



DETERMINANTS OF DECISION-MAKING PROCESSES IN MANAGING INNOVATIVE ACTIVITY

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Abstract

This article concerns conditionality of decision-making processes in management of innovative activity. Basing on description of chosen aspects of decisions included in the literature on management sciences as well as selection of models and tools supporting these decisions an attempt was made to indicate determinants of decision-making process in management of innovative activity. Innovation diamond concept was used here. It is one of the latest systemic solutions concerning management of innovative activity. It is considered by many scientists as one of the most significant discoveries in the field of management of innovation process. Strategy, resources, tactics and human factor are fields determining presently success of innovative activity. Nevertheless, decisions are the most important element of each of these fields and it was attempted to highlight it in a final part of the article. KEY WORDS: decision process; models; innovation diamond.

Introduction

Innovations have been driving force of progress, development and competitiveness since the beginning of our civilisation and the execution of the concept of economic choice. Wide spectre of innovative activity determines possible field of considerations concerning management of the process of innovations which leads from concept to its final implementation. Similarly to differences between innovations on the grounds of degree of novelty, area of implementation or relation with applied solutions also differences between decision processes in management of innovations may be considered (Jurczyk-Bunkowska, 2016).

Deliberations on theoretical and practical aspects of use of decision-making process aim at seeking new concepts of their construction useful for practitioners. Krupa states (on line) that seeking for creative solutions, creating heuristics and invariants as well as models which are easy to use which may be algorithmized very easily may effectively improve effectiveness of work of teams executing innovative undertakings. It requires substantial effort and it does not surrender to any rules.

Search for the fields where decision-making process determines effective management of innovative activity is a leitmotif of this article. The article includes an attempt to indicate determinants of decision-making processes in management of innovative activity basing on the description of chosen aspects of decisions included in the literature of management sciences as well as selection of models and tools used to support decisions. Innovation diamond concept was used here. It is one of the latest systemic studies concerning management of innovative activity. It is considered as one of the most important discoveries from the field of management of the process of innovation. Strategy, resources, Stage-Gate model as well

as climate for innovations constitute the fields determining nowadays success of innovative activity and decisions executed within decision-making process are the most crucial factor of each field.

Decisions in management sciences

Making decision has been present in all fields of human activity since its beginning. The word “decision” etymologically comes from the Latin word “decision” which means order, settling or resolution. It is claimed that making decisions is one of the most important elements of management and in fact, its essence. Management is a decision-making process executed on many levels of an organisation, which mainly has to provide use of evolving chances, effective completion of all functions necessary to pursue adopted objectives as well as elimination of identified or potential threats. In management sciences it is not disputed that decision-making process is the essence of management and effective management means appropriate decisions in this process.

In a classical theory of decision, decision-making process determines a group of thought or calculation operations logically connected with each other which lead to the solution of a decision-making problem through selection of one of possible variants of operation (decision). Decision-making process itself looks in a classical depiction as following:

1. Identification of a decision-making situation.
2. Specification of a decision-making problem.
3. Generation of a decision-making model.
4. Creation of permissible, sufficient or optimal decisions.
5. Making final decision.

Considering decision-making process, it is possible to find various types of decisions in the literature on the subject. There are different criteria according to which

their division is made. Kie un (1997, pp. 228-229) suggests the following typology of this process:

In case of “hierarchical” criterion there are following types of decisions:

- strategic decisions – great decisions specifying the most important goals and strategic concepts,
- tactical decisions – the decisions including methods of execution of strategic decisions within shorter period of time,
- operational decisions – decisions concerning execution of particular tasks, for example decisions on spending particular financial resources,
- implementation decisions – execution of a task, for example delivery of purchased lot of materials.

Whereas “form of making decision” criterion includes the following types of decisions:

- decisions made by a manager on his/her own,
- approving decisions which approve proposals of subordinates, supervisors or suggestions from the surrounding of the organisation,
- collective decisions which are made by a group of workers,
- decisions made by one person separately or with support of advisors.

