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ETIOLOGY OF THE NOTION OF EVENT IN TERMS OF DECISION-MAKING AND DETERMINATION OF ORGANIZATIONAL SYSTEM RISK CONDITIONS

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Abstract: *The problem of functioning of organizational systems in a dynamic environment implies permanent influences from the environment. The tendency of these influences, since these are in connection with the functioning of other systems in terms of meeting their needs, is the creation of entropy of organizational systems. The causes of the impact are found in various occurrences in the environment, which are most often of a situational character. An impact can be made by one phenomenon, two or more. The interaction between phenomena usually contributes to an increase of the impact by intensity, time and number of exposed protected values. Management of an organizational system in such conditions depends on risk management quality, that is, on the quality of decision-making process in terms of risk. By understanding, identifying and responding to such events, it is possible to determine the risk to organizational systems elements and to make a decision on future actions. The problems of identifying optimal solution, that is, optimization tasks, are met and analyzed in all phases of an organizational system existence. The process of decision-making and the choice of the "best" alternative is mostly based on more than one criterion and various limits. This paper presents an approach to the analysis of elements of organizational system environment, which generate events that influence on the behavior of organizational systems. Deciding quality depends on the quality and availability of information about events in organizational system environment, which can be determined through different multi-criteria decision-making models. The result of the research is a qualitatively new definition of the notions of event and the extraordinary event viewed through the risk function as immanent characteristic of all events in the environment.).*

Key words: *Organizational System, Decision-making, Risk, Event, Hazard.*

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1. Introduction

A daily functioning of organizational systems consists of a series of activities in space and time during which different risks and individual decisions create different sensitivity modalities of the system (Alexander, 1996). The resulting modalities are conditioned by the characteristics of people, organizational systems, nature and social phenomena. A significant feature of organizational systems, from the aspect of various environmental influences, is sensitivity to these influences. Organizational systems which do not have the capacity to identify influences and take appropriate measures to protect themselves are considered sensitive. Sensitivity decreases with the establishment of these capacities.

The environment variability in which organizational systems function implies the influence of the resulting conditions on system elements functioning. A situational approach to the study of system functioning, from the aspect of generating a set of circumstances which characterizes the resulting situation, is fundamental question - what are the elements of the environment and in what way they influence an organizational system. Namely, from every new situation (a set of circumstances) a new spectrum of influences is generated, by the analysis of which can be assessed the risk on system functioning. Hence, the need arises for observation of several criteria in the decision-making process on future conditions of organizational systems.

In the problems of multi-criteria optimization in a decision-making process, a decision-maker in organizational systems implicitly strives to find a solution that meets the above criteria to the greatest extent possible, without breaking existing limitations. Unfortunately, such problems do not have a single and global solution, that is, there is no optimal solution applicable to all criteria simultaneously. It often happens that some criteria, partly or completely, are mutually opposed. In addition, the criteria considered can by their very nature be very heterogeneous and expressed in different measuring units, from monetary units, through physical quantities, up to probability or subjective estimations determined on the basis of a scale formed for a particular problem. All this indicates that a final, single solution can not be determined without the involvement of a decision-maker. The importance of a decision-maker in organizational systems is especially evident when risk conditions are concerned, that is, when the experience and the ability of a decision-maker to identify and determine new conditions that imply the risk plays significant role.

The aim of the paper is to show the possibility of determining stochastic elements in organizational systems environment in conditions of risk and uncertainty based on the modeling of multi-criteria determination. The research problem is based on the need for determination of elements of phenomena and events in system environment, in order to start with an experiment, so as to create quality information for a decision-maker.

In the first part of the paper, the problem of researching the stochasticity of organizational systems elements is presented. On the basis of the existing knowledge through the analysis of the content and preliminary analysis of a hazard to system elements, the problem of generating the impact to organizational systems values is presented and the relation between the environment elements and system elements. It is shown the possibility of application of different models of multi-criteria analysis, from the aspect of presence of a number of impact elements from organizational system environment. By applying these models, it is possible to experiment with different types of influences to organizational systems in different circumstances. In the second part, it is developed a study of the interaction between different sets of circumstances influencing the elements of organizational systems. The conditions of the system with the elements of exposure and resistance are defined. The result of the

research is a quality and functionally new definition of the notion of event and extraordinary event, from the aspect of dependence of temporary and spatial dimension of environment influences and risks. In the third part, the results of the research are commented, with the emphasis on new definition of events and extraordinary events in terms of risk and uncertainty of space and time of their occurrence. Also, it is emphasized the significance of the methods and models of the experimental work by which are created the assumptions on how to improve the quality of the information necessary for decision-making.

2. Stochastic elements of phenomena in organizational systems environment - existing knowledge and methods of research

The manifastations of diverse organization in human society, which meet certain objevtives in real world, are complex phenomena (Beck, 2011). Such phenomena, due to their complexity, meaningfulness and connectivity, are called a system (Kljajic, 1994). Starting from the view according to which there are important elements common to all areas of reality, it can be considered that there are principles for the functioning of all systems in real world, and therefore in society (Bertalanfy, 1968). Knowledge of the interaction between the system and the environment has led to the creation of a general theory of a system, which changed the perception and intellectual perspective from which reality has been observed (Bertalanfy, 1968). Although different theoreticians have tried (and succeeded) to prove certain regularities in the origin, development and disappearance of a system, the practice has been reminding them of a scope of circumstances that have random character. Such a character is caused by various factors, but as a rule, it has certain influence on the system. A system unifying various elements into a functional entity, with the aim of pursuing common goal, is called an organization, and such systems are called organizational systems (Figure 1).

