

Interpretive Structural Modeling Approach to Analyze the Interaction Among Key Factors of Risk Management Process in SMEs: Polish Experience

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ABSTRACT:

Many drivers are shaping the risk management processes in enterprise. Understanding the interrelationships between individual risk drivers is a significantly important for decision making processes. This is a complex challenge especially for SMEs enterprises. This paper aims to identify the most important risk factors and determine the interactions of these factors in risk management process in small and medium firms based on Polish SMEs experience. This study is based on the technique Interpretive Structural Modelling (ISM), in order to delineate a flowchart that shows the main risk factors (and their relationships) influencing the risk management processes in small and medium enterprises. Through a process of modelling it was possible to reach a graphical presentation that shows the operating sequence of main risk factors in order to understand the logic of their relationship. The final model is a useful tool that can be adopted to optimize decision making process in SMEs from risk perspective.

Keywords: enterprise risk management, interpretive structural modeling (ISM), risk factors, SMEs

1. Introduction

Risk management, particularly in the field of SMEs management, turns out to be an important challenge. Including risk aspects in decision making process is vital if businesses are to meet their objectives. Including risk aspects in decision making process is vital if businesses are to meet their objectives. As indicate many researchers (Al-Rashidi 2012; Altuntas and Berry-Stölzle 2011; Falkner and Hiebl 2015; Gorzeń-Mitka 2017; Haviernikova 2016; Wieczorek-Kosmala 2014) nowadays risk management becomes a necessity and requires a systematic consideration in decision-making processes of the businesses. It is necessary for all enterprises, but this is particularly important for small and medium sized enterprises (SMEs). Researchers and practitioners agree that the environment within which SME's have to function in the 21st century is one that is increasingly competitive and dynamic (Kana and Mynarzova, 2015; Kuběnka and Slavíček 2016; Kuraś, Kuraś and Lis 2015; Sipa 2018, Sitek 2017). In order that the challenges can be met successfully, it is important that SMEs should be helped to both recognise the risks and then manage them. The diagnosis of key risk factors and determine the interactions of these factors in risk management process in SMEs seems to be a legitimate. The aim of this study is to explore various risk management process determinants in the SMEs, to establish relationships among the them through ISM methodology. In the literature, researchers indicate many techniques to used for modeling and multi criteria decision making. Main of them, which allow for taking into

consideration multiple decision criteria simultaneously, are Interpretive Structural Modeling (ISM), Analytic Network Process (ANP) and Analytic Hierarchy Process (AHP) (Jitesh, Arun, Deshmukh 2008). ISM is a well-established methodology for identifying and summarising the relationships among specific elements which define a problem or an issue (Warfield, 1973, 1982). The proposed model provides a useful tool for SMEs to focus on those determinants of decision making process that are most important for effective risk management. Understanding their relationships will help organisations developed their decision making processes.

The primary purpose of this research is to contribute to the understanding of the relationships between risk management determinants in micro, small and medium size enterprises. Additional aim of this study is, at least partially, fill a gap on the knowledge of risk management in SMEs.

The rest of the paper is organized as follows. Section 2 (Theoretical background) describes the some remarks from literature review on the determinants of risk management in SMEs. Section 3 presents methodological information and research procedure. Section 4 presents and describes the results of research. In Section 5 was indicate limitation of this study and Section 6 concludes.

2. Theoretical background - some remarks from theory and practice on risk management determinants in SMEs

SMEs make significant contributions to the economies of many countries. From the one hand, they are viewed as a source of flexibility and innovation, but from the other hand SMEs are perceived as high-risk ventures. The debate on risk management in SMEs is conducted by academic researchers for nearly 30 years (Gorzeń-Mitka 2016, 2017a, Sheedy and Griffin 2015, He and Lu, 2018), but now this discuss is more intensive. Islam and Tedford (2012) and Gorzeń-Mitka (2018) consider that risk management is less well developed within SMEs. In this case, the strong organisational culture sometimes mitigates against managing risks in structured way. But it isn't risk culture. A firm's risk culture significantly improves its capability to take strategic risk decisions and deliver business performance targets. According previous authors' studies (Gorzeń-Mitka, 2016, 2017b) risk management culture in SMEs is low.

