows value. Use a classical budget approach to manage activities, although it’s useful to go back to your honest business case every three to six months to see how well you predicted success and integrate the learnings into future business cases. [Innovation Process, 3 Steps to Successful Disruptive innovation, model, stages & examples]

 Next approach to the innovation is five step innovation process. The steps are following: Idea Generation and Mobilization, Advocacy and Screening, Experimentation, Commercialization and Diffusion and Implementation.

Idea generation and mobilization – New ideas are created during idea generation. Mobilization occurs when the idea is moved to a different physical or logical location, such as an outside firm or another department. Inspiration for a new idea can originate from an improvement of an existing idea, or something from scratch.

Advocacy and Screening – Not all ideas are worth implementing. Advocacy and screening help evaluate and idea and measure its potential benefits and problems. From there, a decision can be made about an idea’s future. One of the biggest advantages for the joint process of advocacy and screening is refinement. If the idea has potential, discussion and arguments help enhance it.

Experimentation – This stage tests an idea, such as with a prototype or pilot test. Experimentation can remain continuous or exist in spurts, as advocates and screeners re-evaluate an idea. Sometimes, experimentation leads to new ideas due to information that is gathered on the results and the overall feasibility of the original idea. Time is crucial in this process. Individuals must be given adequate time to run the experiments. As refinements and evaluations occur, they must be given enough time to reflect on experiments.

Commercialization – It aims to create market value for an idea by focusing on its potential impact. This step makes the idea appealing to the audience, such as by packaging an idea with the other ideas, clarifying how and when the idea can be used, and using data or prototypes from experiments to demonstrate benefits. An important part of this step is establishing the specifications of any given idea. Commercialization is the stage of the innovation process when the focus shifts from development to persuasion. After the idea is clarified and a business plan is created, it will be ready for diffusion and implementation.

Diffusion and Implementation are “two sides of the same coin”. Diffusion of companywide acceptance of an innovative idea, and implementation sets up everything needed to develop and utilize or produce the innovation. Diffusion happen at all levels of organization. This process is often aided by knowledge brokers, who are effective at presenting an innovation by using their awareness of the specific content and application into which an idea, product or service can be inserted. As a result, knowledge brokers are able to assist with rapid implementation. [Cultivating a Robust Organization]

Another strategy is to study innovation processes retrospectively. In other words, to construct innovation histories. A major issue for this type of research is that people tend to reconstruct events from memory in a way which makes them appear more logical and orderly than they were, also people may simply forget important details. The implications of this depend on the approach to organizational research that is being taken. If one is concerned with identifying casual factors to enable general predictions about the progress of the process to be made (i.e. working within the dominant positivist paradigm) than ensuring that accounts are as accurate as possible is centrally important. The reliability and validity of innovation histories can be enhanced by triangulation of methods – that is, by using a combination of methods, such as interviews, questionnaires and analysis of documents. Care must be taken to obtain information from as many groups involved in, or affected by an innovation as possible. In contrast, approaches such as social constructionism, phenomenology and narrative psychology, which reject the positivist concern with general causal relationships, would treat participant accounts of innovation histories in a different way. [NIGEL KING AND NEIL ANDERSON, 2001]

Enablers of process innovation – The idea of focussing on enablers of innovation is potential rivers of change is perhaps radical. Conventional wisdom about business initiatives holds that they must first be planned in the abstract, without reference to specific tools or levers of change. In the traditional planning approach, we define “ends” (corporate objectives), the “ways” in which these ends are to be achieved (specific visions or critical success factors), and the “means” by which we expect to bring these ands about (enablers of change). Hayes, observing that abstract planning only rarely anticipates how a firm will address its environment with specific initiative, argues that often the appropriate order is “means, ways, ends”. Provide the tools for change (including financial, technological, and human resources), and the specific directions in which to apply them will become apparent as the environment changes. [Davenport, 1993]

Knowledge and Innovation – Knowledge is an input to innovation, inseparable from the innovation process, and is also an output of that process. Innovation is concerned with the new or the novel, the break with the past, with change. Innovation and knowledge management are linked through four key processes: knowledge application, creation, transformation and integration. When we are innovation, we are also creating knowledge, therefore the process with which we are involved have two types of outcome: 1. The innovation itself; 2. The generation of new knowledge.

