Construct of the Model of Crisis Situation Diagnosis in a Company

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The paper points out the construct of the model of crisis situation diagnosis in a company, emphasizing the importance of crisis situation diagnosis for a company’s successful performance. Applying a systemic analysis of the variety of crisis situation definitions found in the scientific literature and define the conception of crisis situation in a company. Though a crisis situation is often described as a negative phenomenon, however, the authors emphasize its positive influence on the further company’s performance focusing on the importance of the diagnosis of a crisis situation in its primary stage. It shows the complexity of the scientific research object. Obviously discussed object brings meaningful input to the analysis of crisis features in a company. In the paper crisis situation diagnosis has been defined as the application of different methods to unfold the features of the diagnosing phenomenon. The importance of crisis situation diagnosis in a company’s management system is huge because it lets estimating the state of a company and making decisions for further its performance. The paper aims at presenting the model of crisis situation diagnosis in a company (CSDC). The realization of the model involves three stages: analysis of the factors determining crisis situation in a company; crisis diagnosis and its depth estimation; analysis of the crisis causes, and the definition of further company’s goals and decision making. The CSDC model describes a general crisis situation diagnosis process in a company, emphasizing the necessity of a new method integrating artificial neural network (ANN) application together with the widely known traditional methods. The presented CSDC model unfolds additional advantages in a crisis diagnosis process: it enables to evaluate crisis depth in a company, to estimate crisis diagnosis results in dynamics, to use the dynamic rates which estimate internal and external environment changes and to do calculations quickly and in details. The interpretation – positivistic methodological approach has been chosen to solve the described problem what enables to reveal the subjective assessment of the phenomenon and point out the researchers’ attitude to the analyzed problems. The results of the model application have been summarized and further application perspectives as well as its improving possibilities have been pointed out. Having carried out the theoretical research and empirical analysis on the model of crisis situation diagnosis in a company, its advantages and disadvantages were emphasized.

Keywords: crisis situation, crisis situation diagnosis, model of crisis situation diagnosis in a company (CSDC), artificial neural network (ANN).

Introduction

Relevance of the topic. Many business leaders agree that every company sometimes faces a crisis, however, most of them do not apply any productive actions to overcome it in time. Rising multiple company bankruptcies, increasing number of debtors (Braucher, 2003; Gruodyte, Kirsiene, 2010) encounter huge difficulties meeting financial requirements and fulfilling commitments to creditors (Review of Financial Stability, 2009; Gruodyte, Kirsiene, 2010). The survey of the company executives showed that 85 per cent of them (from 500) think that crisis is inevitable, but only 50 per cent of them apply the particular actions for crisis plan creation in time. Crisis problems are often solved in their maturity stage and inefficient attention is paid to crisis diagnosis in a company.

In the stable economic period crisis is assessed as a negative phenomenon (Klein, 1981; Rosenblatt, 1989), while in an unstable and constantly changing situation permanent changes become an inevitable element in a company’s performance process. Therefore it is very important to reveal the correlation between crisis and changes, where the positively solved crisis impulses can be reflected for successful company’s development. The results of a crisis situation decision often depend on the efficiency of crisis situation diagnosis. In this context the problem of diagnosis conceptualization and the analysis of this phenomenon remain relevant in social as well as in economic and management aspects.

The relevance of crisis situation diagnosis is confirmed by the decisions designed and applied in business practice, reports of audit companies, and the estimation methods applied by banks and companies. The traditions of the research on crisis situation diagnosis is quite old (Altman, 1983; Augustine, 1995; Birch, 1994; Boin, Lagadec, 2000; Booth, 2000; Darling et. al., 1996; Darling, Kash, 1998; Gonzales-Herrero, 1995), concern about it is still big (Hart et. al., 2001; Paraskev, 2006; Ulmer et.al., 2007; Stundziene, Boguslauskas, 2006; Grigaravicius, 2002; Liucvaitis, 2003; Mackevicius, Raksteliene, 2005 and other). Therefore it can be claimed that scientific research includes a wide performance area, though it lacks new methods, new possibilities applying artificial neural networks.

