Int j simul model 23 (2024) 3, 412-423
Original scientific paper

INTEGRATED MODEL OF RISK MANAGEMENT IN BUSINESS PROCESSES IN INDUSTRIAL SYSTEMS

Stojic, N.; Delic, M.; Bojanic, T.; Jokanovic, B. & Tasic, N.
University of Novi Sad, Faculty of Technical Sciences, Trg Dositeja Obradovica 6, Novi Sad, Serbia
E-Mail: nikola.stojic@arthaus.info, delic@uns.ac.rs, tamarabojanic@uns.ac.rs, bojanajokanovic@uns.ac.rs, nemanja.tasic@uns.ac.rs

Abstract
Today's business systems are faced with an increased intensity of changes from the environment, growing complexity and increased competition, which affects the increase in the level of risk in all areas of management and execution of business processes. Therefore, Risk Management (RM) discipline and practice is increasingly applied in almost all types of business systems. RM is the systematic approach of identifying, estimating and reducing threats or uncertainties that may influence organizations. This article presents the proposed model for monitoring and managing business risks, including strategic and operational goals, organizational responsibility and management, business performance, internal audit and internal control, application of information systems and the success of business processes. The research was conducted on a sample of 387 respondents, employed in manufacturing and service companies. The research results show that organizations that accept the proposed model have a chance to successfully manage risks in their business processes.
(Received in April 2024, accepted in June 2024. This paper was with the authors 3 weeks for 2 revisions.)

Key Words: Risk Management, Business Process Management, Performance Management

1. INTRODUCTION

The complexity of the global business environment and the frequency and speed of change have contributed to the failure of many companies [1]. Many authors associate this phenomenon with the application of inadequate risk management systems [2, 3]. Risk management is a highly complex process that also requires the use of various tools within the model to effectively manage business risks. Risk management is a systematic process for identifying, analysing, and assessing risks to determine the most effective way to manage them [4]. Risks are often handled haphazardly in daily business operations, leading to unnecessary and unexpected costs due to failures, which ultimately reduces overall value of the organization.

Risk management is a very important responsibility of top management and certainly an important factor in successful business. In order to make a correct decision about the importance of a certain risk and to define appropriate activities aimed at reducing it, it is necessary to initiate a process that is today called risk management. Risk management in organizations implies a systematic reduction of the possibility of an error of any type, together with the minimization of the consequences of that error [5]. For every modern organization, errors mean cost, i.e. loss of competitiveness, and avoiding costs that are a consequence of errors in work processes is the main goal of every company. Risk management adds value to the organization by not only identifying potential threats but also by uncovering potential opportunities [6]. The ISO 31000 standard is designed for organizations of all types and sizes that encounter internal and external factors and influences causing uncertainty in achieving their objectives. However, these standards have limitations; they cannot quantify metrics, assess the impact of value on the business, or determine materiality arising from inadequate risk assessment.

Enterprise risk management (ERM) represents management that deals with uncertainties in the enterprise business operations. ERM has been seen as a fundamental paradigm in the

trend moving towards holistic risk management [7]. Interest in ERM is growing and a large number of organizations have ERM programs that have already been applied or are in the implementation phase [8]. COSO (The Committee of Sponsoring Organizations of the Treadway Commission) developed the concept of risk management (ERM), as a framework that was created for risk management in order to ensure the achievement of the company's goals and identify events that can affect the company's operations [9]. Strategic risks are defined as those risks that are most consistent with the organization's ability to implement its strategies and achieve its business goals [10]. The previous models of business risk management have shown certain shortcomings, primarily related to the fact that the mentioned models did not define how models for assessing business risks can help to express risk through financial indicators [11]. The proposed model for monitoring and managing business risks includes strategic and operational goals, organizational responsibility and management, business performance, internal audit and internal control, application of information systems and success of business processes.

2. THEORETICAL BACKGROUND

Business process management (BPM) represents a set of different approaches to managing business processes based on software systems that enable modelling, execution, monitoring, control and adjustment of business processes in the organization [12]. Traditional BPM systems function separately from the domain of risk management [13], resulting in the occurrence of adverse events. It is necessary that, in the execution of business processes, attention should be paid to the risks they face, in order to manage those risks as an integral part of the given process. BPM enables modelling of business processes and creation of business process maps, which is significant because it allows us to clearly and unambiguously define business processes, in order to identify business operations. The BPM system enables us to document knowledge about processes in the company, standardize work, process analysis, risk detection, and thus enables us to improve processes as well as the possibility of automating processes.

The need to incorporate risk into the business process model led to the establishment of an approach called risk-aware business process management (R-BPM) [13]. The given approach defines R-BPM as a system that integrates risks into the organization's business processes in order to increase the awareness of the impact of risks on the efficiency of business processes. This integration should ensure the effective identification, detection and management of risks that arise in business processes [14].