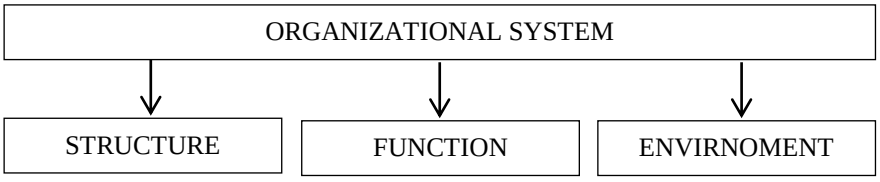

Figure 1. Elements of organizational systems (Stevanović & Subošić, 2007)

An organizational effect has shown positive signs of overcoming individual problems in the struggle for survival and progress of an organization. New values have been created, which have been above individual values (Daft, 2004). The new ways of organizing have implied certain enhanced effects, such as:

1. Use of common resources to achieve common goals;
2. Increase in efficiency of operation;
3. Creating new ideas about problem solving;
4. Use of new technologies;
5. Adapting to changes in the environment and
6. Generating new values.

Newly created values are not only characterized by positive effects on communities, on the contrary, a significant number of negative effects also appears. A number of new phenomena are not expected. The complexity of organizational systems causes series of interactions between elements of deterministic and stochastic character. The existence of elements of stochastic character leads to the emergence of phenomena and events over which subjects of the organizational system must exercise certain influences, in order to keep them within planned frameworks. System regulation of organizational systems enables preliminary identification of stochastic phenomena and events and taking effective measures to control them.

However, in addition to all indicators of progress, a part of the events has still been out of control, with the elements of uncertainty and negative consequences. Sets of circumstances are being created, which are not expected, whose causes are not familiar, whose effects can not be predicted and, ultimately, against which it is not possible to protect.

The result of generating different circumstances in new phenomena is the emergence of various events that can have the capacity without affecting the process, can affect the process in the form of anomalies, or make certain changes in the process. The diversity and multidimensionality of environmental impacts requires from a decision-makers to apply different methods of multi-criteria decision-making in order to find the best alternative.

The question arises whether it is possible to anticipate such events, or take preventive measures in terms of their removal, mitigation and reduction. By analyzing the contents of existing literature and by preliminary analysis of the influence of the environment to organizational system elements, the etiology of the occurrence of events in the environment of organizational systems is investigated.

3. Models of multi-criteria decision-making in the process of determination of risk condition in organizational systems

Multi-Criteria Decision-Making models (MCDM) containing qualitative or quantitative attribute values have wide application in the fields of operational research, management science, urban planning, natural sciences and military affairs. The MCDM problem usually is solved in a two-phase process: (1) The rating, that is, the aggregation of the values of criteria for each alternative and (2) The ranking or ordering between the alternatives, with respect to the global consensual degree of satisfaction. The step-by-step sequence of the problem of multi-criteria decision-making is defined as follows (Mukhametzyanov and Meshalkin, 2014; Pamučar et al., 2017a):

(1) Choice of alternatives (A_i; $i = 1, 2, \ldots, m$);

(2) Choice of evaluating criteria (C_j; $j = 1, 2, \ldots, n$);

(3) Acceptance of scales of an estimation of alternatives on each criterion;

(4) Determination of priorities (weights) of criteria (w_j; $j = 1, 2, .., n$);

(5) Determination of evaluation matrix *i.e.* decision matrix $X = \left[a_{ij} \right]_{m \times n}$;

(6) Choosing a method for ranking alternatives.

Clasic methods, such as SAW (Stević et al., 2017; Kaklauskas et al., 2006), MOORA (Brauers and Zavadskas, 2006; Kalibatas & Turskis, 2008; Brauers, 2008), VIKOR

(Opricović & Tzeng, 2004), COPRAS (Viteikiene & Zavadskas, 2007), TOPSIS (Pamučar et al., 2017), MABAC (Pamučar & Ćirović, 2015), are mostly used in solving problems of multi-criteria optimization. Mentioned models imply that weight coefficients of criteria are determined by some other model, such as the AHP method (Božanić et al., 2016; Pamučar et al., 2016), the DEMATEL method (Pamučar et al., 2017b; Gigović et al. 2016) and the Best-Worst Method (Stević et al., 2017; Pamučar et al., 2018).

Basic settings of the most commonly used traditional models of multi-criteria optimization are presented in the following part of the paper.

3.1. Multi-criteria compromise ranking (VIKOR method)

The VIKOR method represents an often used method for multi-criteria ranking, suitable for solving different decision-making problems. It is especially suitable for situations where criteria of quantitative nature are prevalent. The VIKOR method was developed based on the elements of compromise programming. The method starts from the "border" forms of L_p metrics (Opricović & Tzeng, 2004). It seeks the solution that is the closest to the ideal. In order to find the distance from the ideal point it uses the following function:

$$L_p\left(F^*,F\right)=\left\{\sum_{j=1}^{n}\left[f_j^*-f_j\left(x\right)\right]^p\right\}^{1/p},1\le p\le\infty \tag{1}$$

This function represents the distance between the ideal point F^* and the point $F\left(x\right)$ in space of criteria functions. The essence of VIKOR method is that for every action it finds the value of Q_i, and then it chooses the action which has the lowest listed value (the smallest distance from the "ideal" point). The measurement for multi-criteria ranking of the i-th action (Q_i) is calculated from the equation:

$$Q_i=v\cdot QS_i+\left(1-v\right)QR_i \tag{2}$$

where

$$QS_i=\frac{S_i-S^*}{S^--S^*} \tag{3}$$

$$QR_i=\frac{R_i-R^*}{R^--R^*} \tag{4}$$

where $S^*=\min S_j$, $S^-=\max S_j$, $R^*=\min R_j$ i $R^-=\max R_j$, while S_j represents pessimistic solution, and R_j the expected solution.

