

COSTS OF INNOVATION AS A FACTOR IN THE CHOICE OF INNOVATIVE SOLUTIONS

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Summary: The processes of innovation are now the most important factor in market competitiveness. Companies that follow the way of innovation must make a choice from among the proposed solutions of an innovation. The choice of a variant of innovation determine the expected benefits, which reduce the cost is often a priority. Limited funding for innovative projects also require estimates and cost control processes of innovation. The presented work shows the approach to these problems, pointing to places in the innovation process, which would assess the cost, and suggests tools for the analysis of costs.

Keywords: process innovation, Activity Based Costing, estimating the cost of innovation, multi-criteria analysis.

1. Introduction

Operating conditions in the global market impose constant development companies. The only way to oppose the strong competition and adapt to technical progress is the path of innovation. Innovative solutions should not be treated as a one-off projects, which are a response to competitive behavior and market trends change. They should be considered in the context of continuous improvement and business development, which involves conducting ongoing innovation activities in accordance with the idea of Continuous Innovation.

Innovation processes belong to this type of processes that are characterized by complexity and autonomy. It is difficult to find two identical processes of innovation, particularly in the activities of one economic entity. This excludes the preparation of the standard implementation plan for innovation processes and complicated way to evaluate these solutions. Uncertainty accompanying these processes and a high level of risk that makes innovation particularly with long-term implementation, there are large derogation from established plans, variations in the costs incurred and the differences in the expected benefits. In order to minimize these errors it is necessary to prepare guidelines that indicate the proper stages of the innovation and development plans will choose the correct variant for innovative solutions.

2. Identifying areas of innovation

Innovations are classified due to several criteria. Because of the subject innovation is distinguished by innovation:

- product,
- process,
- organizational,
- market.

Among these innovations can be distinguished by a radical and incremental.

Additionally, there is still division on continuous and destroying innovation.

This diversity leads to many ambiguities in the development of policy in the preparation and conduct of innovation processes.

The first of the major problems which are encountered in companies wanting to follow the path of innovation is to look for areas of innovation. Proceedings in this field in a chaotic manner, which is to collect ideas from all areas of activity, can lead to difficulties in their objective assessment. Selecting the wrong solution of innovation can't bring the expected benefits to improve the functioning of the company, or advantages do not compensate for the costs and workload inserted in the implementation of the selected innovations. This situation can occur when a company decides to innovations in the area that shows no limits and its improvement will not affect the whole organization. Remain the only satisfaction with the implemented innovation that does not translate into financial results. Therefore, after careful analysis should first determine those areas of your business that need improvement in this regard to take of innovative work.

Effective method that would help in identifying such areas, which are the weak links in the enterprise is Theory of Constraints (TOC) [4]. This method ensures that investments made to improve the areas identified by it will bring tangible benefits to the enterprise. Improvement may also relate to solutions of an innovation [5].

TOC for the exploration of areas where innovation will be desirable from the standpoint of the interests of the company has two important advantages. The first is an indication of limiting the growth of the company, which requires the interest and improvement. The second advantage is to focus the work on generating innovative ideas for the selected type of innovation. This facilitates the later stage of the evaluation of the proposed solutions because of the possibility of establishing common criteria evaluation. It also allows you to use the same tools to assess the expected benefits, the analysis of the innovation process plans and estimating costs.

The procedure according to the principles of TOC also allows detection of more and more places where improvement is needed, and thus provides a basis for continuing to create innovative solutions, and hence to the continuous development of the company through the implementation of the idea of Continuous Innovation [3].

3. Assessment of innovative solutions

The complexity of innovation processes is primarily associated with two distinct phases of innovation processes. The first phase is called the Front-End (fig. 1) [2]. It is characterized by non-linearity of tasks carried out. Front-End is to collect ideas, their development, analysis and evaluation. It should end up choosing a solution that will ultimately be implemented. The stages, which consists of Phase Front-End, passes many times. Equally often are required to relapse earlier stages. This course is the result of a parallel analysis of multiple solutions that are in the circle of interest. This instability is also associated with a large number of unknowns that accompany the proposed solutions. The assessment team must make a choice with a high degree of uncertainty and high risk, which results from the lack of information, because the innovation process are unique and their effects are difficult to predictable.

