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**Monika PIŚNIAK**

mgr inż.
Politechnika Częstochowska, Poland

# MODELLING OF DECISION IN MANAGEMENT ORGANIZATIONS

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***Abstract***

*This study stresses the validity of the problem of modeling of decision-making processes in sustainable management. The issue of a methodology for implementing intelligent decision-making systems in strategic management business organization, belongs to a group of research problems not only in the cognitive but also utilitarian. Changes in the economic environment of the organization resulted in the decision-making process modeling procedures are prone to operationalization, which resulted in the development of computerized decision support systems. Dynamically changing environment, diversity of resources, which the company manages, a significant amount of information that you must have in every process, and above all, the number of areas of economic activity, for influencing decisions tend to be interested in a variety of tools and methods of information technology supporting decision-making.*

***Keywords:*** *decision; decision making; management; decision support systems; modeling in management.*

**JEL classification: D730**

## Introduction

All questions lead person in charge of economic organization to carry out the process of making rational decisions. The best solution is to create a model and simulate. It brings this process to take not only rational but also utilitarian decision, that such will lead to solving the problem in the most appropriate manner, taking into account all aspects, not only economically rewarding but also taking into account the employees.

The theory of decision-making is abstract, or formal, and therefore measurable. Detail can be called the theory of rational decision. It occurs when a person in the decision making process, has several solutions have a choice of several goals that are measurable. Even measurable in the sense that they can prioritize, or use the appropriate measuring scale, or you can talk about preference or utility. Of course not, it is assumed that the "measure" by a person other purposes, only the person having to make a decision. The interesting part of this theory are the situations related to the achievement of the objectives, the probability of which is not known to occur in situations of uncertainty, leading to the aforementioned risks. However, the most interesting element of decision theory, there are cases, which have been shown to interact with those others, where decisions are alternated, but it's a completely different topic[1].

Erich Fromm in his work "The Revolution of Hope" shows how important for the life of every man is the decision-making process. It emphasizes the importance of the method by which a man chooses the most suitable option for themselves, at the same time believing in the rightness of your choice. And even the so-called choice the "bad", but assuming at the same certainty about what the method[2].

At the moment we have no decision-making never a complete set of information, only the support of data we received from our historical analysis. This forces to try to guess the impact and future results of the current decision[3]. These decisions shall be taken in accepting or rejecting assumptions of conditions that describe a certain approximately realities decision-making process. These conditions are divided into deterministic, those which are certain, that can predict all the consequences of decisions made and non-deterministic, which is the



*[1] Encyklopedia filozofii, pod red. T.Hondericha, Zysk i S-ka, Poznań 1995 r, s.138.*

*[2] […] człowiek ma silną potrzebę pewności – chce wierzyć, iż metoda za pomocą której podejmuje decyzje, jest właściwa. W rzeczywistości woli nawet podejmować „złą" decyzję i być jej pewnym, niż „dobrą" i być targanym wątpliwościami co do jej słuszności[…] Erich Fromm, Rewolucja nadzieji.*

*[3] P.G.Moore, Ryzyko w podejmowaniu decyzji, Państwowe Wydawnictwo Ekonomiczne, Warszawa 1975 r., s.15.*

risk and uncertainty[4].

The decision making process, in a general sense, is a purposeful and non-random selection of one of at least two alternative solutions to the problem. The beginning of this process is to see and interpret the decision situation, irregularities in the functioning of the organization hinders its normal (planned and efficient) operation, while the end of the process is choosing how to resolve this irregularity[5].

In recent years, followed by a huge increase in the role of professional information systems used in the decision making process. Only in a consistent manner and adapted to the needs of specific user system is helpful in making decisions. This system, while the computer system will have the latest and properly processed which arise from the needs of users, leading to the integration around the target. This is due to the evolution taking place organization, and does an organization achieve success in their environment, whether it will be able to adapt to change, and even with the benefit depends most heavily on leadership[6].

The main reason for this thesis is that it acts as a management decision-making, which in turn creates action, and then decisions. It will notice the separation of decision and action, it is true boundary is not clear. In this paper attention was focused on processes related to decision-making, but you can't skip the process of action, because in a very strong way to interact with each[7].

Currently it is believed that the primary objective of the company is to create value -added, which is triggered to satisfy the material and intangible needs of stakeholders[8].