 To say that knowledge is created during the innovation process is to say that learning has taken place – those involved have collectively or individually learned how to do something new. Learning takes place throughout the innovation process, as problem are tackled, or knowledge and expertise is shared and integrated. This new knowledge may then be incorporated in the innovation, or may generate ideas for new projects and further innovation. These processes, however, are constrained. According to Pavitt (1998) the knowledge base of large firms is cumulative and path-dependent, and constrains what the can learn: Large firms may have competencies in a number of fields of technology but, in the contemporary world of highly specialized knowledge, the costs of mastering all of them clearly appear to outweigh the benefits. Firms develop their technological competencies incrementally, and constrain their search activities close to what they already know. The firm’s knowledge base both determines what it makes, and the directions in which it searches.

Firms are faced with present and future decisions, without the benefit of hindsight available to post-hoc studies or innovation. Innovation is, by definition, characterized by uncertainty – since whatever confers the epithet innovation it must be novel and not previously achieved. And while you are developing your next product drawing on your accumulated knowledge and path-dependent development, new rivals may be about to introduce a radical breakthrough that will outperform your product at lower cost. Decisions about which technologies to follow, which development pathways to pursue, run the risk of being cul-de-sacs that lead nowhere. Alliances, networks and collaborations provide the means by which firms can reduce the risk, share costs and scarce resources, especially with regard to currently peripheral technology areas. [JOHN MOTHE a ALBERT N. LINK]

Strategic innovation is the development of new forms of positioning that enable firms to redefine the way to do business, offering greater non-monetary value to customers and higher level of cost effectiveness. Strategic innovators deliver their superior value proposition by developing new markets and leveraging on innovative forms of distribution and communication. Strategic innovators can remain competitive and achieve profitable growth within competitive environments that are characterised by discontinuity, instability and uncertainty. The can even change the competitive dynamics of the industry and influence its evolution process. [GARZIA, 2011]

 The approach we are calling for, process innovation, combines the adoption of a process view of the business with the application of innovation to key processes. What is new and distinctive about this combination is its enormous potential for helping any organization achieve major reductions in process cost or time, or major improvements in quality, flexibility, service levels, or other business objectives. Executives in the organizations we studied and consulted for have expressed great interest in process innovation. They have ambitious approaches to business change with little result. The successes of pioneering firms with process innovation initiatives offer them new hope.

Process innovation can be distinguished from process improvement, which seeks a lower level of change. If process innovation means performing a work activity in a radically new way, process improvement involves performing the same business process with slightly increased efficiency or effectiveness. The actual level of benefit derived from operational betterment initiatives falls, of course, across a continuum, but in practice most firms seek either incremental or radical change. It is possible that process innovation might yield only incremental benefit, in which case we would classify it as an improvement. We are also familiar with at least one instance in which a process improvement initiative yielded radical benefit, albeit in a narrowly defined process.

Process innovation initiatives start with a relatively clean slate, rather than from the existing process. The fundamental business objectives from the process may be predetermined, but the means of accomplishing them is not. Designers of the new process must ask themselves, “Regardless of how we have accomplished this objective in past, what is the best possible way to do it now?” [Davenport, 1993]

Intellect, science, technology, innovation and knowledge diffusion are the crucial growth forces in any modern economy or corporation. Intellectually based services provide 79% of all jobs, 76% of GNP, and almost all the value added in the economy and in individual companies, including manufacturers. The key factors for corporate success and economic growth, with few exception, have shifted from managing physical resources toward managing knowledge creation, innovation and diffusion. It is revolutionizing all steps in the innovation process, creating totally new strategies and organizational options for corporations and forcing a review of all past concepts for stimulating national economic growth. [JANE HENRY AND DAVID MAYLE, 2003]

**Measuring Innnovation, Innovation centers**

If the company wants to be successful in the long term, must be flexible and adaptable. Given the business environment is changing rapidly. The word innovation is very popular today. So, what is innovation? It is the right path to long-term success. Innovation aims to increase the market value of the final product. We can understand them as a continuous search for resources and new results. At the beginning is the idea which must be realizable (the economic, technical and practical aspects). The result of innovation is an improved process, product, service or anything else. Innovation can reduce production costs, gain new markets, and increase competitiveness. It generates profits, new jobs, increases market share and thus becomes the driving force of a performance. Source of innovation is also created, which aims to connect the most effective elements that create a whole (Adams et al., 2006).

Usually, these types of innovations are distinguished: innovation of product or service, innovation of process, organizational innovation and marketing innovation. J. A. Schumpeter distinguishes these types of innovations: introducing a new product, the introduction of a new method of production, opening a new market, utilization of new resource (input) and creation of new marketing structures. Innovations can consist of many individual ideas. These ideas may then become the effective instrument in the competitive struggle. Innovations can increase the competitiveness of the company (McCraw, 2007).