The object of the paper is a crisis situation diagnosis in a company. The aim of the research is to present the model of a crisis situation diagnosis in a company.
estimating its positive and negative application aspects in the company’s management process and emphasizing the diagnosis importance. Consequently the research goals are as follows:

1. According to the analysis of the scientific literature, to specify the conception of crisis situation in a company.
2. To create the model of a crisis situation in a company based on the usage of artificial neural networks.
3. To justify the model’s positive and negative aspects applying it in a company’s management process.

The interpretation – positivistic methodological approach has been chosen to solve the described problem what enables to reveal the subjective assessment of the phenomenon and point out the researchers’ attitude to the analysed problems.

Conception of crisis situation

Crisis situation in a company is often related with macroeconomic changes. Growing instability of the environment increased the attention to analyse crisis situations in a company. In the classical literature Hermann (1993) defines three crisis features: astonishment, threat and a short period of reaction. In general opinion crisis is understood as a negative phenomenon. However today it is difficult to approve the opinion of Ulmer et.al. (2007) that crisis is a unique moment in a company’s performance history, because today crisis is much more than a usual state of a growing company. Therefore today it is necessary to point out crisis inevitability. Crisis creates a possibility to learn and improve. A crisis symbol in the Chinese language means „a dangerous possibility”. Because of its nature crisis is dangerous in an organization’s life cycle though it gives a possibility to grow (Ulmer et. al., 2007). This inevitability of the changes emphasizes the concept of continual changing and learning company.

Crisis situation is the unstable state of a company when usual business operations fail and company’s performance curve goes down. Uncontrolled crisis situation culmination is bankruptcy; however, it is not the only way of its development. Crisis situations differ from each other with their duration, depth and consequences. It is possible to control it applying some particular actions and means to decreased possible loss and rehabilitate the system functioning. Therefore the importance of crisis situation diagnosis has been pointed out that crisis situation could be noticed in time and crisis could not reach the bottom of its depth and could not make big damage for a company.

Diagnosis in a crisis management process

Some different definitions of diagnosis have been found in the scientific literature: diagnosis is the revelation of the nature and the causes of the analysed phenomenon (Darling, Kash, 1998); diagnosis is the identification of the features of the analysed problem (Dictionary of international words, 2004); diagnosis is the recognition of the particular signals (Goullart, Kelle, 1995); diagnosis is the problem description (Darling, Kash, 1998); diagnosis is the identification of the signals what determine the problem (Smith, 1995). Different causes can determine the same symptoms. So it can be claimed that a diagnosis is a complicated complex process, defining some different symptoms which determine some problems. The process of diagnosis helps assess the company’s state, define the symptoms determining the problem, however it does not let estimate the causes of this problem and in this way it differs from the analysis.

In this research crisis diagnosis has been defined as the application of the different models to assess company’s state and estimate the features of the potential crisis. The importance of the described action is huge because crisis diagnosis lets critically assess company’s state as well as make decisions for its further performance what is very important for the company’s investors, owners and creditors.

Generalizing the possibilities of company’s management in crisis situation it can be claimed that crisis situation diagnosis is the example of information system decision making in a company’s management process because it solves the company’s internal state survey task according to many different rates and relieve the manager’s work analysing a big amount of information, making decisions and preparing the action plan for a further company’s performance. It confirms that the company’s manager has to get all the necessary information about a crisis situation and crisis depth in a company in time. Therefore the essential point in a company’s management system is to fix the threshold when the set of rate combination appears showing the uncomplimentary general results determining crisis or crisis situation appearance in a company.

In order to perform crisis situation diagnosis in time and to stop critical company’s development it is not enough to recognize crisis situation. An important step is to make decisions about the survey on a crisis situation causes including the choice of particular means to stabilize a crisis situation in a company. The earlier crisis is diagnosed, the faster particular anti-crisis means are chosen and the loss is smaller. If crisis is defined later or the first attempts to overcome fail then it develops and requires bigger resources what makes bigger loss.

Presumption analysis of the model of a crisis situation diagnosis in a company creation

The analysed principles of a crisis situation diagnosis allowed creating the presumptions of the model of a crisis situation diagnosis in a company (CSDC), which realization includes three stages (see Figure 1):

The conceptualization of the first stage was based on the need of an environment analysis which enables to identify a crisis situation in a company. In this stage the first troubles in a company’s performance can be noticed. It lets make decisions on crisis identification and its depth estimation. It is also very important to evaluate company’s possibilities (size, human resources, financial possibilities, technical supplementary) for the choice of a crisis diagnosis model application.