According to Florio and Leoni (2017) and He and Lu (2018) the SMEs are reluctant to adopt a formal risk management strategy, even though most of studies showed that the key causes of SMEs failure include poor management (Sipa 2018, Wasiluk 2017), lack of risk management planning, and failure to adopt a risk limit threshold. The majority of the SMEs do not have systematic risk management strategies in place (Gorzeń-Mitka 2017a). Verbano and Venturini (2013) and Liebenberg and Hoyt (2003) suggests that risk management practices in SMEs are often very informal, which inhibits their building risk management capacity. In the other hand, Falkner and Hiebl (2015) indicates numerous studies in which shown how SMEs take a proactive approach to risk.

Undoubtedly, the awareness of small and madium enterprises about risk is growing (Sipa 2018, Skibiński 2016; Skowron-Grabowska and Mesjasz-Lech 2016). Gorzen-Mitka (2017a) and Islam, Tedford (2012) revealed that most operators of SMEs

considered risk management as important and thinks that it should be incorporated in and integrated with their operations. Risk management practices should be made simple and incorporated in the operational plan and organizational culture of small and medium scale enterprise in a bid to improve business performance (He and Lu 2018).

As the author points out in his earlier works (Gorzeń-Mitka 2018), one of unique research, where factors that influence a company's decision to start an ERM program are indicated is study of Altuntas and Berry-Stölzle (2011). The result of the study was to identify the few relationships. First relationship is positively related with affiliated companies are capital allocation methods, performance measurement mechanisms, the aggregation of risk and the implementation of a risk management culture. Second - positively related with size and sustainable performance are incentive contracts and positively related with the total amount of taxes paid relative to firm assets is implementation of a risk management culture. Study indicates also negatively relationship - its related with past performance are performance measurement mechanisms, incentive contracts, the implementation of a risk management culture and audit. Additionally negatively related with lagged changes in performance are performance measurement mechanisms, the aggregation of risk, ERM adoption and the implementation of a risk management culture. In the end, study indicates that managers are more likely to adopt external ERM components than internal.

Interesting conclusions about the determinants of risk management process provides study by Gatzert and Martin (2013). Regarding the determinants of ERM their findings show that while some determinants (assets' opacity, growth opportunities) are not significantly related to the development of an ERM system or are ambiguous regarding the direction (financial leverage), the company size and the level of institutional ownership are, in particular, identified in most studies as significant factors that positively affect the implementation of an ERM system.

According to Florio and Leoni (2017) and Islam, Tedford (2012) a key elements of successful implementation of risk management process is support from top management. It is especially important in regard of SMEs which are regarded as open to risk taking. In this reason risk management in SMEs should stay focused by top leaders.

Next crucial element shaping the effective risk management system in organization is risk communication. It should be provided against the background of that existing perception. As indicate many researchers to manage risk effectively, it is important to build strong communication flows and data reporting (Beretta, Bozzolan 2004; Gorzeń-Mitka 2017c; Hopkin, 2010).

Author points, that the relationship among risk management factors (especially those point out above) are a key elements to improve decision making process. Taking account of the above, it appears advisable to commence research on the link between selected factors of risk management process in SMEs.

3. Problem formulation and methodology

The aim goal of this study is to determine the relationship among key factors of risk management process in SMEs. In this article relationship among selected factors of

risk management process will be analysed. There is an assumption, proposed by the author, that all variables are interrelated with each other dependence.

3.1. Research method

The current study tackles a assessment of relationship among selected factors of risk management process in Polish SMEs by applying a Interpretive Structural Modelling (ISM). Interpretive Structural Modelling (ISM) is one of the unique management methods that provides a structured method for dealing with complex issues. The concept of ISM was primary introduced by J. Warfield in 1973 and develop by him in the following years (Warfield 1973, 1982).

This method consists of seven steps:

- Identification of the crucial elements that are relevant to the problem.
- Establishing the contextual relationship among elements.
- Developing a structural self-interaction matrix (SSIM).
- Determine the reachability matrix.
- Identify the level partitions.
- Classification of key factors of risk management process based on their driving and dependence power.
- Drawing ISM graph of key factors of risk management process in SMEs.

