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OVERVIEW OF RISK MANAGEMENT TOOLS AND METHODS

Abstract: *Due to the lack of a risk management system, many organizations in the world have suffered significant financial losses. Therefore, it is necessary for every organization to establish a risk management system as a structural element of the management system as a whole. The problem of risk management exists as a global problem that requires global solutions. One of the possible solutions is to meet the requirements of international risk management standards ISO 31000: 2009 and use risk assessment techniques in accordance with ISO / IEC 31010. The risk management system is compatible with the quality management system ISO 9001: 2008 and is based on the same principles. If the risk is not recognized and the organisation does not cope or is unprepared for the crises, the organization can suffer great losses. A business crisis is an unplanned and unwanted period in a company's operations, of limited duration with an ambivalent outcome. Crisis management is a process that includes three phases: preventive management, identification, and reactive management of a business crisis, which is helped by controlling as a professional management support. The review of tools and risk management tools creates preconditions for better preparation of the organization for crises, for better coping and faster exit from the crisis.*

Keywords: *crisis, risk management measures, ISO 31000: 2009, ISO/IEC 31010:2019.*

1. Introduction

Risk represents uncertainty in the outcome of expected events in the future, i.e. it is a situation in which we are not sure what will happen, and reflects the probability of possible outcomes around an expected value where „the expected value is the average result of unpredictable situations that recur“. To avoid crises in which non-recognition and untimely response to risks could lead us, it is necessary to assess all internal and external factors that may lead to the realization of the risk. The ISO 31000: 2018 standard, as a separate standard, has an

advisory effect on the management, emphasizing the importance of timely and preventive mechanisms for risk detection. The ISO / IEC 31010 - Risk Assessment Techniques (International Standardization Organization / International Electrotechnical Commission) standard serves to support the ISO 31000 standard through a quality management system. The most used are: HAZOP method, HACCP analysis, Brainstorming method, Risk mapping, Bowtie analysis, FMEA method of the risk assessment system, Pereto diagram and

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Ishikawa diagram. By applying the techniques prescribed in the internationally harmonized and recognized standard ISO / IEC 31010: 2019, it is possible to assess the significance of individual risks to the process or project and to create preconditions for an adequate response before risks bring the organization into crisis, which can result in major problems or even be disastrous for the organization. Organizations should view the crisis as a real possibility, and systematically develop in the direction of dealing with it in all aspects of their business through training togetherness over a common threat and applying a crisis plan that needs to be continuously adapted so that the reaction to the crisis is timely and as effective as possible. For a successful and visionary-minded management, a crisis can be redirected to its advantage and serve as a test of the strength and ability of cooperation of a certain team, which results in the strengthening of team spirit and the stability of the organization in the face of new challenges.

2. Crisis

According to Osmanagić Bedenik (2010), the philosophical dictionary (1982) states that crisis (Greek: krisis) means "break, a transient difficult state in every natural, social and thought process" and that in ancient Greece the word "crisis" meant „decision“. A crisis can be seen as an event or set of events that disrupts the current state of regular activities or as a potential threat in the future that needs to be detected in a timely manner with defined strategy to overcome or avoid it. The crisis is in most cases an undesirable situation for the organization, but it can also contain certain positive characteristics if the management responds in a timely manner and with an effective strategy, that turns the crisis in their favour. The negative characteristics of the crisis are certainly more numerous than the positive characteristics, so it is not surprising that most people perceive the concept of crisis in a negative context. The uncertainty

of maintaining business results in a more conservative approach to everyday life due to the lack of optimism for the future, and therefore it is necessary to rationally and plan all resources, because disruptions in the market can lead to changes in the desires and needs of consumers and their habits, and thus create great losses for the organization if it does not have a high-quality response by countering and crisis management. A conservative approach to business because of the crisis can prevent management staff from investment ventures that could potentially add value to the organization, but because of the crisis, the risks are multiplied. If the crisis is already present, it is necessary to resort to saving the situation in various and not at all pleasant ways, such as reducing wages, laying off employees (downsizing) and cutting costs. Dismissal of employees creates several negative consequences for society and the organization due to the increased interest of the media, so this measure should be approached only in a hopeless and necessary situation to keep the business vital. Dismissing an employee is a stressful and not at all pleasant process to manage a crisis, therefore it is desirable to create a certain compromise solution that reduces the damage to the reputation of the organization and forms a settlement with the dismissed. "Timothy Coombs analyzes the crisis by considering its consequences, which inevitably lead to the creation of negative and unwanted outcomes. If the organization's normal operations are interrupted, it will inevitably suffer financial consequences. Consequences include injury and death of stakeholders, structural or material damage, damaged reputation, damage to the environment, etc. In contrast, crises disrupt and negatively affect entire organizations, that is, they have the potential to do so." Jugo (2017:21-22) states that to preserve the reputation and ensure further business, it is necessary to comply with the demands of stakeholders to the extent that it does not create excessive additional costs or endanger the further development of the