By calculating the values of QS_i, QR_i and Q_i for every action, three independent ranking lists can be formed. The size of QS_i represents the measurement of deviation through which the demand for maximal group benefit (the first ranking list) is expressed. The value of QR_i represents the measurement of deviation through which the demand for minimization of distance of some action from the "ideal" action (second ranking list) is expressed. The value of Q_i represents the forming of compromise ranking list which ties together the values of QS_i and QR_i (the third ranking list). By choosing the smaller or the greater value for v (the strategic weight of satisfying the majority of criteria), a decision-maker can factor the impact of the value of QS_i or the value of QR_i in the compromise ranking list. As the reliable

ranking list by the VIKOR method, we take the compromise ranking list with the value of $v = 0.5$.

3.2. Technique for Order of Preference by Similarity to Ideal Solution (TOPSIS) method

The basic principle of the TOPSIS method is that the best alternative should have the shortest distance from the ideal solution and the farthest distance from the anti-ideal solution. A relative distance of each alternative from the ideal and anti-ideal solution is obtained as (Pamučar et al., 2017b)

$$Q_i = \frac{S_i^-}{S_i^+ + S_i^-}, i = 1,\ldots,n \tag{5}$$

where S_i^+ and S_i^- are separation measures of alternative i from the ideal and anti-ideal solution, respectively; Q_i is the relative distance of alternative i from the ideal solution, and $Q_i \in [0,1]$.

The largest value of the criterion Q_i correlates with the best alternative. The best ranked, or the most preferable, alternative A_{TPS}^* can be determined using the following formula (Pamučar et al., 2018):

$$A_{TPS}^* \left\{ A_i = \max_i Q_i \right\}$$

The separation measures of each alternative, from the ideal and anti-ideal solution, are computed using following formulae (Pamučar et al., 2018):

$$S^+ = \left\{ \sum_{j=1}^{n} \left[w_j \left(r_{ij} - r_i^+ \right) \right]^2 \right\}^{1/2} \tag{6}$$

$$S^- = \left\{ \sum_{j=1}^{n} \left[w_j \left(r_{ij} - r_i^- \right) \right]^2 \right\}^{1/2} \tag{7}$$

where element r_{ij} represents the performance of alternative A_i in relation to criterion C_j. For m criteria $(C_1, C_2, \ldots, C_m)$ and n alternatives $(A_1, A_2, \ldots, A_n)$, the matrix R has the shape $R = \left[r_{ij} \right]_{nxm}$. The values $(w_1, w_2, \ldots, w_m)$ represent weight values of criteria that satisfy the condition $\sum_{i=1}^{n} w_i$.

The ideal A^+ and the anti-ideal A^- solution in the TOPSIS method can be determined using the formula (8) and (9), respectively.

$$A^+ = \left\{ (\max v_{ij} \mid j \in G), (\min v_{ij}, j \in G'), i = 1,..,n \right\} = \left\{ v_1^+, v_2^+, \ldots, v_m^+ \right\} \tag{8}$$

$$A^- = \left\{ (\min v_{ij} \mid j \in G), (\max v_{ij}, j \in G'), i = 1,..,n \right\} = \left\{ v_1^-, v_2^-, \ldots, v_m^- \right\} \tag{9}$$

It can be seen from the formula (6) and (7) that the ordinary TOPSIS method is based on the Euclidean distance (Gigović et al., 2016, 2017).

3.3. Multi-Attributive Border Approximation area Co*mparison* (MABAC) method

Basic setting of the MABAC method is represented in defining distance of the criteria function of every observed alternative from the border approximate area (Pamučar & Ćirović, 2015). After forming the initial decision-making matrix (X), in

the first step are evaluated m alternative by n criteria. The alternatives are presented with vectors $A_i = (x_{i1}, x_{i2}, ..., x_{in})$, where x_{ij} is the value of -th alternative by j -th criteria ($i = 1, 2, ..., m;\ j = 1, 2, ..., n$).

In the next step it is performed the normalization of the initial matrix elements (X) by applying linear normalization (Pamučar & Ćirović, 2015). After weighting normalized matrix, it is determined the matrix of border approximate areas (G)

$$g_i = \left(\prod_{j=1}^{m} v_{ij} \right)^{1/m} \tag{10}$$

where v_{ij} present weighted matrix elements, . present total number of alternatives. After the calculation of the value g_i by criteria, it is formed the matrix of border approximate areas G in $n \times 1$ form and it is determined the distance of alternatives from the border approximate area (Božanić *et al.*, 2016).