For an industrial enterprise, this means among other things the manufacture of such products and services that meet customer expectations. Research conducted by Dohn shows that such features customer service as the availability of products in inventory, time, flexibility, reliability or completeness of the supply depend directly on the production process , especially since its organization and implementation, as well as held during the period of production capacity and use of the available resources[9].

**The economic decision-making processes and risks.**

According to the dictionary of statistical terms, the decision is called a "final decision ", one that ends the process of the draw. An example is the schematic drawing in quality control, where there are two possible decisions that are both final decisions. One is acceptable and the other rejected only if the scheme having three options, the third is the ability to redraw[10].

The word "decision" refers to a variety of situations, you need to universal words, as stated above definition, all dictionaries agree that the decision is the end or the end result of the process. However, what it is the end point of a single decision, is also the beginning of another, because decision-making processes can be represented as a mirrored room, where the decision reflected by creating another.

The examples given in the literature indicate situations where there is a risk of not achieving an adequate level of output products. Therefore, it is crucial to take appropriate decisions based on whether we are dealing with conditions of certainty or uncertainty. Defining risk and its classification attempt took place in another job, therefore, is not incorporated herein by[11].

For criterion sure there is no problem with the choice of a particular strategy, you should only choose the one that gives the best result. In this case, each strategy leads to one result, because the certainty that a matrix has only one column, eg. payment, so choose the one that is the largest payment . In this case, problems are brought decision linear equations[12].

However, in the case of the most common situations, when they are making decisions under risk (uncertainty), there is no longer one result. There are several, for each possible state of nature and therefore the selection criterion strategy of uncertainty based on the relevant transition of all possible outcomes for each strategy or selecting one or more outcomes based on some rule. These are situations where it is impossible to predict the outcomes of this is due to the lack of the required information, or required knowledge to the decision-maker did not have her taken in conditions of uncertainty[13].

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*[4] J. Marcinkowski, Ryzyko, jakość prognoz a efektywność inwestowania na rynkach finansowych, Wydawnictwo Uniwersytetu Ekonomicznego w Poznaniu, Poznań 2009 r., s 113.*

*[5] Leksykon zarządzania, DIFIN, Warszawa 2004, s. 435-436*

*[6] D. W. Miller, M. K. Starr, Praktyka i teoria decyzji, Państwowe Wydawnictwo Naukowe, Warszawa 1971 r. s. 22.*

*[7] Ibidem, s. 22-23.*

*[8] A. Lozano Platonoff, Zarządzanie dynamiczne. Nowe podejście do zarządzania przedsiębiorstwem, Difin, Warszawa 2009, s. 50–52*

*[9] K. Dohn, Studium oceny procesu produkcyjnego w przedsiębiorstwie przemysłowym, Wydawnictwo Politechniki Śląskiej, Gliwice 2006, s.9*

*[10] M. G. Kendall, W. R. Auckland, Słownik terminów statystycznych, Państwowe Wydawnictwo Ekonomiczne, Warszawa 1986r, s.24.*

*[11] M. Piśniak, Taksonomia definicji ryzyka i próba ich klasyfikacji, Ekonomiczne i prawne wyzwania roku 2015, Lwów 2015 s. 137-140.*

*[12] D.W. Miller, M.K. Starr, Praktyka i teoria decyzji, Państwowe Wydawnictwo Naukowe, Warszawa 1971 r, s.97-98.*

*[13] P.G.Moore, Ryzyko w podejmowaniu decyzji, Państwowe Wydawnictwo Ekonomiczne, Warszawa 1975 r., s.155.*

Therefore, decision-making at all levels of management requires gathering appropriate information resource which must conform to the characteristics such as credibility, brevity, speed and rationality collection and develop the information[14].

**The issue of decision-making**

Often, decisions are made that are not rational, as mentioned earlier, and therefore to facilitate the decision making process used mathematical tools and computer programs. In the case of decision-making in local government units, you need to consider many aspects of investment, taking into account the individual nature of the undertaking. There are many determinants that affect the success of the project.