The need for measurement of effects increases with the increase of the funds invested in innovation activities Measurement is necessary on the one hand because of the feedback for the company management, informed decision making on the basis of objective data and at the same time should be evaluated during the process, so that a project that has no potential be successful. Innovative activities bring with them a high degree of uncertainty precisely because it may not be clear at first, whether the project is going to be realized. As Cooper points out, only about half of the new product-oriented projects will be successful in the market. Of the projects that have undergone the development phase, one-third of them fail to be marketed. "For its success, it is necessary for innovative projects to introduce metrics for the evaluation of the various phases of the process. This fact is related to the phase and gate model (Davila et al., 2012; Dervitsiotis, 2010).

Measuring the economic effect of innovation can be a problem in the attributability of costs and effects to a particular project. Often, it appears that accounting systems can not reliably determine the costs and returns of a particular innovation. This contradiction in his work is also devoted to F. Valenta. It points out that the only indicator that can be deduced from the profit and loss statement is the operating margin and its share in the overall performance of the enterprise. However, this indicator is very inaccurate to make it almost unusable to determine the effect of an innovation event, mainly because the items in the report are broken down by type, not by product, so that, for example, personal costs include all personnel costs and all material costs and services purchased. The solution, therefore, is the indicator of the production margin, which draws data from internal accounting, "from which the costs of the internal production units of the company are compiled. The difference between these costs and the volume of own production and services is the margin of production. " in the US, this indicator is readily determined directly from the profit and loss statement. Because of these complications, businesses often evaluate innovation activity as innovation performance is reflected, for example, in profit growth or total turnover. Therefore, businesses often can not determine the costs and revenues of individual innovation actions. Moreover, in many cases, "financial indicators (ROS, ROE, ROI etc.)“ are delayed and provide information about the past, support the short-term behavior of the company and sacrifice long-term value creation." This is also one of the reasons why the non-financial indicators that are innovating evaluated from multiple perspectives. There is no single guidance in evaluating the effectiveness of innovations in professional literature and practice. Each innovation is unique, specific and should serve to gain competitive advantage and grow the business. This results in revenue growth, but at the same time raises costs. A well-designed system for evaluating innovation projects should, therefore, include an appropriate mix of financial and non-financial indicators (Davila et al., 2012).

**Principles of innovation measurement (Bloch, 2007):**

* Thorough research before determining a base

We need to carry out a thorough research before we establish the basis, that is, the situation with which we will compare the achieved values. Thanks to it, we set the key reference point we need to compare innovation activities. This value can be determined in many ways, for example, we can compare with competitors, whether local or international, or with previously achieved values.

* Long-term observation

Innovation measurement does not stop after implementation. There is a need to constantly monitor and evaluate an innovative product, for guidance can then be an inspiration for other projects. At the same time, good knowledge of development gives you the opportunity to respond to potential failures.

* Dimensions of quality

When measuring innovations, management cannot rely solely on quantitative indicators. Quality indicators of success can often be more beneficial.

* Continuous rating

It is important to evaluate innovative projects not only when deciding on their development and final output. This system can prevent high damage to unsuccessful projects, the inappropriateness of which may have been evident in the early stages

It is necessary to emphasize even the most general principle of the evaluation process, efficiency. Specifically, its efficiency and economy. In order for the evaluation process to be effective, the company's management must provide the relevant relevant information for its decision-making. Efficiency then makes it a condition for the evaluation to be carried out at reasonable costs. These principles are met by adhering to other rules such as complexity, systematicity and interdisciplinary approach.

**Innovation measurement according to the Oslo manual**

The collection of data on innovation according to the Oslo manual is also used by the Czech Statistical Office. This methodology was established in 1992 and was used primarily in the Community Innovation Survey innovations survey. The results of these surveys serve first and foremost to compare the innovation activity of individual countries, but also to compare individual sectors and businesses. The evaluation follows a period of three years. The second version of the Oslo Manual focuses on technical innovation, so non-technical (marketing and organizational) are a bit secluded (Chesbrough, 2007; Muller et al, 2005).

* **Measurement of expenditure on innovation (inputs)**

Access to data collection on innovations can take two forms, subject and object access.