As it was mentioned above, in management sciences making a conscious choice of one of variants of action among at least two which are considered as possible to perform constitutes a prevailing part of the process of management of a contemporary organisation. Czermski and Czapiewski (1995, pp. 14-15) call such an action an act of choice or an act of conscious refrain from choice which should also be perceived as a decision in management. There are some differences in the literature on the subject concerning definition of a decision in management in comparison with other fields of science. In management practice a model of making a decision by a single person is common. Deciding means there formulation of a decision-making problem, description of all possible variants of action, assessment of these variants and implementation of the decision. Processes of making independent decisions are based on heuristic methods, logical reasoning, common sense, imagination, intuition and experience enabling at the same time good understanding of a problem as well as the whole process at the same time generating new knowledge and experience. Science has developed also decision-making processes with determined particular steps of operation. They are called algorithmic processes. The procedure of their execution corresponds to functioning of an algorithm, i.e. basing on a set of principles of conduct specifying ways of resolving an undertaken problem with clearly specified number of taken steps. In situations when it is not possible to solve a problem with the use of an algorithm, heuristic methods are used (Safek, 2014, p. 244).

In decision-making process it is crucial not only to follow specified algorithms but also provide conditions of effectiveness of decision-making processes. Kie un (1994, p. 238) indicates three phases providing effectiveness of decision-making process.

The first is preparation phase which includes the following steps:

- defining a problem where the conditions of effectiveness include: completeness, speed, credibility of information,
- determining possible causes where the conditions of effectiveness include: maximal number, convergence with initial information, logicity of possible reasons,
- confirmation of the most probable causes where the conditions of effectiveness include: logicity, accuracy of assessment of probability of cause-and-effect relation,
- specifying possible variants of a decision where the conditions of effectiveness include: defining: needs, values, system of assessments, realism in assessment, quantitative research,
- specifying acceptable variants where the conditions of effectiveness include: quantitative research, realism in assessment of implementation capability.

The second phase is a choice. The phase includes two elements:

- initial choice of a decision where the conditions of effectiveness include: quantitative research, defining professional ethics, social values, lifestyle, risk assessment,
- making a final decision where the conditions of effectiveness include: ability of prospective assessment.

The third implementation phase is:

- implementing a final decision where the conditions of effectiveness include: using principles of efficient organisation in systemic depiction,
- effect analysis where the conditions of effectiveness include: control procedures, updating system of assessments,
- adjustment where the conditions of effectiveness include: repetition of procedure of a decision.

Models and tools supporting decision-making processes

Development of science has caused that a contemporary manager has been equipped with a huge set of decision-making models and tools supporting making decisions. Their description is included in specialist monographs as well as in handbooks concerning management. A decision-making model is described there as synthetic, analytical reproduction of a decision-making problem in a form of mathematical, statistical, economical, information, psychological model, etc. Regardless of an accepted decision-making model an optimal decision should be made in a decision-making process. This decision is one of permissible decisions and fulfils the most proper criteria of assessment. A permissible decision is a choice which meets all limiting conditions. Whereas decision-making criterion means allocation of quantitative or qualitative benefit measure, usability, costs and profits of a given decision (Rebizant, 2016). This article includes characteristics of chosen models and tools which are the most useful for support of a decision-making process from the practical point of view. These tools are of quantitative,

qualitative as well as hybrid nature and they mostly constitute achievement of quantitative-system school. The methods and tools are as following (Kisielnicki, 2016):