The decision making process consists of three steps: identify which problem identification, design and choice. These basic steps can be divided into sub-stages with a greater level of detail, which is often found in the literature and practice of management. Decision-making problem identification stage is aimed at full identification, diagnosis of the causes of its origin determine its effects and possible solutions. The design stage involves the determination of decision criteria, based on which will be developed and evaluated variants of decision-making and formulation of these variants. Selecting step is based on comparison with each decision variants and selecting one of them based on predetermined criteria. The decision making process is complex and multi-faceted, which affect elements of the environment and the internal components of the organization. Result decision process depends on many factors[15].

**Modelling in Management**

The term "simulation" was borrowed for the purpose of learning from everyday language. Popularly "simulate" (lat. simulo- pretend) I mean to take the look of something else, as well as imitate, play something else[16].

Simulation methods are used to describe, study and design of economic and social systems for decades. Applications simulation there since the Second World War, when born, a research approach called Monte Carlo. It enabled the mathematical modeling of real processes that were too complex to be able to predict their results by using analytical solutions. Initially, simulation method has been used mainly in physics and mathematics, but now examples of the application without the slightest difficulty can find not only in physical-mathematical sciences, but also everywhere in between chemistry, natural sciences and economics, management and financial practice.

Simulation is quite a special research approach. Is it in fact, not one approach, but a set of methods and techniques that mimic the real system, using a computer and various kinds of software. This multiplicity of approaches identified as simulation methods introduces some confusion, especially among beginners simulation. Under the common banner of the simulation are: discrete simulation, simulation handling (including the method of system dynamics), the Monte Carlo method (including simulations of static spreadsheet), game management, simulation quality, agents and others. Differences in these approaches, for example. Monte Carlo simulation and system dynamics makes people use such methods may have difficulty communicating with each other[17].

Actual phenomena around us have a probabilistic nature, sought to demonstrate that the random nature of the results obtained captures the essence of the system, the model we built, and not the result of mistakes that we made during the development of the model; how to obtain simulation results and how to interpret them to deepen their knowledge on the audited system in which there are random factors. Albert Einstein, one of the greatest physicists of our time, disagreed Although the probabilistic interpretation of the world offered by quantum physics, which he expressed opinion, I would never believe that God plays with the world in the bone, but just the uncertainty of the effects of planned actions makes managers They are looking for tools to enable rational decision making under risk[18].

In the literature you can come up with a different apprehension of the concept of simulation. Colloquially, it is understood that the simulation is the imitation of something else[19], which is also reflected in many scientific definitions. And so Morgenthaler says that simulation is playing the essence of the system or its operation without using the same[20]. However, not the same mapping is important, which may be made in the analysis and

*[14] T. Rojek, Systemy informacji ekonomicznej jako narzędzie controllingu, Materiały z konferencji naukowej: Controlling w zarządzaniu przedsiębiorstwem, red. J.Duraj, Łódź 1999 r., s.91.*

*[15] E. Markowski, Intuicja jako czynnik wspomagający proces podejmowania decyzji w warunkach ekstremalnych, Artykuł pochodzi z publikacji: Zarządzanie kapitałem intelektualnym w organizacji inteligentnej, (Red.) W. Harasim, Wyższa Szkoła Promocji, Warszawa 2012*

*[16] Słownik wyrazów obcych. Pr. zb. pod red. J. Tokarskiego. PWN, Warszawa 1980, s. 720*

*[17] B. Mielczarek, Modelowanie symulacyjne w zarządzaniu, Oficyna Wydawnicza Politechniki Wrocławskiej, Wrocław 2009, s. 12-14.*

*[18] Ibidem.*

*[19] R.F. Barton, Wprowadzenie do symulacji i gier, WNT, Warszawa 1974, s. 9–11.*

*[20] R.C. Meier, W.T. Newell, H.L. Pazer, Simulation in business and economics, Prentice Hall, Englewood Cliffs NJ 1969, s. 2.*

observation. Witte given that simulation is a test system using the substitute system (Ersatzsystem)[21]. Klein while the simulation is understood as a process of numerical solution of the model consists in carrying out a sequence of calculations[22].

About experimenting on the model constituting the representation of reality he writes Bielecki

About experimenting on the model constituting the representation of reality he writes Bielecki[23]. On the other hand Szabanowie indicate that the test carried out on a computer model "is based on the observation and analysis of changes over time, occurring in the model as a result of internal and external influences"[24]. On the aspect of observing changes over time as a distinctive feature for simulation draws attention of many authors.