The methodological concept of the second stage of the CSMC model includes crisis diagnosis, bankruptcy
probability estimation and crisis depth evaluation for the further decision making. In this stage the necessity of an artificial neural network (ANN) application has been emphasized to evaluate crisis depth in the context of a company’s life cycle.

The methodological concept of the third stage requires to base decision making in a company after the crisis has been diagnosed. In this stage it is important to form out further company’s goals, to create company's performance strategy and to choose the right management means. A performance measurement system is also to be applied. A performance measurement system (PMS) is a set of metrics used to quantify both the efficiency and effectiveness of actions, to identify competitive position, locate problem areas, assist the company in updating strategic objectives and make tactical decisions to achieve these objectives, and supply feedback after decisions are implemented. (Gimzauskiene Valanciene, 2005; Valanciene, Gimzauskiene, 2007; Strumickas, Valanciene, 2009; Gimzauskiene, Kloviene, 2010).

The CSDC model describes a general crisis situation diagnosis process in a company, emphasizing the necessity of a new method integrating artificial neural network (ANN) application together with the widely known traditional methods.

**Adaptability of the model of a crisis situation diagnosis in a company**

The created model of crisis situation diagnosis in a company (CSDC) is universal and applicable in any organization management systems. This model is adaptive for organizations to diagnose crisis and to develop a unique decision for their further performance. The structure of the model serves as the construction of crisis diagnosis and decision making methods, enabling to evaluate crisis depth and to avoid mistakes in the company’s management process.

Therefore it is necessary to define the bounds of practical adaptability of the model. The first limitation is the model’s adaptability only in the profit-making companies. Applying this model in the other types of companies it is necessary to assess the concept of crisis situation estimation, paying attention to the research object, cluster, company's size, etc. In the systemic aspect of the problem of crisis situation diagnosis the theoretical basement of the model, its universality and functionality appear as its advantages. The disadvantage is its complexity what makes difficulties to survey empirically the model’s applicability in practice. Comprehensive model research in practice is possible only through participation in a company’s performance and decision making in a company’s management process. Only the researcher who fully understands an organization value creation process and influences on it can realize the model scenario in practice.

Empirical research of a crisis situation diagnosis in a company showed that applied and trained ANN can operate with five rates. It checked all possible combinations of five different rates (in total 1716 combinations) from the given 13 rates and 13 their dynamic rates. After this operation ANN gave six

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**Figure 1. Model of crisis situation diagnosis in a company (CSDC)**
combinations with the least error and then one combination with error 0.25 has been chosen for the next processing (see Table 1).

Table 1

<table>
<thead>
<tr>
<th>Rate combination</th>
<th>Ratio of the golden balance rule</th>
<th>Dynamic ratio of the golden balance rule</th>
<th>Ratio of long-term asset and all term asset</th>
<th>Dynamic ratio of long-term asset and all term asset</th>
<th>Current asset turnover</th>
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<td>Least error</td>
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It was noticed that some rate combinations had the same error. It can be explained that financial rates of a company are related with complex and undisclosed links, what is seen in the diagram of nonlinear diagnosis surface (see Figure 2).

![Figure 2](image.png)

Figure 2. The diagram of bankruptcy probability dependence on the rates of long-term asset, all assets and the golden balance rule

The checking stage of ANN showed that the method correctness makes over 81 per cent. Trained ANN for crisis diagnosis in a company enables to identify crisis and evaluate its depth in the company’s life cycle. Trained ANN determines the application of the model of a crisis situation diagnosis in a company, which emphasizes ANN application necessity and its place in the whole crisis situation diagnosis process.

Having carried the research on crisis diagnosis and estimated the results, the following recommendation can be formed out for companies diagnosing crisis:
- it is recommended to establish a crisis management system in a company in order to diagnose a crisis situation in time;
- having applied ANN and noticed the first crisis features, it is necessary to find out its causes, analysing company’s weaknesses. It is recommended to make audit, monitoring and continual control of the company’s performance;
- having diagnosed chronic crisis and estimated the potential of a company, it is recommended to define its further goals and to start bankruptcy process as soon as possible.