1. Optimisation models derive from a mathematical decision theory and operational research and they are aimed at searching for a variant of solution with an optimal decision. An optimal decision is a decision which maximises or minimalizes particular objective function on the basis of a chosen criterion, i.e. getting the greatest benefits or the smallest losses. Depending on a form of a model and usages we have here linear, non-linear, single-criterion, multicriteria etc. When a problem is solved with a use of an optimisation model, we use the most often methods of mathematical programming and, for instance when a linear model in a mathematical sense is used, a presented solution is called optimisation solution when we determine extreme of function (objective) with adopted limitations.
2. Simulation models. A great number of decision-making problems in management may be solved with the use of these models but they are mostly used in case of complex situations when optimisation methods fail. Simulation process is when a manager seeks to describe reality as closely as it is possible and creates a model, and then due to the use of computer system he/she may make decisions of a different kind in a situation created in a model way. Hence, simulation models allow the managers to experiment on the model before it will be implemented in a real enterprise. In practice, it leads to a great decrease of costs as well as elimination of mistakes especially during implementation of new projects or in creation of business plans.
3. Forecasting models constitute similarly to the above-mentioned methods a wide range of possibilities to prepare decisions. This type of models is unique in that they are used to make future decisions. Determination whether a given value will be formed beneficially or adversely for an enterprise is a basis of these decisions. In latter situation we will have so called warning forecast. Forecasting models are used mainly to make planning decisions and both long-term and short-term strategic plans. Time series analysis is a tool which is often used to forecast formation of economic values interesting for managers.
4. Econometric models. They are system of equations or equation which presents in an approximate way quantitative link occurring between analysed economic phenomena. They are used to consider the most difficult economic problems when relations between economic phenomena are very complex and multidirectional. Process of learning mechanism of decision-making problem means creation of the so called model of estimation of parameters and as a result drawing conclusions on its basis. A model supporting decisions is a formalised description of a studied fragment of reality taking into consideration only its crucial elements (excluding less important ones). Cause and effect models are useful in the process of making decisions in which between a clarifying variable and a variable clarified there is a cause and effect relationship.
5. Decision games are a tool which allows to conduct an analysis and predict rational conduct of people in competitive situations. The essence and assumption is that almost each situation may be presented as a game. The simplest situation with a decision game may be described with the use of the so called two player game with no winners. The game is completely competitive and there are no negotiations between the players, the one who wins takes what the other loses.
6. Decision trees constitute a decision model in which hierarchical sequences of actions (fully depending on a decision-maker) and events (independent from a decision-maker, sometimes with random character) are presented in an ordered manner. Graphic presentation in a form of a decision tree makes analysis of all elements of situations crucial while making decisions. As a result, it is possible to determine decision variants and their consequences. In this model, in a non-confidential form, there are no rigorous and flexible conditions, they are taken into account during creation of the tree. Additional information on probabilities and costs of particular decision variants leads to increase of optimisation rationality through maximisation of function of usability. The aim of use of a model in a form of a decision tree is to make assessment of a decision-making situation easier, the model allows to analyse many variants and criteria of their assessment at the same time. Multivariant analysis may be conducted with the use of decision trees and it is possible to use this model in a computer systems of supporting decisions through program implementation (Rebizant, 2016).

Determinants of decision-making processes in management of innovative activity

A perennial desire to satisfy needs, improve living conditions, facilitate and improve work as well as, due to curiosity, innovativeness and decision-making processes related to it have been accompanying humankind since the dawn of time. When we are thinking about innovations our imagination leads us to material artefacts. Nevertheless, innovations in contemporary business do not have only material dimension such as progress, development and gaining competitive advantage. It is mainly appropriate decision-making process which is the most crucial creative and productive factor determining economic output. Innovations are driving force of a lofty aim, i.e. embodiment of values which enables leaders (managers) to unite people in a joint action to create modern enterprises based on knowledge, innovativeness and entrepreneurship (Gajda, 2016, p. 76).

Baruk (2010) writes that effective management of innovative activity, its proper understanding and control are of crucial meaning for economic growth, development of economies at the same time increasing prosperity and level of life of the society. Creative thinking and appropriate decision-making process without which there is no concept (idea) which may be implemented are basics for the above-mentioned effects to appear in an innovative process (Webber, 1990).

Two keys to success determined with correct decisions exist in management of innovations and implementation of new products, namely good selection of projects and adequate execution of projects. According to R. Cooper (Jankowski, 2016) "... it sounds very simply but it is not easy to implement these rules in practice. The research shows that many project teams do not execute correctly some key tasks of the process and as a result the projects fail ... Together with my colleagues from Scandinavia and Germany we have conducted huge research in Europe and the United States and it has turned out that the success rate connected with the launch of new products into the markets is from 30% to 80%. When we look at the most effective companies it turns out that they use systemic solutions. Whereas the ones which are unsuccessful do not apply any solutions and in such a case coincidence rules."