These method have been applied in different studies in many different areas (Attri, Dev, and Sharma, 2013; Jitesh, Arun and Deshmukh, 2008). In this study it was use ISM method procedure describe by Janes (1988) and Alawamleh, Popplewell (2011).

3.2. Description of the study sample

The study was conducted in first half of 2017 on a sample of 269 companies, categorized, according to the number of employees, as small and medium enterprises (micro-enterprise 21,2%, small-enterprise 58,9%, medium-enterprise 20,8%). Small businesses dominated the sample. The survey questionnaire was addressed to both manufacturing (28,3%), trade (19,6%) and service (15,7%) enterprises. Questionnaires were sent to owners of businesses and people responsible for risk management in companies. A part of questionnaire was developed using ISM methodology to determine underlying relations among these factors. 73 risk management experts from SMEs finally participated in part of the study, regarding the evaluation of the relationship among the factors of the risk management process.

In this study, I concentrate on a key factors referring to a risk management process in SMEs. Leading factors of risk management in SMEs was selected based on literature review. Using the research data collected from 73 respondents and following the ISM method steps, the ISM directional graph is developed.

4. Interaction between key factors of risk management process in SMEs - results of research

Experts judgment are use to describe the contextual relation of all the ten factors. With the use of this methodology, we can identify the direct and indirect relationships between factors of risk management process in SMEs. The results of expert

opinion, based on ISM methodology symbols (V,A,X,O), was shown in provide input to structural self-interaction matrix (table 1).

Table 1. Structural self-interaction matrix (SSIM)

	Risk management determinants	1	2	3	4	5	6	7	8	9	10
1	Support from top management		V	V	A	X	X	V	V	V	O
2	Promote communication on risks and a risk culture	A		V	O	X	O	O	O	O	O
3	Defined and transparent rules, procedures and internal control	A	A		X	A	A	A	A	A	A
4	Coherence of risk management with objectives of company	V	O	X		O	O	X	X	X	X
5	Awareness and knowledge of the risk management process	X	X	V	O		O	O	O	O	V
6	Risk description in the company profile context	X	O	V	O	O		A	A	A	X
7	Designation level of risk tolerance	A	O	V	X	O	V		X	X	V
8	Designation of risk respond	A	O	V	X	O	V	X		X	V
9	Designation risk assessment criteria	A	O	V	X	O	V	X	X		V
10	Review of risk management impact to the company's operations	O	O	V	X	A	X	V	V	V	

V - the row influences the column; *A* - the column influences the row; *O* - there is no relation between the row and the column;

X - row and column influences each other

Source: own study

A converted symbolic structural self-interaction matrix into binary matrix (elements are 0 or 1) provides the reachability matrix (Table 2). Based on initially reachability matrix, driving power and dependence power were calculated for each criterion - MICMAC matrix (Figure 1). The purpose of MICMAC analysis is to analyze the drive power and dependence power of factors. It is done to identify the key factors that drive the system in various categories. Based on their drive power and dependence power, the factors, have been classified into four categories i.e. autonomous factors (weak drive power and weak dependence power; relatively disconnected from the system, with which they have few links, which may be very strong), linkage factors (strong drive power as well as strong dependence power; any action on these factors will have an effect on others and also a feedback effect on themselves), dependent (weak drive power but strong dependence power) and independent factors (strong drive power but weak dependence power, key factors of system) (Attri, Dev & Sharma 2013). Using

this method allows us to arrange selected risk management factors into four distinctive categories. As Figure 1 shown, there were 2 autonomous criteria (2 - promote communication on risks and a risk culture, 5 - awareness and knowledge of the risk management process). It indicates that there were disconnected factors from the system.