Subjective Approach – This is to track the expenditures for the company's innovation activities over a certain period. It includes expenses that are not related to a specific innovation project. The advantage is better international comparability of data on innovation expenditure and the possibility of comparing innovating and non-innovative enterprises. Disadvantages are seen primarily in the opacity of linking results with inputs, in the often non-existent link between an innovative project and innovation that is being marketed. "Realized innovation can be the result of different projects, and a single innovation project can be the basis for many innovations."

Objective Approach – Expenses are tracked as the resulting amount of innovations realized over a given period. Expenditure on innovations that have been suspended nor expenditure on R & D (research and development) that is not associated with any specific project is excluded. The main advantage is the possibility of a more specific combination of expenditure and outputs. The disadvantage is that when using this approach, companies must use older financial records, and data should also inform them about specific projects, which is rarely the company's full data.

Expenditure tracking is then broken down into the following groups:

* R & D expenditure
* Expenditure on intangible technology and know-how
* Expenditure on material technology
* Expenditure on tools, industrial engineering, industrial design and production deployment, including other expenditure on pilot operations and prototypes
* Expenditure on training related to innovation activities
* Marketing of technically new or improved products
* **Assessing the impact of innovation on company performance (outputs)**

This indicator should use indicators from the following areas:

*Share of technically new or improved products in revenues*

In assessing this value, according to the Oslo Manual, it is recommended to use the percentage of sales of technically new products, technically improved products, products which are not technically unchanged or are the result of a simple differentiation of the product produced by altered production methods or products which are not technically unchanged or are the result simple product differentiation produced by unaltered manufacturing methods. When looking at this indicator, the life cycle of the product should be taken into account, while its value will affect whether an enterprise performs custom or serial production, the age of the firm, and whether the firm replaces discarded products or merely extends its program.

*The results of the innovation effort*

This variable should describe the impact of innovation on the overall performance of an enterprise, so it is suggested that some general data be tracked at the end and at the beginning of a three-year period. Here are the following indicators:

sales in years t and t-2;

exports in years t and t-2;

employees in years t and t-2;

profit from ordinary activities in years t and t-2.

*Influence of innovation on the use of factors of production*

The variable monitors the impact of process innovations, which is a change in the use of factors of production, use of human resources, material consumption, energy consumption and utilization of investment capital. To determine the amount of impact, it is better to first determine whether the innovations introduced over the last three years have resulted in a reduction in the cost of the products produced by these processes. If so, we can quantify this reduction (Cooper, 1999; Chesbrough, 2007).

**System of Innovation measurement**

***Boston Consulting Group methodology***

Boston Consulting Group is an international consulting company providing strategic and management services. It originated in the early 1960s, and her work was famous for the "Boston Matrix". The group also regularly conducts surveys on measuring innovation in enterprises, including the recommended set of indicators. The methodology is based on the so-called Cash Curve and on the fact that the innovation process tracks the conversion of inputs to outputs.

***Cash Curve***

Thanks to the "Cash Curve" (Fig 1) it is clear which aspects of the innovation process need to be measured and which are not. This curve is a representation of the difference between total revenue and expense over the period that is defined by the initial idea and withdrawal of the product from the market. Its development is clearly determined by four factors that determine the success of innovation and the return on investment. These are the initial costs, the time to market, the time the product starts to produce, such as the time to volume and the accompanying costs that come after the product is put on the market. Each factor has several indicators (Innovation Metrics Survey, 2006; Regnell et al., 2009).

Figure : Cash Curve



Source: Innovation Survey Report, BCG [on-line]

According to the BCG experience, it is best to monitor 8-12 indicators. Selecting the right one depends on the specific situation, we should achieve a balance between different indicators. One way to find the right combination is to choose between them and track their development. After a while we will see which of them are of informative value to us.

***Model "innovation framework"***

Another model for evaluating innovation is the model developed by Strategos (Innovation and Strategy Consulting Company) in cooperation with the Woodside Institute (management research organization). It combines three insights into the innovations provided by a set of metrics. In addition, metrics are divided according to whether they evaluate inputs or outputs. The model also includes a set of indicators to measure the proces (Regnell et al., 2009).

