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ANP AS A TOOL FOR DETERMINING THE RESILIENCE FACTORS' INTERACTION IN SMES

Abstract: *In this paper, the methodology of determining resilience factors' interaction is presented. The importance of interaction between resilience factors is very important and depends on current situation and state of the company. Changeable conditions cause mutual interactions between factors. Also, high level of knowledge and competence of the company staff is required for accurate defining of interactions between defined factors. As an example of the application is taken one SME from production sector.*
Keywords: *ANP, Organizational resilience, factors interaction, SME*

1. INTRODUCTION

Business practice shows that all of potential risks, their sources and consequences cannot be identified in organizations no matter what kind of strategy they employ. The modern business is becoming increasingly complex which is caused by the development of new technologies demanded by customer needs and globalization trends. The complexity and variable business conditions have emerged conditions for business risks that need to be managed on the long term in order to ensure the sustainability of the organization [1].

Mechanisms that are traditionally used by organizations to deal with different type of risks, e.g. risk management (ISO 31000:2008) [2] or Business Continuity Management (BS 25999:2006) [3], seem to be insufficient so many organizations do not manage to hold on the market and therefore extinguishes or becomes part of another organization. The important need is to open the possibility of organizational resilience potential assessment and to clearly define interaction of its indicators which should present a clear picture of the organization's position in the market. This allows the opportunity to compare organizations and enable their benchmark. The final consequence of this should be defining appropriate measures to improve business performances and to enable long term sustainability.

The organizational resilience indicators are not defined by international consensus or international standards which makes them flexible and custom for different types of organizations. This paper proposes the model for determining the interaction of organizational resilience indicators defined by Stephenson (2010) [4] and updated by Lee et al [5]. For modelling this type of interactions Analytical Network Process (ANP) is used. This tool is appropriate because it takes into account all interactions (inner or outer) and gives all feedback informations needed for further processing and decision making. Interactions, which are the input data, are made by team of expert from observed SME. Chosen company is from production sector in Central Serbia and proposed model was tested (as an example) in order to identify all possible gaps and issues.

The paper is structured as follows: literature review of organizational resilience and ANP approach is presented in the section 2, model for determining the mutual influence of organizational resilience indicators is presented in section 3, in the section 4 the illustrative example of determining the mutual influence of organizational resilience indicators in one medium sized organization is presented and section 5 sets the conclusion.

2. PROBLEM STATEMENT

From the socio-ecological perspective [6], researchers agreed that studying organizational resilience requires an interdisciplinary approach and in that manner system approach represents an adequate solution. In the field of engineering, resilience is treated as ability to sense, recognize, adapt and absorb variations, changes, disturbances, disruptions and surprises [7]. If the research focus is set to the organizational perspective, resilience conveys the properties of being able to adapt to the overall requirements of the business. Different definitions of organizational resilience have influence on its constituent elements and its assessed values in real business organizations.

Globalization has significantly increased the customers' expectations all over the world which means that SMEs have to be innovative and adaptive to new challenges [5]. Besides that, SMEs have to combine old and new business models and to improve their resilience. The significance of SMEs may be illustrated by the fact that SMEs form the backbone of the EU economy – accounting for 99.8 per cent of non-financial enterprises in 2012, which is equal to 20.7 million businesses [8]. The main factors that that influence SMEs organizational resilience are determined by market and their own properties. SMEs have limited approach to resources, especially cash resources [9] which make them open and vulnerable to the external environment so they have to define appropriate strategy in order to assure the sources for achieving resilience. The high level of organizational resilience may be developed and managed through the business strategy.

In order to define appropriate strategy, organizational resilience level has to be assessed. One of the most important steps, while doing that, is determining the interaction of organizational resilience indicators. This may be done by Analytic Network Process (ANP) methodology.

ANP methodology is based on possibility to take into account interaction between selected indicators [10-11], which is the most important difference among similar methodologies. Taking into account interactions between indicators is important for determining organizational resilience level. Fast changing environment cause changes of some indicators which could influence on other in the same organization. So, this aspect needs to be considered if interaction exists. The main ANP characteristics are interaction and feedback on which we can base our decisions for improvement.

3. MODEL FOR DETERMINING INTERACTION OF ORGANIZATIONAL RESILIENCE INDICATORS

In this Section, identification of indicators, possible interaction between indicators and the modeling procedure of indicators are described.

3.1 Identification of indicators

According to Lee et al [5] new model of organizational resilience is developed. Also, for all indicators definition is included as description for better understanding. New model has two groups

of organizational resilience which comprise planning and adaptive capacity. In total, they identified 13 indicators (5 indicators for planning and 8 for adaptive capacity). Two groups of indicators are shown in table 1.