The alternative A_i can belong to the border approximate area (G), upper approximate area (G^+) or lower approximate area (G^-), *i.e.* $A_i \in \{G \vee G^+ \vee G^-\}$. The upper approximate area (G^+) present the area in which the ideal alternative is located (A^+), while lower approximate area (G^-) present the area in which the anti-ideal alternative is located (A^-). Belonging of the alternative A_i to the approximate area (G, G^+ or G^-) is determined based on the expression (11)

$$A_i \in \begin{cases} G^+ & if\ \ q_{ij} > g_i \\ G & if\ \ q_{ij} = g_i \\ G^- & if\ \ q_{ij} < g_i \end{cases} \tag{11}$$

In order the alternative A_i to be chosen as the best from the set, it is necessary to belong to the upper approximate area (G^+) by as many criteria as possible. For example, if the alternative A_i by 5 criteria (out of total of 6 criteria) belongs to the upper approximate area, and by one criterion belongs to the lower approximate area (G^-), this means that by 5 criteria the alternative is close or equal to the ideal alternative, while by one criterion it is close or equal to the anti-ideal alternative. In case the value is $q_{ij} > 0$, *i.e.* $q_{ij} \in G^+$, the alternative A_i then is close or equal to the ideal alternative. The value $q_{ij} < 0$, *i.e.* $q_{ij} \in G^-$ shows that the alternative A_i is close or equal to the anti-ideal alternative.

Ranking alternatives. The calculation of the values of criteria functions by alternatives is obtained as the sum of distances of alternatives from border approximate areas.

3.4. Complex Proportional ASsessment (COPRAS) method

Ranking alternatives by the COPRAS method assumes direct and proportional dependence of significance and priority of investigated alternatives on a system of criteria (Ustinovichius et al., 2007).The selection of significance and priorities of alternatives, by using COPRAS method, can be expressed concisely using four stages (Viteikiene & Zavadskas, 2007).

For normalization in the COPRAS method, the following formula is used (Viteikiene & Zavadskas, 2007):

$$n_{ij} = \frac{a_{ij}}{\sum_{i=1}^{m} a_{ij}} \tag{12}$$

where x_{ij} is the performance of the i-th alternative with respect to the j-th criterion, a_{ij} is its normalized value, and m is the number of alternatives.

In the COPRAS method, each alternative is described with the sum of maximizing attributes S_{+i}. In order to simplify calculation of S_{+i} and S_{-i} in the decision-making matrix, the columns maximizing criteria are placed first, followed by the minimizing criteria. In such cases, S_{+i} and S_{-i} are calculated as follows (Viteikiene & Zavadskas, 2007):

$$S_{+i} = \sum_{j=1}^{k} n_{ij} \cdot q_j \tag{13}$$

$$S_{-i} = \sum_{j=k+1}^{n} n_{ij} \cdot q_j \tag{14}$$

In formulas (2) and (3), k is the number of maximizing criteria; n is total number of criteria; and q_j is significance of the j-th criterion.

The relative weight Q_i of i-th alternative is calculated as follows:

$$Q_i = S_{+i} + \frac{\sum_{i=1}^{m} S_{-i}}{S_{-i} \sum_{i=1}^{m} \frac{1}{S_{-i}}} \tag{15}$$

The priority order of compared alternatives is determined on the basis of their relative weight (the higher relative weight, the higher priority/rank). The methods presented form part of the corpus of methods applicable in the study of the influence of environmental elements on organizational systems functioning. The application depends on the conditions and time for experimentation. The problem of organizational systems functioning refers to the influence of various factors, of permanent or situational character. The complexity of methods and models is inversely proportional to the time of event generation in organizational system environment.

4. THEORETICAL AND FUNCTIONAL CONCEPT OF EVENT AND EXTRAORDINARY EVENT

The environment of organizational systems represents a set of different phenomena and interactions between them. Individual or cumulative action of a phenomenon or a set of phenomena is determined as an event. The analysis of the content of certain references presents different interpretations of the term *event*, which have certain common characteristics (Table 1).

In Law Lexicon (1964), an event presents a circumstance that occurs against the will of the organization subjects, and to which it is objectively related the occurrence, the cessation or the change of condition. An event is often qualified as *force majeure*.

The flow of time is an event of great importance for the acquisition and loss of subjective rights (Law lexicon, 1964).

Table 1. The most significant characteristics of different interpretations of the concept of an event (Komazec, 2017)

Source	Most frequent elements of the concept of an event	Common characteristics
Law lexicon (1964)	A circumstance ocurring against the will of the subject. *Force mejaure*.	Accidental occurence Familiar or unfamiliar cause Series of circumstances arises Undefined in space and time No influence of the subject
Little encyclopedia (1978)	A subset of the set of possible results of an experiment.	
Dictionary of the Croatian or Serbian language (1903)	What is happening, with familiar or unfamiliar cause. A chance, case, intention.	
New Larousse Encyclopedia (1999)	A realized circumstance. A fact, an act.	
Dictionary of Serbo-Croatian literary language (1967)	What happened, in a particular place. An occasion, opportunity.	
ISO Guide 73:2009 Risk Management	Appearance of series of circumstances.	
Standard SRPS A.L2.003:2017	Appearance or change of particular set of circumstances.	

According to Little encyclopedia (1978), an event is also a subset of the set of all possible outcomes of an experiment (Little encyclopedia, 1978).

In Dictionary of Croatian or Serbian language (1903), an event (m. *eventus*, *casus*) is defined as something that is happening. In general, it refers to what is happening, whether good or bad, with familiar or unfamiliar cause; what can happen or is thought to be possible to happen; something special that can happen, where it is required or it is said what is to be done; chance, case, intention, when the cause of what is happening is not familiar, and it is thought to occur with no cause. *Occasio*, *opportunitas* as a chance, an experience; what can lure a man to do something. Happening - an act of happening and what is happening (Dictionary of the Croatian or Serbian language, 1903).