organization and the loss of balance in current operations and the resolution of disputes between the organization and stakeholders. For the successful resolution of disputes, the common sense of the stakeholders and their flexibility regarding requests are necessary. The positive characteristics of the crisis can mostly be seen in the post-crisis phase through the analysis of the steps taken to mitigate or avoid the crisis itself. Crisis management helps us in crisis management, as a corporate strategy by which the corporation deals with major disruptions in the regular functioning of the business. is in charge of making decisions and measures necessary to manage the crisis. "Crisis management is crucial for a successful exit from any crisis situation in the organization. Every crisis has its own causes that need to be identified and resolved. In the same way, every crisis can have a great potential for a new rise of the organization, which should be recognized and used." (Legčević and Taučer, 2014) Mihaljević and Čuljak (2017) state that crisis management and crises "have been studied and researched in relative detail in the past dozen years" and that "there are numerous definitions in circulation, to which various authors contribute to the foundation of this term. Comprehensiveness is still not achieved, and definitions are fluid. " Osmanagić Bedenik (2010) states that controlling is "professional and neutral support for management in the processes of adaptation to internal and external changes so that the content, methods and information flow of controlling best reflect the level of use of business economy instruments in the organization and thus the preventive management of business crisis". and also claims that coordination and integration are fundamental principles of controlling. Controlling is responsible for promoting coordination and integration at horizontal and vertical levels in the organization so that it acts in harmony and harmony with the common principles and goals that they want to achieve. The significance of controlling in

crisis situations is of crucial importance for the implementation of all activities with the aim of getting out of the crisis through a uniform approach to the problem. Controlling directly affects the outcome of crisis management through cooperation with the organization's management, providing decision-making support through qualitative and quantitative analyzes with real values on which management's decisions in crisis management are based. "Especially in a crisis, controlling is unavoidable, since it contributes clearly to situations and the consequences of individual decisions with its instruments." (Osmanagić Bedenik, 2010) The controlling department must provide accurate and fully transparent indicators on which management decisions are based. Controllers assume responsibility for the accuracy and relevance of information and analyses, and management for decisions based on them. The obligation of controlling in the crisis process is to encourage regular reporting and detection of inconsistencies and risks in the process so that, based on this information, guidelines can be created by superiors with the aim of effectively solving and suppressing them at the root.

3. Risk and introduction of risk management measures

Srića (2011) states that "Risk represents uncertainty in the outcome of expected events in the future, i.e. it is a situation in which we are not sure what will happen and reflects the probability of possible outcomes around an expected value" where "expected value is the average result of unpredictable situations which are repeated. Buntak, Kovačić and Martinčević (2020) state four types of risks in their risk matrix: dangerous risks (low probability, high impact); critical risks (high probability, high impact); minimal risks (low probability, low impact); routine risks (high probability, low impact). Observing the risks from the aspect of managers in a business organization, two

types play the most important role, namely: "Business risks (occurring within cash flow), and Financial risks (related to the way the organization is financed, especially borrowing which can cause insolvency and bankruptcy.)"

The PDCA cycle (P-plan, D-do, C-check, A-act) serves as a support technique for the risk management because any action aimed at risk cancellation is not final and requires continuous monitoring of the implemented risk management strategy with the aim of timely adaptation. The introduction of a risk management system in the organization reduces costs in the long term through preventive measures. In addition to the economic benefits for the organization, risk management creates a safer workplace by reducing business risks to a lower level. Organizations may introduce a specialized risk management department or authorize individuals or groups within individual departments to support the entire organization in risk analysis in its processes.