Table 2. Reachability matrix table

	Risk management determinants	1	2	3	4	5	6	7	8	9	10	Driver
1	Support from top management	1	1	1	0	1	1	1	1	1	0	8
2	Promote communication on risks and a risk culture	0	1	1	0	1	0	0	0	0	0	3
3	Defined and transparent rules, procedures and internal control	0	0	1	1	0	0	0	0	0	0	2
4	Coherence of risk management with objectives of company	1	0	1	1	0	0	1	1	1	1	7
5	Awareness and knowledge of the risk management process	1	1	1	0	1	0	0	0	0	1	7
6	Risk description in the company profile context	1	0	1	0	0	1	0	0	0	1	4
7	Designation level of risk tolerance	0	0	1	1	0	1	1	1	1	1	7
8	Designation of risk respond	0	0	1	1	0	1	1	1	1	1	7
9	Designation risk assessment criteria	0	0	1	1	0	1	1	1	1	1	7
10	Review of risk management impact to the company's operations	0	0	1	1	0	1	1	1	1	1	7
	Dependence	4	3	10	6	3	6	6	6	6	7	

The rules of transformed the SSIM table into the initial reachability matrix: if in the SSIM is V, then the entry in the reachability matrix becomes 1; if in the SSIM is A, then the entry in the reachability matrix becomes 0; if in the SSIM is X, then the entry in the reachability matrix becomes 1; if in the SSIM is O, then the entry in the reachability matrix becomes 0.

Source: own study

According to Figure 1, the factors 4 - coherence of risk management with objectives of company, 7 - designation level of risk tolerance, 8 - designation of risk respond, 9 - designation risk assessment criteria, and 10 - review of risk management impact to the company's operations, were positioned in the group of linkage criteria.

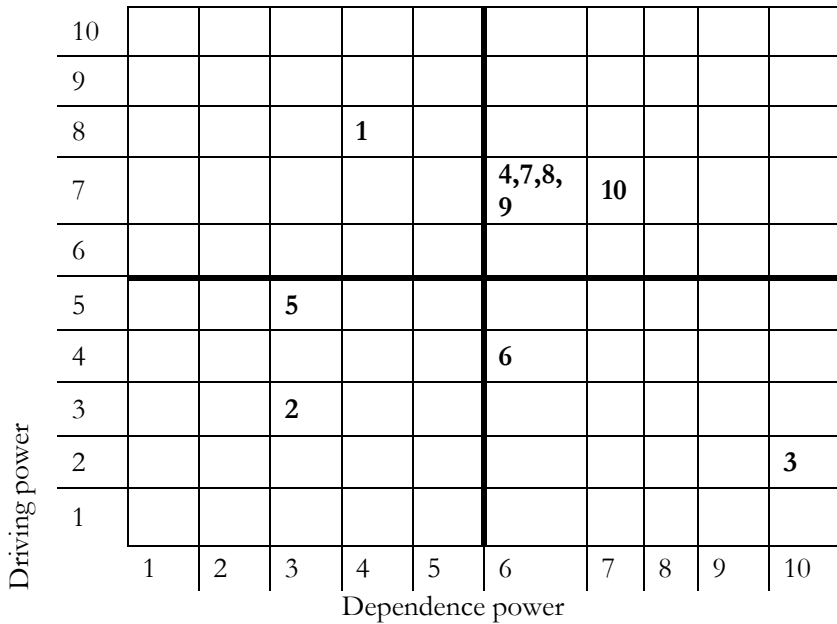


Figure 1. Driver power - dependence diagram

Source: own study

Any stimulate to these criteria may have an influence on the other criteria and therefore get a new feedback from the system. The factor 1 - support from top management- was positioned in the category of dependent criteria. There were also 2 independent criteria: 6 - risk description in the company profile context, 3 - defined and transparent rules, procedures and internal control). In the current study, it was a key factors of risk management system in SMEs.

In next step, following graph (Figure 2) was generated to portray the relationship among selected factors of risk management process in SMEs. The structural model is generated from the final reachability matrix. The Figure 2 portrayed both the direct and the indirect relationships between key factors of risk management process in polish SMEs. It can be seen in Figure 2 that basic elements of risk management process (level of risk tolerance, ways to risk respond, risk assessment criteria) and designation of risk management impact to the company's operations and their objectives are very significant elements for implementation of this process of the Polish SMEs, as they come at the base of the ISM model. Defined and transparent rules, procedures and internal control is the element which most reflects the implementation of risk management process of SMEs. This factor appears at the top of the model.