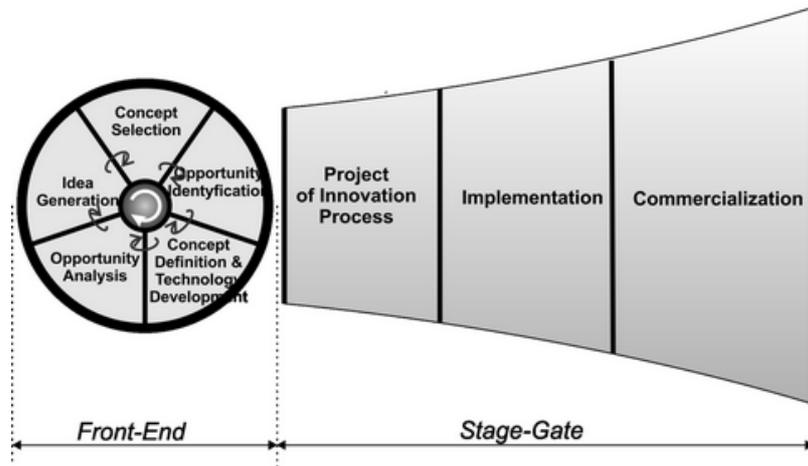


Fig. 1. Phases of innovation processes
Source: Own elaboration based on [2]

The second phase, which is described as Stage-Gate (fig.1) [2], requires the implementation of the innovation process works in series. It includes the development stage of the chosen solution, which takes the form of the project, its implementation and commercialization. In conducting the Stage-Gate process innovation execute scheduled tasks in the final phase of the Front-End. Important here is consistency and quick response to the disruption, as important in this phase is the execution time. The sooner all stages of the phase of Stage-Gate will be realized, the sooner you can count on the return on investment in innovation. Due to the uniqueness of the innovation process, you should expect differences in the implementation of tasks in comparison to the planned tasks. This in turn forces you to continuously make decisions.

Phase Stage-Gate should be implemented for the chosen variant design innovation. Falling within the scope of the stages are highly cost-intensive and should be completed as soon as possible. This excludes the parallel conduct of this phase for several projects of innovation.

To lead to a situation in which it is possible to carry out an appropriate choice of the prepared variants of innovation, we should begin from the moment the development of the concept of innovation. At this early stage it is possible, based on the experience and knowledge, to eliminate these variations, which show a great derogation from the expected benefits. An appropriate moment to carry out such an assessment is the beginning phase of the Front-End.

The processes of innovation, compared to processes in the current business activities, distinguishes several important features. They make the implementation of development plans and to assess the expected benefits associated with making decisions based on the number of unknowns:

- *Uniqueness.* Innovation processes are not repeatable. Each is a separate project in which there are different tasks to perform. Tasks assignments for the other sets of resources, require the involvement of different groups of performers and have different lead times.

- *Uncertainty and risk.* Innovations that affect the application of new solutions, never used in the business, because of its originality is characterized by the uncertainty of success. No patterns, incomplete knowledge and lack of experience does not guarantee that the implemented innovation will achieve its benefits. Developed plans for innovation processes also contain a high degree of risk for the implementation of planned activities and the occurrence of unforeseen events. Under such conditions it is necessary to constantly make decisions in situations of disturbance during the implementation of innovation.
- *Complicated process.* Innovation processes contain many phases of different nature. Each of these steps has other priorities. Phase Front-End requires creativity in developing innovative concept solutions. Stage-Gate gives priority to speed of execution of tasks, the effectiveness of decision making and requires constant monitoring.
- *Interdisciplinary team.* Multi-stage innovation process includes the tasks of different nature, requires the involvement of a team that must characterize the expertise of many disciplines. Often the individual tasks invokes another team executive, and might also need to take advantage of the knowledge of people outside the company.