***System of prerequisites for implementing innovative strategies***

Compared to the two previous systems, which tried to evaluate the whole innovation process with its inputs and outputs, this methodology developed by the West Bohemian University in Pilsen evaluates the innovation potential, ie the innovation capacity of the enterprise. The second difference is that it follows, in particular, the qualitative aspect of the matter. It emphasizes the role of leadership, employee motivation and non-economic factors. The evaluation is carried out using a questionnaire consisting of six parts: Strategy and planning, Marketing, Production, product and organizational area, Quality and environment, Logistics area, Organizational and Human Resources in the Society (Dervitsiotis, 2010; Regnell et al., 2009)

**Innovation centers**

As measured by the rate of their diffusion, science parks, and innovations centers are among the most successful institutional innovations in the field of science and technology policy. In recent decades, hundreds of them have been created throughout the industrialized and industrializing world. However, the enthusiasm that accompanied them in the 1970s and 80s has nov been replaced by growing skepticism. In fact, today many of them are the experience to date and point out some implications for the design, management, and future prospects of science parks seen primarily in the context of promoting (Stankiewicz, 1998).

The universities and engineering schools are particularly important as the source of such proto-firms. They are far less frequently capable of giving rise to regular product-oriented firms. The latter is much more likely to be spun off by the already existing firms. On the other hand, the academic proto-firms often fail to develop and tend to degenerate into narrow niche activities. That depends as much on deficient financing and management as on various structural factors. Proto-firms need the support of appropriate infrastructure to offset as least some of their inherent weaknesses. The science parks and innovation centers, if appropriately organized and managed, can help this to happen (Stankiewicz, 1998).

A recent study has shown that only 5 % of R & D staff feel highly motivated to innovate. Some industries have failed more than 85 % of new products, and over 90 % of companies believe they are too slow to introduce new products and services. The weaknesses of traditional innovative approaches led some organizations to explore different paths and find new inspiration. These organizations have launched innovation centers at major technology centers with an explicit mandate to accelerate digital innovation. These innovation centers, including teams of people and often physical sites, are based on a global technology hub. The aim is to use the ecosystem of start-up entrepreneurs, venture capitalists, accelerators, vendors, and academic institutions provided by these centers. Major global technology hubs are the preferred destinations for setting up innovation centers. 60 % of companies that have set up these centers have a presence in the Silicon Valley. The US and Europe have the largest share with 29 % of total innovation centers closely respectively, followed by Asia at 25 %. Penetration varies significantly between sectors; manufacturing is a clear leader at 58 %, but despite facing increasing pressures from digital disruptions, Financial Services lags at only 28 % (Toker & Gray, 2008).

We live in an era of digital Darwinism, a time when technology and society continually evolve. The reality is that innovation is now a constant, and the net result sets the stage for disruption. Every day, startups continue to push industries and technologies forward. As they do, new trends shape and reshape markets. Enterprise organizations now increasingly face a new reality where doing nothing about it or operating is a surefire way to get disrupted and eventually become obsolete. To compete in an era of digital Darwinism requires companies to think beyond “business as usual” and to start exploring new areas of opportunity for emerging expertise, technology, and insights. One of the most promising trends in the evolution of business is the rise of corporate innovation centers. Part of the challenge companies faces in doing so is that it’s very easy, almost natural, to apply legacy thinking, processes, and models toward innovation. This anchors new possibilities to yesterday’s standards, which then limits or inhibits the return on innovation. But that isn’t stopping corporate innovation centers from rising in technology epicenters all around the world. Innovation centers are everywhere, including the Czech Republic (Prague, Plzen, Brno, Ostrava etc.) The innovation process is costly for companies. So, what are the possibilities of financing innovations in the Czech Republic? Funding resources are provided by the following institutions: Grant Agency of the Czech Republic, Technology Agency of the Czech Republic, and Ministries. Furthermore, the Czech Republic negotiated various operating programs that can be used to fund the development of innovations from EU sources. For example, Operational Programme Enterprise and Innovations for Competitiveness (OP EIC). The objective of this program is to achieve a competitive and sustainable economy based on knowledge and innovation (Suciu & Petrescu-Prahova, 2011; Urbancova, 2013).

# Sources

COMMUNITY FRAMEWORK FOR STATE AID FOR RESEARCH AND DEVELOPMENT AND INNOVATION. (30. December 2006). *Official Journal of the European Union*, p. 10.

Druckner, F. P. (2006). *Innovation and Entrepreneurship.* New York: HarperCollins US.

Dymitrowski, A. (2014). *The role of innnovations.* Warsaw: Wydawnictwo Naukowe.

Gunday, G., Ulusoy, G., Kilic, K., & Alpkan, L. (October 2011). Effects of innovation types on firm performance. *International Journal of Production Economics*, pages 662-676.