Integrating risk at the level of business processes is the topic of research by several authors, whose results indicate many challenges in risk-aware business management (R_BPM), which is considered a new management paradigm [14, 15]. Some of the most commonly cited challenges are related to the decision to introduce either a pure modelling approach or a pure management approach for R-BPM [16]. When developing an integral risk management model, it is necessary to identify and define key factors (dimensions) that have all the features of that model, and which will represent only their own construct in the model, and not build a new one with others, when defining key factors. The research of numerous literary sources contributed to the identification of six dimensions of the assumed model. The key factors (dimensions) that are used in the development of an integral business risk assessment model in companies are described below.

2.1 Strategies and goals

Organizations must base their operations on a mission, vision and set goals and adapt their strategy to achieve those goals. According to Castro et al. [17] and Rummler and Brache [18]

it is necessary to first identify real or potential problems that affect the organization's strategy. In creating the company's goals and strategies, in addition to the employees who are the runners of the process, it is necessary to include as many interested parties as possible.

In order to be able to control and improve the processes, the goals of the process must be defined and the employees must be aware of the process in which they participate, its goals and their role, as well as to actively cooperate in achieving the stated goals [19]. Research conducted by Castro et al. [17] indicates that the key factors for the successful implementation of BPM are top management support and alignment of goals with strategic planning.

The first stage of the BPM life cycle is identifying a critical issue, which involves recognizing an actual or potential problem that impacts the organization's strategy [18].

2.2 Business process management

The basic idea in managing the business processes of the organization is to develop business processes while removing activities that do not add value and improving the process flow within the limits of the organizational functions of the company [20]. BPM represents an interconnected set of managerial approaches that enable business processes to be designed, implemented, monitored and adjusted with the support of integrated software applications of modern information systems [12]. The structure of the BPM approach consists of methodologies, metrics and IT applications that enable the design, monitoring, measurement and adjustment of business processes in the organization [21]. One of the important capabilities of the BPM approach is that it enables the transfer of planned strategies and goals from the highest organizational level to the level of business processes. Application of this approach requires two clearly defined elements: organizational strategy and process architecture [22]. In order to ensure the efficient and effective connection of business processes with the organization's strategy, clearly set goals of the process are needed. Without agreed and clear process goals, it is not possible to improve processes in which added value is created. Process architecture includes the following elements: business system goals (definition and measurement of goals), strategies (solid connections with consumers, service quality, agile processes, ...), business process model (internal and external integration of processes) and basic guiding principles of the business system (business system values).

2.3 Management responsibilities and human resources management

For the successful implementation of an integrated risk management model, a risk analysis must be performed and one must be aware of the possibility of risks occurring within the process. Risk management is considered essential for good corporate governance. Risk management, along with controlling and internal auditing, is an important instrument of corporate governance in terms of clear demarcation of management and leadership, i.e. capital owners, boards and managers. The applied Model of business processes in the organization must contain information related to risks in business processes [15]. In order to successfully prevent or reduce the possibility of risk occurrence, it is necessary for top management and employees to be aware of the importance of risk management in the company [13]. In the research conducted by Castro et al. the main factor that prevents the application of process management, and therefore risks, is human resistance to change. This is why it is necessary for employees to have more access to BPM information. The most frequently noted factor in the literature is the necessary support from top management [17]. For the successful realization of the set goals and strategy, managerial responsibility is also required. The role of management and executive management is that they themselves should recognize the importance of risk assessment and management. The role and responsibility of management is to provide all the necessary resources for a process to take place efficiently. In addition, it is

necessary to ensure the motivation of all employees to do the jobs they know best and to be adequately rewarded for that, which will affect the success of the process itself and therefore reduce risk [23].

2.4 Business information systems, resources and knowledge

IT-based process management is often written in the literature. Hammer [24] argues that BPM is basically a management concept, and IT is mostly a peripheral aspect of it. However, information technologies have a significant role in managing processes [25] and it is very important that IT and processes are in harmony with each other [12]. Information systems allow employees to achieve electronic and verbal communication in the simplest and most secure way, which allows them to obtain information necessary to perform a certain business process and provides them with adequate procedures for saving data and procedures for recovering data in case of loss [26]. In this way, it is easier to monitor the process and determine the place of occurrence of risk as well as the cause of occurrence of risk. The knowledge, skills and responsibility of employees are necessary in order for them to be successfully involved in the risk management process. Training managers improve the exchange of knowledge in the company and reduce the gap between employees and superiors. The organization has the appropriate resources (such as people with process knowledge) to create a "process orientation culture". By looking at all the risks that come from the business culture and environment, success in managing the company can be significantly influenced.