According to the Larousse Encyclopedia, an event means (lat. *evenire*) - to happen, to befall 1. What happens, what comes or acts, a fact, circumstance. 2. Significant, striking act. 3. In statistics, a coincidence that occurs, in a particular place. A set of significant facts that occurred (New Larousse Encyclopedia, 1999).

In Dictionary of Serbo-Croatian literary language (1967), an event is presented as - 1. What happened at a certain place; 2. An occasion, opportunity; 3. An important phenomenon, a peculiar thing (Serbo-Croatian literary language, 1967).

According to the international standard ISO Guide 73: 2009 Risk Management - Vocabulary, an event is the emergence of a certain set of circumstances. An event is occurrence or change of a particular set of circumstances (Standard SRPS A.L2.003: 2017). The same standard in the explanation provides the following interpretations:

1. An event may consist of one or more occurrences and may have several causes;
2. An event may consist of something that has not happened;
3. An event can sometimes refer to an "incident" and an "accident" and

4. An event without consequences can also be considered as an event that is "barely avoided", "just about to happen" or "almost happened".

The Serbian standard SRPS A.L2.003: 2017 states that an event is characterized by a consequence, as an outcome that affects the objectives. An event gets important for an organizational system in the moment when it acquires capacity, or when a set of circumstances is such that it can result in negative consequences on system values. Therefore, an event may pose a threat to system values, whether it familiar or not. In case it is familiar, an event can be studied, analyzed and monitored. In case when it is not familiar, an event is hypothetically observed, through the development of potential scenarios.

Bearing in mind mentioned characteristics and the results of the content analysis of available references, an event can be defined as every accidental result of a set of circumstances, which ocured in a particular place and in a particular time, against the will of the subject which is directly or indirectly influenced by it.

4.1. Influence of the event condition to the existence of hazard to system elements

The term related to events in organizational system environment, which is in significant relation with the condition of the organizational system, is a hazard. From the aspect of the existence of a hazard, an accumulated set of circumstances due to which there is a risk, uncertainty or certainty that it will result in negative consequences on system values, becomes significant for system management and the subject of its monitoring and analysis. Thus, a set of circumstances caused by various occurrences in the environment, with or without a negative impact on organizational systems values, obtains the form of an event. The declaration of the resulting set of circumstances an event in the management of the system arises at the moment when competent authorities assess that the resulting set of circumstances is significant from the aspect of the impact on planned functioning of organizational systems (Pavličić, 2010).

Mentioned significance of an event, from the aspect of the impact on organizational systems functioning, is related to the emergence of a hazard to system values. Any disruption in organizational system functioning implies a threat to the protected values of a system - known or unknown (Komazec et al., 2015).

The term "hazard" comes from the French word '*hasard'* and the Arabic word '*az-zahr*', meaning "chance" or "opportunity" (Benson, 1981). A hazard is defined as "potentially harmful physical event, phenomenon or human activity that can cause loss of life or injury, property damage, social and economic disorders or environmental degradation. This event has the probability of occurrence within a specific time period in a given area, with certain intensity ", (UN International Strategy for Disaster Reduction, www.UNISDR.ORG (2009).

Different authors also defne a hazard as (Шойгу et al., 2004):

1. A possibility of causing injury, material, physical or moral damage to a person, society or state;
2. An accompanying phenomenon or probability of occurrence of a potentially destructive phenomenon in a specific period of time and in a particular region;
3. A situation in which processes and phenomena are possible which can lead to injuries of people, causing material damage, destructive action on the environment;
4. A process, property or state of the environment, in the event of occurrence of conditions which can lead to one or several negative consequences to human health, the state of the environment, which cause material or social damage

with a deterioration of living and working conditions and the process of normal economic activity or deterioration of the environment quality.

An event that is preliminarily recognized as a "hazard" is a source of possible damage (Standard SRPS A.L2.003: 2017) and a hazard can be a source of risk. The term "possible" refers to its potentiality. A potential hazard relates to the fact that a set of circumstances is recognized as potentially dangerous to system values. The degree of danger is determined by analyzing the risk of occurrence of an event with negative impact, based on the available knowledge about phenomena that form the resulting set of circumstances.

One of the approaches to defining the notion of a hazard, from the aspect of natural disasters appearance (Thywissen, 2006): A hazard is an extreme geographical event that leads to a natural disaster. In this case, extreme means significant deviation in positive or negative direction from what is considered normal. Basics for determining hazards are place, time, scope and frequency. Many hazardous phenomena occur and their locations can be predicted. Natural hazards can be defined as extreme events that occur in the biosphere, lithosphere, hydrosphere and atmosphere.

Based on the approach to defining the concept of hazard from the point of view of the causes in natural and social systems, (Thywissen, 2006): A hazard is a product of combination of natural and social systems. A hazard is the result of the interaction of nature and man. Would it be treated as completely climatic, geological, political or economic, important components that need to be considered when seeking the right solution for them would be nissed.

TheNature is neutral, however, the environment becomes dangerous only when it interacts with a man.

A certain event turns into a natural disaster when:

1. It is extreme in scope;
2. The population is extremely high and
3. The systems used by people are extremely sensitive.