Conclusions

1. According to the analysis of the scientific literature and having evaluated the variety of crisis situation interpretations, a crisis situation conception has been specified: it is an unstable state of a company characterizing the decrease of the company’s performance.

2. Having assessed that the model of crisis situation diagnosis in a company (CSDC) is universal and applicable in an organization management process, it can be claimed that these results were determined by the usage of the artificial neural networks (ANN) method, which allowed evaluating crisis depth and assessing crisis situation dynamics in a company.

3. Having generalized the results of the research it can be claimed that the presented model of a crisis situation in a company is universal and functional, because the applied artificial neural network method allows identifying a crisis situation in a company more specifically. It is emphasized that to prove the model’s efficiency a longer period of observation on company’s performance results is needed.

References


Aldimantas Sakalas, Ruta Virbicikaitė. *Construct of the Model of Crisis Situation Diagnosis in a Company* 

1. Remiantis literatūros šaltiniu analize, patikslinti: *jomės kritinės situacijos diagramavimo modelis.*

2. Sukurti: *jomės kritinės situacijos diagramavimo modeli,* peržiūrėti ir taisyklių metodą taikymą.

3. Pagrįsti modeli teigiamus ir neigiamus aspektus taikant į jomės valdymo sistemoje.

Vyrūjačio metodologii prieiga problemas įprasto interpretacinė pozitīvistinė prieiga, išgalioti atskleisti subjektų reiškinį vertinimi ir išryškinti tyrėjo požiūrį į nagrinėjamus reiškinius.


Įmonės krizės situacijos diagnozavimo empirinis tyrimas parodė, kad modelyje taikyti dirbtiniai neuronų tinklai (DNT) gali dirbti tik su penkiais rodikliais. Paruošti DNT patikrinio visas galimas penkių rodiklių kombinacija (iš viso 716) iš pateiktų trylikos santykinų rodiklių ir trylikos jų dinamikos rodiklių. Po šios operacijos paruošti DNT parinko vieną penkių rodiklių kombinaciją su mažiausia paklaida tolesniems skaičiuojamams. Tolesni skaičiuojamai parodė, kad naudojant DNT krizės situaciją diagnozuoti rezultatų tikslumas sudaro daugiau kaip 81 proc. Todėl galima teigti, kad paruošti DNT gali identifikuoti krizę įmonėje ir įvertinti jos dydį įmonės gyvavimo cikle, kaip įsitikinčia DNT taikymo svarbą ir apibendrus rezultatus, galima pateikti šias rėkomendacijas:

- išvados

1. Remiantis atliktu mokslinės literatūros analize bei įvertinus krizės situacijos interpretacijų įvairovę, darbe patikslinta įmonės krizės situacijos sąvoka: tai nestabili įmonės būsena, pasižyminti įprastų verslo operacijų trikdvės, įmonės veiklos nuosmukia.

2. Įvertinus tai, kad įmonės krizės situacijos diagnozavimo modelis yra universalus ir taikytinas organizacijų vadyboje, galima teigti, kad šiuos rezultatus sąlygojo pritaikytas dirbtinių neuronų tinklų metodas (DNT). Taikytas DNT metodas leido įvertinti įmonės krizės dydį bei krizės situacijos dinamiką.

3. Pritaikytas atliktu tyrimo rezultatus, galima teigti, kad pritaikytas įmonės krizės situacijos diagnozavimo modelis pasižymi universalumu ir funkcionalumu, ne taikomas DNT metodas leidžia tiksliai identifikuoti krizę įmonėje. Akcentuota tai, jog įmonės krizės situacijos diagnozavimo modelio veiksmingumas pagrįstas reikalingas ilgesnes laikotarpis, per kurį būtų stebimi įmonės veiklos rezultatai.

Raktas: krizės situacija, krizės situacijos diagnozavimas, Įmonės krizės situacijos diagnozavimo (IKD) modelis, dirbtiniai neuronų tinklai (DNT).

The article has been reviewed.

Received in November, 2010; accepted in June, 2011.