The following indicators appear as indicators of the necessity of introducing risk management measures:

- **activity indicators:** such as asset turnover ratio, current assets turnover ratio, receivables turnover ratio, inventory turnover ratio and supplier turnover ratio
- **liquidity indicators:** such as current liquidity ratio, accelerated liquidity ratio, current liquidity ratio and financial stability ratio
- **indebtedness indicators:** such as indebtedness ratio, own financing ratio, financing ratio and interest cost coverage
- **cost-effectiveness indicators:** such as cost-effectiveness of total business and cost-effectiveness of business (sales)
- **profitability indicators:** such as return on assets (ROA) - return on total assets, return on equity (ROE) - return on invested capital, gross

profit margin and net profit margin

- **investment indicators:** such as return on investment (ROI) - return on investment, earnings per share (EPS) - earnings per share, dividends per share (DPS) - dividend per share, dividends pay-out ratio (DPR) - dividend payment ratio, price per share (PPS) - total return on shares and dividend yield.

These indicators are used to analyse the business of the organization and may indicate certain imbalances in business that need to be managed in a timely and effective manner.

4. Application of standards in risk management

Risks are events that may or may not occur, but it is necessary to consider the broader context of events and to reduce the impact of risks on the outcome with the quality planning or to avoid them completely by continuous monitoring and adaptation of the strategy. In order to detect risks, it is necessary to assess all internal and external factors that can lead to the realization of the risk. Risk management needs to be handled responsibly and thoughtfully due to the possible damage that may result from the insufficient quality of management's approach in acting on them. Systematic risk management must be seen in the form of continuous monitoring and timely action with the aim of complete elimination or reduction of harmfulness within various departments of the organization.

The quality management department may take a decision on the implementation of the ISO 31000: 2019 standard for risk management in departments and on the implementation of the ISO 22301: 2019 standard intended for the management of continuity and consistency. The ISO 9001: 2015 standard is one of the key standards in the quality management system, and according to Džolan (2017) it "includes risk

identification, risk analysis, risk categorization, control and risk reassessment.” Vuković (2015) states that “the current draft ISO 9001: 2015, although it sets requirements for risk assessment, does not require the existence of a formal risk management system”. The standard ISO 22301: 2019 defines guidelines for business continuity management in organizations. As a rule, it is associated with the security of information systems in which there are significant risks of personal data theft and misuse.

ISO 31000 defines the principles and guidelines of risk management and is not intended for certification but serves to raise awareness of organizations about the possibility of implementing additional security aspects in business to prevent unwanted and unnecessary losses that may arise from inadequate approach to risk management. The ISO 31000:2018 standard, as a separate standard, has an advisory effect on management, emphasizing the importance of timely and preventive mechanisms for risk detection. Management principles and risk assessment techniques defined in the ISO 31000 family are key prerequisites for the evolution of business towards a quality management system through the implementation of standards intended for environmental management (ISO 14001:2015 - environmental management systems) and standards for safe drinking water supply (46001: 2019 - water safety management system for human use) by using the information on risks in processes that may harm biodiversity and human, plant and animal health through negligent handling of harmful substances. Increasing the safety of products intended for human consumption can be achieved by implementing the HACCP method, which creates control points in which the harmfulness and deviations of substances in products are examined, thus preventively responding to the possible realization of risks in

consumption by end users.

ISO / IEC 31010 - risk assessment techniques (International Standardization Organization / International Electrotechnical Commission) standard serves as a support to ISO 31000 standards through a quality management system. The first version of the ISO 31010 standard appeared in 2009, and in the meantime, it has been adapted and reissued in the form of ISO 31010: 2019. The techniques of the ISO / IEC 31010 standard consist of a wide range of qualitative and quantitative analyses which can provide a closer insight into the realization of the effects of risk in individual processes. For maximum utility of the techniques, it is necessary to educate people in managerial positions in departments to have a balanced effect on risks throughout the organization. The greatest effectiveness comes from a combination of the techniques themselves to get a broader picture and provide a greater chance of identifying, analysing, evaluating, and determining treatments with the objective of eliminating threats to the vitality of the organization. ISO / IEC 31010 techniques (Table 1) offer both qualitative and quantitative methods of risk assessment, but each technique is unique and has a different form of application in the risk assessment process, and therefore it is recommended to combine techniques to achieve the most accurate assessment used by risk management to decide on further steps related to risk management. The usual practice of linking is based on risk assessment through techniques that provide the possibility of their identification, which is followed by support in the form of numerical evaluation, statistical analysis and creating a visual representation in accordance with the identified intensity of certain assessed risks. The current version consists of 31 techniques that provide qualitative and quantitative support in the identification, analysis, evaluation and treatment of risk (Table 2).