The determination of the concept of a hazard from the aspect of general impact on system values, (Thywissen, 2006): In the broadest terms, a hazard is a threat to people, to valuable inanimate nature. Hazards can happen, but they also do not have to. However, when they occur they imply real impact on people and other values. Hazards arise from the interaction of social, technological and natural systems.

A hazard is a follow-up event or the possibility of its occurring at a certain time in a particular place (ISO Guide 73: 2009). It implies a potential threat to people, as well as a real event that affects them. There are many ways to characterize a hazard, for example, natural, technical, created by human factor, nuclear, ecological. The categories are probably as diverse as the disciplines and sectors of social life being covered. But what they have in common is the potential to cause serious, harmful effects which root in any incident, accident, and disaster.

A hazard can be individual or general. In tha case, it is a specific hazard scenario. An important feature of a hazard is that it gives an impression of the likelihood, or the possibility to happen. A hazard is a threat, not an event itself, at the initial stage (Smith, 2013). Any hazard can manifest itself through a real harmful event. In other words, if a hazard can be measured in the units of real damage, then a hazard is no longer a hazard, it becomes an event, an accident, or a disaster (Thywissen, 2006).

Based on the above, it can be concluded that a hazard may imply direct or indirect impact on the values of organizational systems. Organizational systems, in relation to events that can potentially pose a threat to the environment, can have two states: exposure and vulnerability. The degree of presentation of both states depends on

important characteristics of the system: persistence, resistance and sensitivity (Komazec et al., (2016).

4.2. Risk elements of the system

An organizational system functions in its environment. Environmental variability implies the variability of the conditions in which a certain impact of the event on organizational system values is realized (Adigees, 2004). The level of exposure of the organizational system elements and their sensitivity (vulnerability) to events are basic characteristics of the existence of a risk to an organizational system (Louis, 2009).

Exposure of organizational systems values to the impact of an event from the environment is a very important feature of possibility of occurrence of a hazard. Exposure is the degree to which an organization and/or interested party is susceptible to the impact of an event (Standard SRPS A.L2.003: 2017). Exposure means number of people and/or other elements of the system (values) at risk that may be affected by the effects of a particular event. Together with vulnerability and hazard, exposure is another precondition of the risk and negative impact of events on organizational systems values. The exposure of organizational systems is very low, if the system is inactive or out of function.

Thywissen cites an interesting relationship, stating that exposure determines the severity of the event impact on elements at risk, and vulnerability determines final damage level. Therefore, in its economic dimension, vulnerability is shown through the projection according to which at a given event organizational systems will suffer damage in certain percentage. Which parts of the system and what level of damage is shown through exposure (Thywissen, 2006). Based on everything mentioned, it can be concluded that exposure is not a risk element, but it directly affects the possibility, manner and intensity of the risk event on organizational systems values.

Vulnerability, according to SRPS standard A.L2.003: 2017, is characteristic feature of organizational systems values that results in sensitivity to the source of risk, which can allow the influence of the event with consequences (Standard SRPS A.L2.003: 2017). Further, in the same standard it is stated:

1. Vulnerability can be considered a measure of quality of the existing protection conditions;
2. Vulnerability can be defined as the degree to which an organization and/or interested party is susceptible to the impact of an event due to its exposure;
3. If damage scope is defined by the duration of harmful effects on protected values, then vulnerability includes also resistance. This conclusion stems from the assumption that vulnerability implies susceptibility of an event, or sensitivity of an organization to an event.

Besides exposure, another precondition of a negative event is vulnerability. Vulnerability is a dynamic, characteristic feature of every system (household, region, state, infrastructure, or other risk element) that contains many components. The importance is determined by seriousness of an event. Vulnerability points to the potential of damage and represents a forward-looking variable. Vulnerability should include an anticipatory feature of imagination, of what could happen to a particular system in terms of certain risk and hazard (Institute of Management Accountants, 2007). Determining vulnerability means questioning what would happen if a particular event (events) affected certain elements at risk. Vulnerability is an inherent feature of a system that is always present even in a peaceful period between the events. It does not appear or disappear depending on the event appearance or disappearance, but it is a constant and dynamic feature that exhibits in a certain

amount during the event, depending on the severity of the harmful event. This means that vulnerability can often be measured only indirectly, and for this indirect measurement as a benchmark is taken the resulting damage (Bukov, Porfiriev 2005).

What is usually seen in the aftermath of a negative event is not vulnerability itself, but the damage occurred. By examining the form of damage of a particular society without knowing the magnitude of the event, does not allow the conclusion about the vulnerability of that society. In this sense, the strength - damage relationship reflects the vulnerability of an endangered system element (Thywissen, 2006).

Poverty is also a measure of sensitivity, *i.e.*, potential generation of disorders in a particular system. Poverty (vulnerability) indicates existing state of subject's protection, that is, the sensitivity of the subject to potential hazards (Standard SRPS A.L2.003: 2017). Under sensitivity are considered the characteristics of the system, territory, community and the conditions in which they are located. These conditions affect the ability of organizational systems to anticipate, resist, fight and recover from the consequences of risky events from the environment. The degree of sensitivity also represents the difference between existing and necessary protection measures of organizational systems values. The greater the difference, the greater the degree of sensitivity, that is, the community is more vulnerable to potential hazards. Knowledge of the difference between existing and required state is measure of knowledge of organizational system sensitivity (Nocera, 2009).