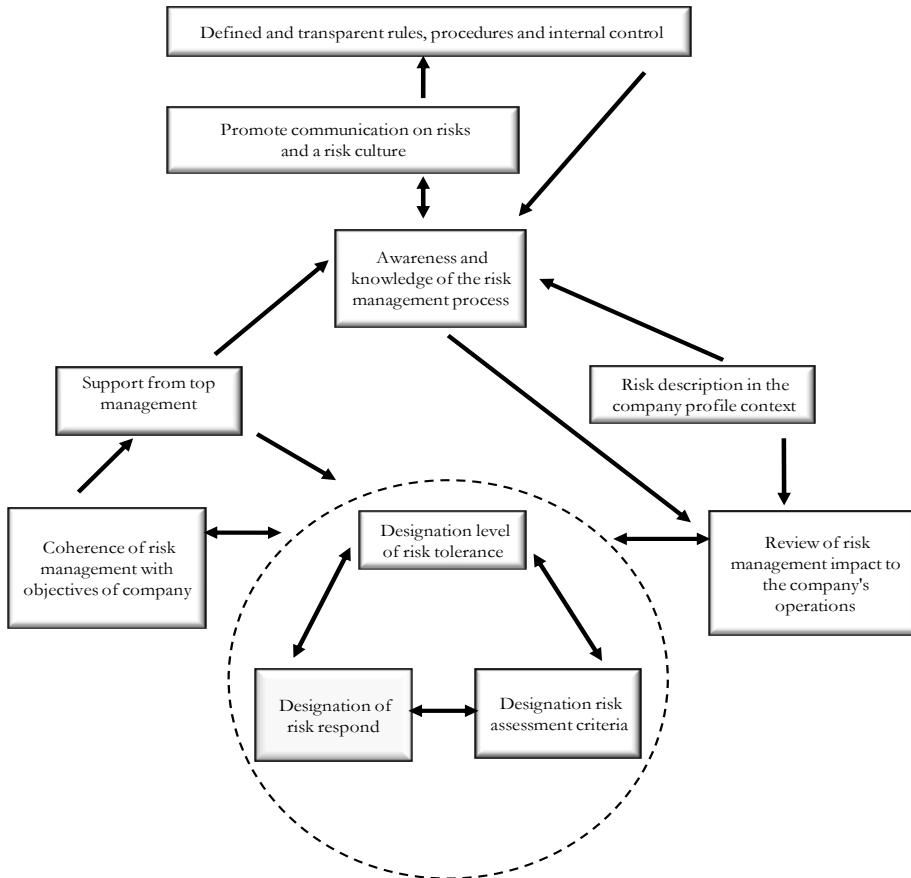


Figure 2. The interaction among key factors of risk management process in SMEs - ISM model
Source: own study

5. Limitation of this study

While this study contributes to fill a gap on the knowledge of risk management in SMEs, some limitations open up avenues for further research. First, study on risk management in SMEs, especially on determinants of this process is undoubtedly a multidimensional concept. In this study are investigated only selected factors of risk management process in SMEs enterprises opinion. There are many other areas of challenges in this area and future research should investigate the relationships between other dimensions of this concept. Second, this research aimed to identify selected challenges in an exploratory way and the ISM methodology was developed using the knowledge of experts, which represents an element of bias. Also, as the research focuses on one specific sector context, the Polish SMEs, the findings are not universally applicable across different sectors or in different countries. Finally, the model has not been statistically validated. Future research could extend this research concept here identified complementing it with dedicated areas such as business aspects.

Conclusions

The objective of the ISM model in this research is to understanding of the relationships between risk management determinants in micro, small and medium size enterprises. The model developed in this paper provides the opportunity to understand the relationships among key risk management factors. As indicate Alawamleh and Popplewell (2011), the task of decision making process is to place high priority on those factors that form the base of ISM model because it is they who would drive other factors, in this case concerning on risk management process. Using ISM methodology it provides an understanding of the relationships among the risk management determinants in the SMEs; classification of determinants under autonomous, dependent, linkage and independent categories and suggested model would help the SMEs to develop strategies to mitigate risks in complexity environment.

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