Table 1. List of ISO / IEC 31010 risk assessment techniques (Kundih, D., 2020)

Brainstorming method	Ishikawa diagram (Cause and effect analysis)
Structured or semistructured interviews	Layers of protection analysis (LOPA)
Delphi technique	Decision tree analysis
Check lists	Human reliability analysis (HRA)
Primary hazard analysis (PHA)	Bow tie analysis
Hazard and operability studies (HAZOP)	Reliability centred maintenance (RCM)
Hazard analysis and critical control points (HACCP)	Sneak circuit analysis
Environmental risk assessment	Markov analysis
Structured what if technique (SWIFT)	Monte Carlo simulation
Scenario analysis	Bayesian statistics and Bayes Nets
Business impact analysis	FN curves
Root cause analysis	Risk indices
Failure modes and effects analysis (FMEA)	Consequence/likelihood matrix
Fault tree analysis (FTA)	Cost/benefit analysis
Event tree analysis (ETA)	Multi-criteria analysis (MCA)
Cause-consequence analysis	

The HAZOP (Hazard and operability studies) method is currently the first choice for identifying weaknesses in the design process and is used worldwide within the manufacturing industry. Outside the manufacturing industry, it is used in a modified form.” (Crawley and Tyler, 2015). According to Čičak (2017), one of the biggest disadvantages of this method is that „it is not possible to analyse more complex situations and complex systems, such as situations created by the simultaneous occurrence of multiple independent events “.

HACCP (Hazard analysis and critical control points) analysis is based on the definition of critical control points within the risk assessment process and is most often used as a technique in the food industry. Critical points are a key factor in evaluating a particular service or product because of the knowledge of potential deviations from acceptable values, which provides guidelines for further action to align the end service or product with that defined in the organization plan thus ensuring consistency and quality maintenance.

The brainstorming method is primarily a qualitative method of imaginative analysis of potential problems and solutions in a particular process. In the field of risk analysis, brainstorming can identify certain

threats that may arise in the process. To manage them successfully, it is necessary to use other techniques that include a quantitative component of risk management due to accuracy and defined numerical values that describe in more detail their significance on conducting a particular project with much greater precision and the ability to rank risks according to the priorities they represent in a particular process.

Risk mapping - The process of risk mapping defines the identification of risks, quantification of their impact and probability, and the addition of a label that is later applied to visual tools such as a matrix display and scoring scale. Risk scoring is performed by multiplying the assumed probability of realization of the source of danger and its impact on the process itself, and for a given risk a label is set which is later incorporated into the matrix display and scoring scale. The scoring scale groups risks according to intensity through probability and impact analysis. The matrix presentation defines risks according to significance and probability. The specified matrix can determine whether it is a dangerous, critical, minimal, or routine risk.

Table 2. Analysis of risk assessment techniques ISO / IEC 31010: 2019, (Kundih, D., 2020)

0	RISK ASSESSMENT PROCESS							
	RISK IDENTIFICATION	RISK ANALYSIS			RISK EVALUATION			
		CONSEQUENCES	PROBABILITY	RISK LEVEL				
Brainstorming method	SA	NA	NA	NA	NA			
Structured or semistructured interviews	SA	NA	NA	NA	NA			
Delphi technique	SA	NA	NA	NA	NA			
Check lists	SA	NA	NA	NA	NA			
Primary hazard analysis	SA	NA	NA	NA	NA			
Hazard and operability studies (HAZOP)	SA	SA	A	A	A			
Hazard analysis and critical control points (HACCP)	SA	SA	NA	NA	SA			
Environmental risk assessment	SA	SA	SA	SA	SA			
Structured what if technique (SWIFT)	SA	SA	SA	SA	SA			
Scenario analysis	SA	SA	A	A	A			
Business impact analysis	A	SA	A	A	A			
Root cause analysis	NA	SA	SA	SA	SA			
Failure modes and effects analysis (FMEA)	SA	SA	SA	SA	SA			
Fault tree analysis (FTA)	A	NA	SA	A	A			
Event tree analysis (ETA)	A	SA	A	A	NA			
Cause-consequence analysis	A	SA	SA	A	A			
Ishikawa diagram (Cause and effect analysis)	SA	SA	NA	NA	NA			
Layers of protection analysis (LOPA)	A	SA	A	A	NA			
Decision tree analysis	NA	SA	SA	A	A			
Human reliability analysis	SA	SA	SA	SA	A			
Bow tie analysis	NA	A	SA	SA	A			
Reliability centred maintenance (RCM)	SA	SA	SA	SA	SA			
Sneak circuit analysis	A	NA	NA	NA	NA			
Markov analysis	A		NA	NA	NA			
Monte Carlo simulation	NA	NA	NA	NA	SA			
Bayesian statistics and Bayes Nets	NA	SA	NA	NA	SA			
FN curves	A	SA	SA	A	SA			
Risk indices	A	SA	SA	A	SA			
Consequence/likelihood matrix	SA	SA	SA	SA	A			
Cost/benefit analysis	A	SA	A	A	A			
Multi-criteria analysis	A	SA	A	SA	A			
SA	STRONGLY APPLICABLE		A	APPLICABLE		NA	NOT APPLICABLE	