These features require an individual approach to each of the innovation process.

Innovation processes should be analyzed and evaluated in two aspects. The first should relate to the benefits that can be achieved through innovative solutions introduced. The second one should relate to the evaluation process innovation.

The first assessment should be carried out in the phase of the Front-End (fig. 2). Concerns the selection of one of the proposed solutions. It will be developed in later stages. An evaluation of solutions at this initial stage of the innovation process is difficult. This is due to lack many important details that choice was clear. It is therefore necessary to refer to the experience and knowledge of those entrusted with carrying out this assessment. The choice must evaluate the benefits obtained as a result of implemented innovations. They may be tangible benefits and intangible. Enclose them in the form of criteria.

Such an assessment would be difficult, if we should choose a solution from the set of solutions belonging to different types of innovation. It would be impossible to find common criteria for the evaluation of such a set of innovations, among which are proposed product innovations, process, organizational, or market. Therefore, to facilitate this choice should focus on the interesting area of innovation. Proposed in this regard Theory of Constraints is ideal for this task. Focus on what constitutes a restriction on the development of the company allows you to narrow the proposed innovations to a single genus. If the limit is, for example, one of the posts, I will relate ideas different versions of process innovation, where the limit will be structural defects occurring in the product, be it product innovations. It can't be ruled out that despite the use of Theory of Constraints concepts of innovation arise from different ranges. Such a defect can be eliminated by a change after the product design or by changes in the manufacturing process. But even in this case, you will find it easier to compare these solutions because of the shared benefits from these innovations to be achieved.

However, there is still a doubt concerning the credibility of the evaluation of innovative solutions even within one type of innovation. Innovations that do not relate to minor improvements should be evaluated together with the innovations that relate to radical changes and can be treated as creating a new business. Innovation, which aims to improve one of the parameters of the product can't be compared with the innovation, which aims to create a new product. On this basis, it can be seen that the distribution of innovation

presented in the earlier part of this study does not take account of this fact. It would therefore make a classification according to another criterion. This classification presented Moore [7]. He divided the innovation by the time horizon, which takes into account the scope for innovation. There is here a distinction between:

- innovation of current needs - they are executed in a short time, on small improvements, require low cost and can be funded from current budget unit,
- innovation of potential development - require more time and more funding,
- new business innovation - innovation is the longest period of time, leading to radical solutions, creating new business. They are very complex and are accompanied by the greatest level of uncertainty and the highest risk of success.

This division clearly differentiates the scope of innovation and suggests how to authenticate the evaluation process solutions. When considering innovative solutions should be an apportionment of the three groups, leading the evaluation process innovation separately in each of them. This company's management, knowing its potential, should decide which of the types of innovations prefer.

A group benefits can be assessed more likely, others less. Especially in the field of process and product innovation is likely to be at a higher level. By acceding to evaluate the proposed innovations should be established evaluation criteria. These will be the criteria of a deterministic or fuzzy. The first of these occurs, if it is possible to determine directly or indirectly (using appropriate algorithms) values of the parameters that will change. These criteria include measurable benefits so often of a material. The second group of criteria will apply to benefits that are not possible to determine in an accurate manner. The evaluation of these benefits will be subjective and will depend on the knowledge and experience of the assessment.

The most important criteria, which are the measure of innovation costs. Determining which of the solutions will benefit their reduction, is often the decisive criterion for the selection of innovation. At this early stage of the innovation process innovation costs can usually be determined only in an approximate manner. Too many unknowns does not allow for the accurate calculation. So this criterion should be defined as a fuzzy criterion. However, in some cases it is possible to determine the cost of innovation, where exactly. This may be in a situation where innovation influences, for example to change the treatment parameters, and we can determine exactly what values they adopt these parameters. By using the above calculations can determine the cost of treatment after the introduction of innovation. This is a situation where the costs will be evaluated in a deterministic way.