In publications of Gajda, it can be read that "it is amazing simulation model of the movement"[25]. Tarnowski and Bartkiewicz however indicate that the purpose of the simulation, in addition to studies to characterize the subject's environment and internal properties, it is also restore process , wherein the mapping is performed using a computer on the basis of the mathematical model[26]. Although the use of IT tools is not a prerequisite, it is. In practice, due to the large number of mathematical calculations, the simulation appears to be impossible without their use. Currently, the use of computer simulation considers it so obvious that identifies simulation with computer simulation. It should also be noted that in many publications can also find the concept of a simulation in connection with the Monte Carlo, games, operating or sampling model (stochastic simulations)[27].

In this article, a simulation shall be carrying out experiments using a computer program to model the dynamic mapping from the real system. So defined simulation has significant advantages. Mainly reducing the cost and time compared to similar studies conducted on the real system[28]. It is also the so-called flexible simulation model, which means easy entry and taken into account in the model disturbance , extortion or input signals. In addition, the simulation is characterized by repetition of experiments, experiments on a model making it safe for a real system, it does not affect the structure[29]. Moreover, simulation models, in contrast to other models, formal allow the mapping of the phenomena associated with the complex, complex problems that occur in reality[30]. However, like any method of testing and simulation also has disadvantages. The most frequently mentioned in the literature include those related to the simulation model. It may be incomplete, ambiguous or illogical[31]. Furthermore it draws attention to the effort of building a model [32] and the risk that it may generate useless results. A major problem is also the choice of the simulation.

## Dilemmas of choice simulation methods in decision-making processes relating to sustainable management of the organization

When choosing a method of simulation in the context of fitness to make informed decisions about any matter in the management of economic organization, it is essential to consider those methods which in the literature are considered particularly useful in modeling the individual elements of business management.

The main criterion for the distribution of simulation methods is the type the modeled process. If the state changes in the test process taking place in certain units of time, talking about discrete simulation. Methods of discrete simulation can be distinguished, depending on the implementation of the system description . For processes with a large number of events where the system is indicated by events and actions of their service is dialed planning method events. If the system has a large number of activities and description of the present action for implementation, it is advisable to apply a method of the review and selection of activities[33]. In this method in each step, the simulation conditions are checked the occurrence of events and time dependent on the system state.

Considering the production system, the events include: the acceptance, machine failure or purchase materials. It should be noted that in this case the predominant event dependent on other events, and they are

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*[21] T. Witte, Simulationstheorie und Imre Anwendung auf betriebliche Systeme, Gabler Verlag,Wiesbaden 1973, s. 17.*

*[22] L.R. Klein, Wykłady z ekonometrii, PWE, Warszawa 1982, s. 119.*

*[23] W.T. Bielecki, Informatyzacja zarządzania. Wybrane zagadnienia, PWE, Warszawa 2001, s. 62.*

*[24] B. Szaban, J. Szaban, Symulacja komputerowa systemów dynamicznych, Wydawnictwo Politechniki Szczecińskiej, Szczecin 1983, s. 21.*

*[25] J.B. Gajda, Prognozowanie i symulacja a decyzje gospodarcze, Wydawnictwo C.H. Beck, Warszawa 2001, s. 1.*

*[26] W. Tarnowski, S. Bartkiewicz, Modelowanie matematyczne i symulacja komputerowa dynamicznych procesów ciągłych, Wydawnictwo Politechniki Koszalińskiej, Koszalin 2000, s. 21.*

*[27] J. B. Gajda, Prognozowanie i symulacja a decyzje gospodarcze, Wydawnictwo C. H. Beck, Warszawa 2001, s. 4.*

*[28] R. Zdanowicz, J. Świder, Modelowanie i symulacja systemów produkcyjnych w programie Enterprise Dynamics, Wydawnictwo Politechniki Śląskiej, Gliwice 2005, s.15.*

*[29] R. Zdanowicz, Modelowanie i symulacja procesów wytwarzania, Wydawnictwo Politechniki Śląskiej, Gliwice 2007, s. 47.*

*[30] W.T. Bielecki, Informatyzacja zarządzania. Wybrane zagadnienia, PWE, Warszawa 2001, s. 63.*

*[31] R. Kotowski, P. Tronczyk, Modelowanie i symulacje komputerowe, Wydawnictwo Uniwersytetu Kazimierza Wielkiego, Bydgoszcz 2009, s. 16.*

*[32] R. Zdanowicz, Modelowanie i symulacja procesów wytwarzania, Wydawnictwo Politechniki Śląskiej, Gliwice 2007, s. 48.*

*[33] Z. Biniek, Elementy teorii systemów modelowania i symulacji, Infoplan, 2002, s. 141–169.*

controlled based on logical conditions that must be in place so there may be a next event. Consequently, this method can be applied to problems where there are such mechanisms.