Table 1. Indicators

Adaptive capacity	Planning
Minimization of silos (i1)	Planning strategies (i9)
Internal resources (i2)	Participation in exercises (i10)
Staff engagement and involvement (i3)	Proactive posture (i11)
Information and knowledge (i4)	External resources (i12)
Leadership (i5)	Recovery priorities (i13)
Innovation and creativity (i6)	
Decision making (i7)	
Situation monitoring and reporting (i8)	

3.2 Interaction between indicators

The most important factor for solving problems and as its consequence, decision making is total understanding of the problems. During solving complex problems the biggest challenge is how to structure problem and make it simple for understanding because of high level of abstraction. Hence, in addition to expert knowledge of the problem, a significant contribution and support of complex solving problems and decision making make human's way of thinking. No matter that computer tools and programs is used for the entire process of solving complex problems, the two mentioned human skills cannot be replaced [12].

Regarding this fact, there is a need for team of experts with various and different knowledge and education profiles. The teams' responsibility is to define and describe all processes in the organization,

make interactions if possible and make decision on base of the results. Interaction between indicators is shown in figure 1.
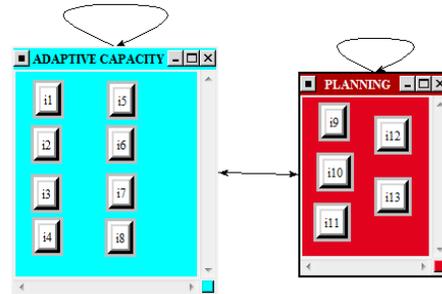

Figure 1. Interaction of indicators

3.3 Modeling procedure

After defining the interaction between indicators, team of experts proceed to next phase which include pairwise comparison. Pairwise comparison was conducted using the fundamental scale of absolute number called also Satty's scale [13]. When we have interaction between indicators then comparison is little different. We need to compare the importance of indicators with respect to goal to determine priorities. Figure 1 represents the fact that in our case there are both interactions, inner and outer dependence. This means that the problem knowing and understanding is of great importance. Solving the problem requires the identification of [14]:

- all elements relating to the considering problem,
- all connections and interactions,
- events which caused the problem under consideration, and
- possible solutions.

The team of experts (consists of: general manager, quality manager, risk manager and three shift managers), after entire process consideration, interactions are proposed.

Next step is participating of team of experts in pairwise comparison. This step is crucial for outcome of the whole process. Comparison has to be accurate

which depends on, not only on experts' knowledge and competence, but consideration of future company's picture and place on the market. The most important fact is to have company's goal on the mind through whole process of comparison. In the next section, results are obtained.

4. ILLUSTRATIVE EXAMPLE

In this paper, the organizational resilience indicators are assessed using Super Decision Software [15]. The treated company is selected from the group of SMEs of production sector in Central Serbia. In the process of collecting input data, the experts' team (general manager, quality manager, risk manager and three shift managers) of analyzed company was introduced with the appropriate resilience survey [5]. The obtained results are presented in table 2.

Table 2. Results of interaction

Name	Normalized
Minimization of silos (i1)	*0.07725*
Internal resources (i2)	*0.08504*
Staff engagement and involvement (i3)	*0.12914*
Information and knowledge (i4)	*0.16887*
Leadership (i5)	*0.17522*
Innovation and creativity (i6)	*0.10261*
Decision making (i7)	*0.14384*
Situation monitoring and reporting (i8)	*0.11803*
Planning strategies (i9)	*0.32229*
Participation in exercises (i10)	*0.17622*
Proactive posture (i11)	*0.29721*
External resources (i12)	*0.08320*
Recovery priorities (i13)	*0.12108*

It is necessary to take into account, current situation in the considering

company, at the market and possible direction of improvements and progress. In our case, taking into account all possible factors, both groups (adaptive capacity and planning) are considered equally influential respect to the goal.

From the presented results, we can see and conclude that Planning strategies and Proactive posture of the company need to be ranked as the most important. Stability and possible the fastest recovery from unwanted situation depends on better planning and act proactively. That means that the full understanding of current and especially future problems based on past events is the necessity.

These directions of the new approach need to be accepted as unavoidable choice if company wants to survive on very demanding market. The obtained results should be treated as input data into process of strategy in analyzed company because every day without business activities based on planning and proactive measures can be observed and recognized as a possible profit lost.

5. CONCLUSION

In the current business environment, organizations need to be engaged in a comprehensive and systematic process of prevention, preparedness, mitigation, response and recovery and business continuity. In this paper, ANP methodology is used to determine the interactions between organizational resilience indicators. In the beginning, the proposed model of resilience is determined. After that, the ANP methodology applied the presented problem is presented and the proposed model was tested. From the obtained results it is obvious that organizations must be more prepared for market disruptions and draft plan that provides scenarios for disaster or emergency is not enough good business tool which can provide long term

sustainability. The concept of resilience should be incorporated into the knowledge of the corporate strategy in order to show the best results for company.

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