4.3. Resistance of organizational systems to the influences of risky events

According to Thywissen, in the life cycle of organizational systems resulting damage does not only depend on hazard, vulnerability and exposure, but also on persistence and resistance of elements at risk. In the literature, most of considerations indicate major overlap between persistence and toughness, which are often used as synonyms. These two dimensions of a harmful event are very difficult to separate (Thywissen, 2006).

Persistence represents strategies and measures that directly affect damage during events, by alleviating, reducing pressure or reducing effects, and flexible strategies that change behavior or activities to avoid adverse effects. Resistance represents persistence enhanced with the ability to maintain functionality of organizational systems during an event and to ensure complete recovery (Bozanic et al., 2016).

The notion of toughness is used to characterize the ability of the system to return to the reference level after the operation disorders and to maintain certain structure and functions. The toughness of the system is often represented by flexibility of the system itself, *i.e.*, how many changes and obstacles it can tolerate, while retaining the desired level of functioning (UN International Strategy for Disaster Reduction, www.UISDR.ORG, 2009).

Adaptibility, flexibility or elasticity are characteristics of the ability to absorb the influence of an event. Resistance is represented by various elements, such as: organization, competence, types of constructions, barriers, land composition, geography, atomic shelters, locations, and so on. As resistance increases, the ability to protect the system, society and the environment increases also. Resistance is inversely proportional to vulnerability (UN International Strategy for Disaster Reduction, www.UISDR.ORG, 2009).

The ability of organizational systems, community or society exposed to hazards is the capacity to adapt with resistance and changes in order to achieve an acceptable level of functionality. This is determined by the ability degree of the system to organize itself and to increase learning ability from past events, as well as to improve risk reduction measures. Resistence is the ability of the organization to absorb the

consequences of business cessation, and to maintain the level of services to a minimum (UN International Strategy for Disaster Reduction, www.UISDR.ORG, 2009).

The capability or capacity of the organization is the ability to maintain basic functions during and after the event with consequences to the protected values as soon as possible, and with as little harmful effects as possible (Standard SRPS A.L2.003: 2017). The following explanations are provided in the standard:

1. Resistance also means an organization's ability to absorb negative effects from the environment, or to adapt and recover from the event with consequences to the protected values;
2. Resistance includes strategies and measures that mitigate or suppress harmful effects, as well as adaptive measures to avoid adverse effects. In this way, resilience also implies the ability of the organization to maintain its functionality during the event, as well as to recover from the event occurred.
3. Resistance is a characteristic of an organization that is inverse to vulnerability.

It should be considered that in conditions of acting of the events with negative effects and the exposure of system values and their vulnerability, it is necessary to connect and analyze the notion of sensitivity of system elements in order to examine the process of acting of events with negative impact.

4.4. Changes of system conditions due to the influence of hazards

Disorders in organizational systems functioning represent a state created by the impact of risky events and the degree of sensitivity of organizational systems elements. There can be no disorders if there is a hazrd, and there is no sensitivity. If there is no sensitivity, the system element that is exposed to hazard is not vulnerable, because protection measures had been taken. On the other hand, the system element may be sensitive to the hazard, but there could be no set of circumstances for the emergence of the hazard. Therefore, the existence of a risk of occurrence of a certain hazard does not necessarily imply negative effects on system elements, unless there is sensitivity (Alexander, 1996).

It can be concluded that events are everyday occurrences that represent a set of circumstances and interactions in the real world (Table 2). Events, as a state, have neutral value from the aspect of a hazard to the system, up to the moment of their identification or materialization. Organizational systems are daily exposed to different phenomena, with varying intensity and method of acting on system elements. The sensitivity of system elements is proportional to the degree of awareness of management of the need for risk management, on one hand, and concrete measures taken to reduce the degree of negative impact, on the other. The events in the process of organizational systems functioning can appear as regular (planned, expected) events and extraordinary (unplanned, unexpected) events (Karović & Komazec, 2015).

All the events that imply a hazard to organizational systems values conditionally represent extraordinary events. In order for a particular event to obtain a legal form of an extraordinary event, it must be verified in a lawful manner by competent authority. The term "extraordinary" event refers to an unplanned phenomenon, unexpected action, or deviation from a regular one.

According to Alexander, the notion extraordinary means beyond usual order, which is not regular, distinctive, unusual, exqusite (expresses the state), (Alexander, 1996).

In Rečnik Srpskohrvatskoga književnog jezika a syntagm extraordinary situation is presented as a situation in which, due to the occurrence of extraordinary circumstances, it is departed from the application of a certain number of legal norms, and other norms foreseen for such a case are applied instead.

Table 2. The most important characteristics of different interpretations of the concept of extraordinary event (Komazec, 2017)

Source	Most frequent elements of the concept of event	Mutual characteristics
Alexander (1996)	Beyond usual order, which is not regular	Not regular Deviates from the application of existing legal norms Use of specially developed norms Endangers values Not defined in time and space Need of extraordinary forces to react Potencially dangerous
Dictionary of the Croatian or Serbian language (1903)	Because of the emergence of an exceptional circumstance, it deviates from the application of legal norms, but others are applied, in accordance with the situation	
Mlađan (2014)	The capabilities of regular forces to go beyond the needs of the endangered system	
Komazec et al., (2015)	All events in the Armed Forces, as well as those who are directly or indirectly related to it, resulting in the endangering of life and combat readiness	

The notion of extraordinary event from the aspect of the criteria of needs and possibilities, according to Law lexicon (1964), is interpreted as the possibility of regular forces to respond, satisfy and overcome the needs of an endangered system. Every extraordinary event represents a unique case in itself (Mladjan, 2014).