Discrete simulation methods, also identified with mass service models are used for the preliminary assessment system parameters in steady state, and to assess performance and decisions during the design and planning of production systems. For this type of model is necessary to know the characteristics of arriving requests into the queue, the process of handling requests and queues. As a result of such a simulation is achieved two fundamental characteristics of the queue, they are the average number of pending applications and their waiting time[34].

For problems where changes occur continuously, fuzzy, poorly described empirical data about the medium- and long -term, it is advisable to simulate continuous[35]. The system described is therein by means of differential equations[36]. With respect to simulate continuous states to the method of system dynamics. Creating a model that convention herein is based on the system by means of jets and levels where the streams determine the rate at which power levels are[37]. This method is used primarily in order to know the characteristics of feedback and analysis of the relationship between streams[38].

Returning to the example of the production system, orders for materials, or the end of respective process steps take place in specific units of time, identified as discrete[39]. However, you can find numerous system-dynamic models that incorporate issues production, the production process is considered in the category of economic process, and research has focused on the production as the supply chain. Therefore, the selection of an adequate method is determined by not only the characteristics of the production system, at the specificity of the decision problem, the characteristics of the input data as to whether the expected results. An important aspect in this context is to analyze the requirements for detail generated by simulation data and the period, which has taken the decision concern. At the same time it is necessary to analyze the specifics of modeling used in the production system variables and the relationship between them in terms of their random occurrence (deterministic and stochastic models ) and behavior over time (continuous models and discrete)[40]. Where the expected results in the form of detailed data concerning the short period of time, the simulation would be performed on the basis of discrete models. The studies relating to a long period, where the purpose of the simulation is not enough to determine the values of specific parameters, to know the behavior of the system, it is the use of continuous models.

## Conclusions

The interest in simulation methods in the world is very high, evidence emerging new books each year and the subsequent resumption of respected academic textbooks. The Polish market in this respect is quite poor. There is a lack of translations of recognized foreign publications, and few studies on Polish authors are not able to fill the existing gap. Therefore it arises automatically request concerning the validity of agitated issues and the need to drill undertaken subject.

In the literature you can find different classifications of computer simulation methods. The basic division, taking into account the changes in the system being modeled and simulated time mapping method extracts the simulation of continuous, discrete and mixed. However, a number of other criteria for classification logic simulation.

When deciding, you never have a complete collection of the necessary information, so the decision-making processes require "guessing" the results of the present decision. This process only support our analysis of historical facts. Therefore, the most important thing is learning how to "guess" the results. This process can be risky, but analyzing the decision-making processes, it can be seen that in most cases we are dealing with conditions of uncertainty. In such a situation cannot be modeled in a linear fashion, and then choose the optimal strategy.

Pay attention to the relevance and validity of the decision-making process, the importance of math-oriented decision theory, thus giving the chance to choose the best option to choose the right course of action, but also accurately "predict" the effects of the election. Boiled down to solving the problem of decision-making, which is a deviation of the existing state of the desired condition. Solving the problem of decision-making lies in answering

*[34] R. Zdanowicz, Modelowanie i symulacja procesów wytwarzania, Wydawnictwo Politechniki Śląskiej, Gliwice 2007, s. 44–46.*
*[35] Z. Biniek, Elementy teorii systemów modelowania i symulacji, Infoplan, 2002, s. 115*
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*[38] R. Łukaszewicz, Dynamika systemów zarządzania, PWN, Warszawa 1975, s. 36*
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*[40] A. Manikowski, Z. Tarapata, Prognozowanie i symulacja rozwoju przedsiębiorstw, Wyższa Szkoła Ekonomiczna, Warszawa 2002.*

the question: what should be done to compensate for the difference between the state of existing and desired state.

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