OECD. (2005). The Measurement of Scientific and Technological Activities: Guidlines for Collecting and Interpreting innovation Data. *Oslo Manual*, p. 169.

Terziovski, M. (2007). *Building innovation capability in organizations.* London: Imperial College Press.

Urabe, K., Child, J., & Kagono, T. (1988). *Innovation and management.* Berlin: Walter de Gruyter.

Vacek, J., Skalický, J., Šlechtová, Y., Vacík, E., Jiřincová, B., & Doležal, Z. (2011). *Seeking and implementation of innovation opportunities.* Available at: https://www.kip.zcu.cz/USME/seeking.doc

[1] The Innovation Process: Definition, Models, Tips [online] Dostupné z: <https://www.cleverism.com/innovation-process-definition-models-tips/>

[2] Innovation Process, 3 Steps to Successful Disruptive innovation, model, stages & examples [online] Dostupné z: <https://jeroen-de-flander.com/innovation-process/#innovation%20process%20model>

[3] Cultivating a Robust Organization: 5 Stages of the Innovation process [online] Dostupné z: <https://online.rivier.edu/5-stages-of-the-innovation-process/>

[4] NIGEL KING AND NEIL ANDERSON. *Managing innovation and change: a critical guide for organizations*. 2nd ed. London: Thomson Learning, 2001. ISBN 978-186-1527-837.

[5] Davenport, T.J. *Process Innovation: Reengineering Wor through Information Technology,* Harvard Business School Press, 1993. ISBN 1422160661

[6] EDITED BY JOHN MOTHE a ALBERT N. LINK. *Networks, Alliances and Partnerships in the Innovation Process*. Boston, MA: Springer US, 2002. ISBN 978-146-1511-519.

[7] GARZIA, Carmine. *Managing the strategic innovation process*. Milano: EGEA, 2011. ISBN 9788823843035.

[8] EDITED BY JANE HENRY AND DAVID MAYLE. *Managing innovation and change*. 2nd ed. London: Sage Publications, 2003. ISBN 9780761966098.

Adams, R., Bessant, J., & Phelps, R. (2006). Innovation management measurement: A review. *International Journal of Management Reviews*, *8*(1), 21-47.

Bloch, C. (2007). Assessing recent developments in innovation measurement: the third edition of the Oslo Manual. *Science and Public Policy*, *34*(1), 23-34.

Cooper, R. G. (1999). The invisible success factors in product innovation. *Journal of product innovation management*, *16*(2), 115-133.

Davila, T., Epstein, M., & Shelton, R. (2012). *Making innovation work: How to manage it, measure it, and profit from it*. FT press.

Dervitsiotis, K. N. (2010). A framework for the assessment of an organisation's innovation excellence. *Total Quality Management*, *21*(9), 903-918.

Chesbrough, H. (2007). Business model innovation: it's not just about technology anymore. *Strategy & leadership*, *35*(6), 12-17.

Innovation Metrics Survey, BCG [on-line] Retrieved from: www.bcg.com/publications/files/2006\_Innovation\_Metrics\_Survey.pdf

McCraw, T. K. (2007). *Prophet of Innovation: Joseph Schumpeter and Creative Destruction*. Cambridge: The Belknap Press of Harvard University Press

Muller, A., Välikangas, L., & Merlyn, P. (2005). Metrics for innovation: guidelines for developing a customized suite of innovation metrics. *Strategy & Leadership*, *33*(1), 37-45.

Measuring and sustaining innovation [on-line] Retrieved from: http://www.equal.ecotec.co.uk/resources/gpg/

Regnell, B., Höst, M., Nilsson, F., & Bengtsson, H. (2009, June). A measurement framework for team level assessment of innovation capability in early requirements engineering. In *International Conference on Product-Focused Software Process Improvement* (pp. 71-86). Springer, Berlin, Heidelberg.

Stankiewicz, R. (1998). Science parks and innovation centers. *Capitalizing knowledge: New intersections of industry and academia*, 133-150.

Suciu, A., & Petrescu-Prahova, M. (2011). Social networks as a change management strategy for performance excellence and innovation.*The Journal for Quality and Participation, 34*(1), 16-20. Retrieved from https://search.proquest.com/docview/867279745?accountid=9646

Toker, U., & Gray, D. O. (2008). Innovation spaces: Workspace planning and innovation in US university research centers. *Research Policy*, *37*(2), 309-329.

Urbancova, H. (2013). Competitive advantage achievement through innovation and knowledge. *Journal of Competitiveness*, *5*(1).