Innovation diamond concept is one of the latest systemic studies concerning management of innovative activity. The concept is considered by many scientists as one of the most important discoveries in the field of management of innovation process. Innovation diamond concept is a visual representation of the four fields (Cooper, 2016):

1. Strategy of innovation.
2. Resources, management of portfolio of initiatives.
3. Tactics with use of Stage-Gate model.
4. Climate, culture, human element.

Decisions are the most important in all of the above-mentioned elements and they determine effective management of innovative activity of contemporary enterprises.

Strategy refers to decisions regarding selection of aims of a company in scope of innovations, decisions concerning sale volume and markets, technologies and products on which a company wants to concentrate its efforts. It should be remembered that decisions in management of innovations do not only mean operational solutions. It mainly means creativity in the field of new products and services offered to its clients. It is innovativeness which, when it is integrated with strategy, allows to gain long-term competitive advantage. Strategic decisions must allow a company to fully use chances which it faces due to its innovative activity. It is necessary to implement overall innovative strategy and then execute its assumptions consistently through every day decisions and actions (Siwi ska, 2016).

Resources and management of portfolio of initiatives. It is another field in which decision-making process determines success of innovative activity. Majority of companies allocate too less resources for the projects. In order to achieve innovative success, managers have to make difficult decisions, e.g. that they will spend more money, devote more time and designate more people to work on innovations. Finally, they also have to make decisions concerning targeting resources to appropriate projects. Moreover, they have to make appropriate investment decisions connected with investment portfolio in such a way to know when to continue particular innovative project and when to resign from it. Using resources especially human ones may be compared with a layout of football players on the football pitch in such configuration and with such players to win the match.

Stage-Gate model plays a tactical role in process of innovations. Decisions on each stage of execution of an innovative project "from concept to implementation" constitute its base. Stage-Gate model is nowadays the most popular decision tool in creation of effective innovative strategies, 80% of American and Western European companies including Procter & Gamble, Nestle, HP, BMW, Bank of America, Lego, Johnson & Johnson or IBM use it (Siwi ska, 2016). This model constitutes a conceptual and operational map where stages mean concrete actions of a project team from research through project works, tests, etc. Gates, in turn, mean in this system moments where difficult decisions are made whether investment will be continued or whether it will be stopped on a given stage. According to Cooper Stage-Gate process increases speed and effectiveness of innovativeness of a product and it multiplies its results.

Climate, culture is the fourth element of innovation diamond which should be taken into consideration by managers especially in case of decisions concerning personnel. Decisions building adequate atmosphere for innovative activity, appropriate remuneration, giving recognition for innovativeness are significant here. All decisions should be made in such a way to create pro-innovative attitudes and values in a company. Managers and leaders of teams should promote, stimulate and support each innovative activity. Research indicates that in western companies succeeding in the field of innovations there is completely different climate and culture than in majority of the remaining enterprises.

Conclusions

Both in theory of decisions and in management sciences efforts of scientists focus on strive for prediction of conduct of systems consisting of people, objects and procedures. The scene is dominated by the two approaches which because of virtue of their complexity are intertwining with each other in reality repeatedly and invariably. The former is normative depiction, determined as collection of rules and recommendations which should be followed to make decisions reasonably and in an aware way. The latter is described as behavioural depiction which presents real conduct of people who make decisions which are not always perfect and do not coincide with recommendations of normative models (Sałek, 2014, pp. 247-248).

However, in order to make appropriate decisions in a contemporary and highly competitive and uncertain surrounding a normative approach with knowledge of theoretical aspects connected with decision process is more justified. Knowledge of particular stages of the process and their importance. It is also necessary to use models and tools which constitute an array of a manager and which support making decisions through optimisation, simulation models or more advanced econometric models.

Nevertheless, decisions made in the fields which are the essence of management of innovative activity are the most important. These fields were indicated in this article basing on the latest studies and practice of the most innovative western countries. These are the fields from the so called innovation diamond, i.e. innovation strategy, resources, tactics and climate, culture and human factor.

Companies which will be able to manage them with appropriate decisions should not worry about executed innovative projects and at the same time their current and perspective functioning on dynamic, highly-competitive and globalising market. They may look at the future optimistically and gain newer solutions in the scope of product, process, organisational and marketing innovativeness.

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