Besides extraordinary events, there are also everyday events (regular, immanent to the system), for the elimination of which an organizational system engages minimum forces and resources within regular activity, whereby these can successfully and efficiently simultaneously eliminate more of these events (Mladjan, 2014; Komazec et al., 2014).

Extraordinary events refer to all unwanted sets of circumstances, phenomena or interactions that provoke negative consequences on human life and health, material and cultural property, combat readiness of organizational systems, order and discipline, business and reputation (Mučibabić, 1995).

Kasagić states that all incidents in the armed forces, as well as those who are directly or indirectly connected with it, are considered to be extraordinary events, which result in endangering the lives of members of the Army, affecting combat readiness of the unit and causing material damage to the Army (Komazec et al., 2015).

From the above analysis of the content of different definitions of the notion of event and extraordinary event, the following general definition of event and extraordinary event can be made: "An event is a state created by a disruptive action of a set of circumstances unexpected in time and space, due to which are possible to occur or have occurred negative consequences to organizational system values. The consequences of the event can be eliminated or reduced by regular actions (measures), forces and resources" (Komazec, 2017).

"An extraordinary event is a state created by a negative action of a set of circumstances unexpected in time and space, resulting in negative consequences or unacceptable risk to organizational system values and verified by competent authority. The consequences of such event can not be eliminated or reduced by the application of regular procedures (measures), forces and resources, but it is also necessary to engage additional capacity of organizational systems over a longer period of time" (Komazec, 2017).

An extraordinary event can overcome the dimension of an event and pass into a higher state of endangering organizational systems values. More events occuring at a given moment represent a situation. The development of the negative capacity of the event, through the extraordinary event situation, can lead to an emergency situation, that is, a crisis situation (Komazec et al., 2016).

5. Comments on the result of the research

An analysis of existing literature, which deals with the definition of the concept of risk through the etiology of the occurrence of events that affect organizational systems functioning, proves the possibility of investigating the effects from the aspect of riskiness of events. Namely, a new set of circumstances is stochastic, in most cases, therefore, the level of uncertainty is proportionally higher. Under such conditions, the management of organizational systems is difficult. Management of organizational systems is responsible for identifying potential hazards, taking measures to prevent events with negative consequences, as well as measures to improve the capacity for identifying and remediating risky events. Deciding on future management moves depends on the degree of danger of new circumstances. It is precisely in this segment that a key difference in the perception of a new set of circumstances arises, and it is classified as a potential "event" or as a potential "extraordinary event".

The research provided a qualitatively new definition of two terms, of "event" and "extraordinary event". Both concepts are observed from the perspective of risk existence to the organizational system as an immanent property, rather than physical occurrence of events. With this approach, hypothetical observation of an event is also possible, through creating different scenarios for the development of future situations. Basic characteristic of a scenario is the use of past and present information in real-time for the purpose of designing future state of organizational systems. The generation of scenarios can be improved by applying multi-criteria decision-making methods and different simulations. The sensitivity of the results of this research can show the limits of decision-making under the conditions of uncertainty and risk, but also to show to decision-makers how to determine the boundary between a harmless state, an event and an extraordinary event.

A deciding based on the results of the application of different decision-making models provides certain degree of security in the quality of information about events or extraordinary events. For a decision-maker, reaching a level of security in information is a key moment in the decision-making process. Namely, by knowing whether a new set of circumstances is a hazard to an organizational system, a decision-maker makes a decision to take measures to protect organizational system values. The measures undertaken may vary in structure, feasibility, impact, possibility and needs for financing, etc. It is certain that making a decision on system reaction to the occurrence of an "event" has less implications on the weight of the decision on riskiness of the measure taken. While, on the other hand, the adoption of measures in case of an "extraordinary event" may require urgency, intensity and

extent of taking measures, which further implies errors in the decision-making process.

6. Conclusion

By exploring the conditions of the creation of a "set of circumstances" that has an impact on organizational systems elements and generates new states of organizational systems, qualitatively and functionally new definitions of the state of events and extraordinary events have emerged. Namely, the management of an organizational system requires permanent decision-making, which will direct the system towards some future desired situations. A changeable environment generates events that have different implications on organizational systems elements. The deviation of any element from the planned behavior leads to disorders in the system operation. There are events that have permanent and predictable influence, and there are also those with stochastic character. Stochastic events have predispositions of risky events, or the possibility of occurrence with negative consequences. Also, the study of stochastic events opens the questions of possibilities of exploring the influence on organizational systems values. Methods of multi-criteria decision-making can be used to experiment with the influence of different factors in different conditions. Namely, the system of rules and limits set up through the applied multi-criteria decision-making models provides a study of the impacts in controlled conditions. By applying different simulations, it is possible to investigate the sensitivity of the influence of different factors and the emergence of new states of organizational systems.

Researching the etiology of the notion of event in this paper has shown that there is a possibility of managing such events, through known states or generation of scenarios, or hypothetical states. In both cases, management must have the ability to anticipate behavioral scenario of various events in the organizational system environment. Based on these knowledge, management can determine its own weaknesses and strengths, and thus design a system that will provide sufficient degree of resistance to different events.

The results of the research show that preliminary analysis of real or hypothetical conditions can define the state of circumstances generated by an event or an extraordinary event in an organizational system environment. Future research should focus on exploring the relations of the sets of circumstances in different conditions, simulating the environment and acting on system elements.

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