Bowtie analysis is a visual representation of the input values, potential hazards and outcomes that result in the realization of hazards. With this analysis, it is possible to see the broader context of a particular hazard and thus point to the need to create guidelines with the aim of effective preventive action aimed at eliminating the hazard. The wider possibility of applying bowtie analysis manifests through combining with techniques that complement the hazards defined by the analysis by adding quantitative features that can more closely define the criteria by which management is directed towards preventive action on hazards. Šotić (2016) states that the "objective of risk analysis is to describe the risk, i.e. to present an informative picture of risk. ", and also explains that "to present such a picture in the dissertation is used a "bow-tie" diagram, which illustrates the building blocks of risk, i.e. risk analysis."

FMEA method of risk assessment system (Failure Mode and Effect Analysis) is a method that prevents risks and minimizes their impact through a planned approach. In practice, the name FMEDA method (Failure Mode and Criticality analysis) is also used. According to Dobrović et al. (2008) "FMEA is a method that maximizes customer satisfaction by completely eliminating or partially reducing the causes of potential problems. To achieve this, the FMEA needs to be implemented as soon as possible, although not all data or information is fully known at a given time. " ISO / IEC 31010: 2019 recognizes four basic types of application of FMEA analysis: 1. FMEA system; 2. FMEA design; 3. FMEA processes and 4. FMEA services. Buntak et al. (2014) state that "regardless of the risks involved, the FMEA method can reliably assess the possibility of their realization through the calculation of RPR factors, whose acceptable values are predetermined" where the RPR factor is defined as the level of potential risk.

The Pareto diagram is a method that determines that 80% of all nonconformities account for 20% of the problem. The evaluation process consists of the detected frequency of non-compliance in the sample expressed as a percentage in the order from highest to lowest and by expressing the cumulative values which according to the ABC structure are classified into classes A (up to 80% of cumulative), B (80% up to 95% of cumulative) and C (95% -100% of cumulative). This diagram can identify key risks on which management can base further guidance.

The ishikawa cause-and-effect diagram is used to analyze the factors that lead to a particular problem through evaluating items from the problem cause groups. Based on the information obtained, the probable causes that lead to the problem can be identified. The diagram is named after the creator Kaor Ishikawa, for whom Pipunić and Grubišić (2014) state that he "advocated the thesis that quality improvement is a continuous process that can always be further improved." It is also called a fish bone diagram because of its characteristic appearance. According to Čelar et al. (2014) Ishikawa "in his considerations found that there are 6 major groups of causes in the occurrence of errors and called them 6M: machine, method, material, man (manpower, mind power), measurements and the environment (Milieu / Mother Nature)."

5. Conclusion

Risk cannot be avoided because there is no entrepreneurial activity without risk. Risks should be taken, but in a planned way. Risk should be accepted as a reality and everything should be done to get to the risk management phase. The risk management system should be a structural element of the management system of the organization as a whole. Risk management is a necessary component of any business organization. With an adequate approach, it reduces potential losses in the long term, which can

have disastrous proportions for their further business and even survival. Using ISO / IEC 31010: 2019 risk assessment techniques, such as FMEA method, HACCP method, HAZOP method, Bowtie analysis, brainstorming and many others, it is possible to approach certain threats and danger to the organization and to lay the foundations for the prospective success of crisis avoidance and crisis situations and to better overcome and prepare organization's management in crisis situations. The peculiarity of crisis management is that it is necessary to act in a state of uncertainty in which every decision can be the difference between the survival or collapse of the organization, which contributes to the additional burden on management in the implementation of regular business activities. The crisis situation defines the strength of the organization through the unity of the

organization and successful management, or discord led by bad management, which affects the positive or negative outcome of crisis management. Successful crisis management as well as getting out of a crisis situation can be seen as one of the aspects that make the difference between an average manager and a leader. A review of risk management tools and methods discussed in this paper leads to a conclusion that it is very important to make management aware of the need to integrate risk management into the business process to identify in time all the risks that could lead to a crisis.

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