In assessing the solutions must also take into account the costs of carrying out the process of innovation. Without a set plan yet, and information about the necessary resources to do so only in a subjective manner. It will therefore be fuzzy criterion. It follows that the assessment of the concept and we have two criteria of cost - deterministic and fuzzy.

Among the evaluation criteria, the criterion of the cost will certainly be viewed as one of the most important. But besides him, the choice of variant solutions can be affected by other criteria. To perform an assessment on the basis of a set of criteria, some of which are deterministic and the second is fuzzy, it is necessary to use multi-criteria analysis [1]. To evaluate should also involve a team of experts who have experience and knowledge related to process innovation.

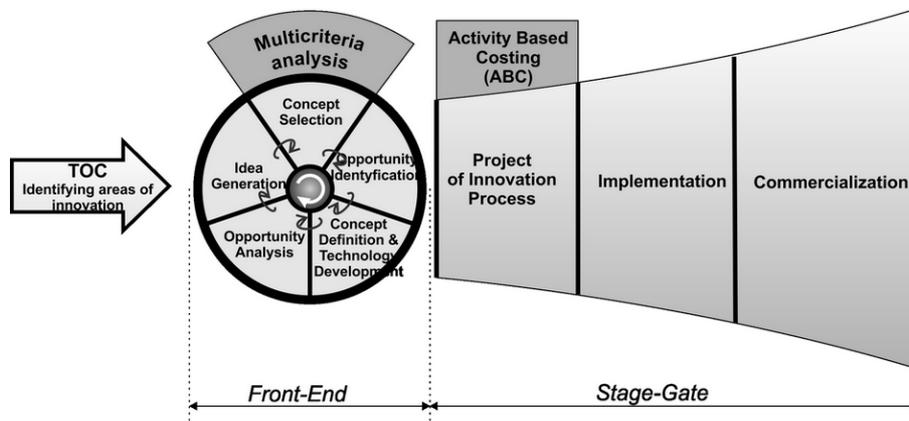


Fig. 2. The innovation process and indicating the places and tools to assess the cost of innovation

Source: Own elaboration based on [2]

Phase Front-End should indicate this variant of innovation, that will best benefit the company. This will be the innovation, which in the later stages of the process will be developed and implemented. However, if selected during the development of the concept of innovation, it appears that it would be to make some changes that affect the expected benefits, the evaluation process solutions must be repeated. The processes of innovation are very important from the standpoint of development of the company, so you should all stages of phase Front-End perform accurately and if necessary repeat it so long until a certainty as to the choice of the correct version of the innovation. Improper decision will not bring the expected benefits or the benefits will be achieved very significant cost and effort.

4. Cost of innovation processes

An extremely important element in determining the start of implementation of innovation processes is to assess the costs to be incurred in the process of their implementation. Innovation is usually allocated a limited amount of financial resources and it is important that during the process of innovation, not to exceed the budget. This involves developing a detailed plan of innovation and the most accurate estimate of costs.

In terms of estimating the costs of current operations, the company uses traditional methods of calculation, which help especially in determining the value of indirect costs attributable to a product. Indirect costs are calculated based on different activity output measures referring to the costs incurred by the firm in previous periods of account. When a company operates in a stable manner, produces a constant range of products for which the assured demand, traditional cost accounting allows for a reliable assessment of indirect costs. Conversely, if a company launches an innovative, traditional cost accounting can distort the information on those costs. It is connected with these features of innovation processes, different from the processes carried out on a regular basis. The indirect costs of innovation processes to a lesser extent, depend on the productive potential of the plant. Greater impact on their level will have a marketing, research and development activities, actions for achieving high quality, action-oriented environment, and others. It makes use of

traditional methods of estimating indirect costs becomes an important limitation with regard to innovation processes, because they do not reflect the exact nature of innovation. Criticism of these methods may be found in [6]. The definition of innovation is that it is a process involving a range of activities associated with creating the idea, the creation of the invention and its implementation. Hence, this method should be applied costing of innovative activities, which correspond to the nature of innovation.

The most appropriate cost accounting system will then Activity Based Costing (ABC). It allows to determine the process costs as the sum of the various steps and measures taken for its implementation. Indirect costs are determined using cost carriers that are assigned, respectively, calculated mark-ups.

Activity Based Costing should be carried out when the set is the innovation plan. Made with adequate detail and assigned to each activity resources, will contain a sufficient amount of information to assess the level of costs. Develop a plan for innovation in the Front-End phase may include alternative actions that will take into account the expected derogation from the plan. Anticipating possible problems arise during the implementation of planned activities, so you can avoid that the plan will include several options. For each of them can be carried out taking account of costs of activities in this way the view of the diversity of the necessary funding at the time of disturbances in the original plan.

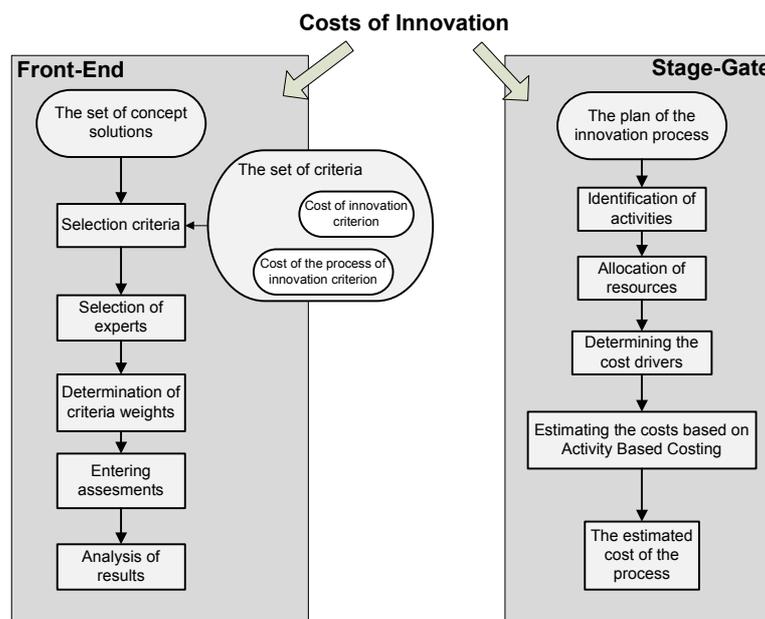


Fig. 3. Model assessment of the costs of innovative solutions
Source: Own elaboration

5. Summary

Innovation processes are highly desirable element in the functioning of enterprises in the face of the requirements of the market where there is intense competition. Driving innovation is a very difficult task that often requires a considerable commitment of funds. Cost analysis of innovation in the context of achievable benefits after the implementation of

innovative solutions and to estimate costs of implementing the innovation process is one of the most important elements affecting the decision to start or abandonment of the planned innovation. It is therefore important to determine the place in the processes of innovation, in which the assessment of costs can be an important element in decision-making and in assessing the costs to follow the appropriate model (Fig. 3). Skillfully led innovation, cost analysis provides only information on costs that relate to the process of innovation without disruption. Unfortunately, innovation processes are very sensitive to many factors affecting their course, and thus in such cases should be expected to increase costs. This is particularly true innovation for a long time for implementation. Therefore, you should protect yourself against unexpected cost increases evidencing the costs incurred in the performance of individual tasks. The correct classification of costs and their control, may be an important source of information about the causes and consequences of rising costs. It will also be the basis for making the right decisions limiting the excessive spending on innovation processes.

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