2.5 Internal auditing

Internal auditing provides assurance by evaluating and reporting on the effectiveness of corporate governance, risk management and control processes designed to assist the organization in achieving its strategic, operational, financial and compliance objectives. Internal audit is best positioned to provide assurance when its resources, competencies and structure are aligned with organizational strategy and appropriate standards. Internal audit helps businesses achieve their goals by introducing a disciplined approach to assessing and improving the effectiveness of risk management, process control and leadership. Internal audit does not focus on the past, but on the current state and how the company will deal with risk in the future [27].

The primary role of internal audit is in evaluating the functioning of the risk management process defined by the management, while its secondary role is reflected in proposing measures to improve the process and eliminate weaknesses and deficiencies, in order to reduce the risk to a level acceptable to the company. Internal audit's independence from management ensures that internal audit can plan and carry out its activities without restriction or prejudice, using unrestricted access to people, resources and information as needed. However, Regular interaction between internal audit and management is essential to ensure that internal audit activities remain relevant and aligned with the organization's strategic and operational needs [23]. Through its activities, internal audit enhances the organization's knowledge and understanding, thereby contributing valuable assurance and advice as a trusted consultant and strategic partner. There is a need for collaboration and communication between management, front line and second line roles, and internal audit to avoid unnecessary duplication, overlap or gaps.

2.6 Business process performance

Business process performance is a term of English origin and is most often translated as performance or success. Some of the authors view performance as the organization's ability to achieve its goals [27]. According to the previous, performance can be defined as the

organization's success in achieving goals and performing its mission, both in terms of efficiency and effectiveness. The performance of the organization, that is, the business process understood as success in achieving goals, is a multidimensional quantity, which includes effectiveness and efficiency, qualitative and quantitative indicators, behaviour and products of behaviour. It is necessary to determine what the process is, in order to be able to analyse the current situation of the mapped process and to identify risks, because risks affect effectiveness and efficiency [18]. It is also very important to measure performance, because the establishment of key performance indicators is essential for periodic monitoring of process performance [18]. Measuring and analysing organizational performance is crucial for achieving organizational goals. Performance is typically assessed by measuring qualitative and quantitative performance indicators (e.g., profit, number of clients, costs). It is especially important for each company to identify relevant indicators, understand how they relate to the company's goals, and determine how they are influenced by the activities performed [28]. Companies that perform systematic risk management have a high level of organizational performance. The data indicates that companies should have specific measures for performance, in order to link the way in which risks are managed and the impact of risks on business process performance.

3. HYPOTHETICAL MODEL OF RISK MANAGEMENT

The basis for the successful implementation of the BPM approach is a clearly set strategy and business goals of the organization. Business processes can have different goals, and those goals are supported by activities in the processes [19]. Hernaus et al. [29] emphasize that top management is committed to executing the strategy through related business processes and that the success of BPM implementation depends on management support. Therefore, risks are sensitive to objectives because risks are linked to activities. It is necessary to clearly define business processes, in accordance with the set strategy, in order to reduce the possibility of risk. It could be argued that business strategies and goals have a positive impact on business processes, and thus on the risks that may arise in these processes. Castro et al. [17] concluded that the main factor preventing the application of process and risk management is human resistance to change and problems with top management support. Suriadi et al. [13] indicate that top management and employees should be aware of the importance of risk management in order to reduce the possibility of risk occurrence. For the successful realization of the strategies and goals, management responsibility is also needed, and the role of management and leadership management is that they themselves should recognize the importance of risk assessment and management. Cotes and Ugarte [30] claim that organizations that manage strategic goals are high-performing companies, because strategic goals are linked to critical processes, employees, and technologies.

Škrinjar and Trkman in [31] emphasize that for the successful management of business processes, it is necessary to know who is authorized for which part of the process, in order to be able to determine responsibility due to the occurrence of risks. During the process, risks related to information technology, human resources and management responsibility and business process management may arise. Kummer and Mendling in [32] conclude that all risk management activities are carried out from the executive director to the employees who are responsible for the execution of risk management in the organization. Information technologies can be used to link risks with data and resources. Information technologies have a significant impact on the successful design, execution, monitoring and adjustment of business processes, and therefore on risk management in business processes. Without the use of information technologies, it is not possible to manage business processes and risks in real time.

The results of business process management are measured using a performance management system. Successful management of business processes affects risk management. In order to improve performance and reduce risk in business operations, more and more companies are introducing internal control systems and resource management [10]. Risk management improves the performance of business processes because it helps companies avoid losses. The previous considerations and theoretical background are the basis for setting up the hypothetical model of risk management, which is shown in Fig. 1.

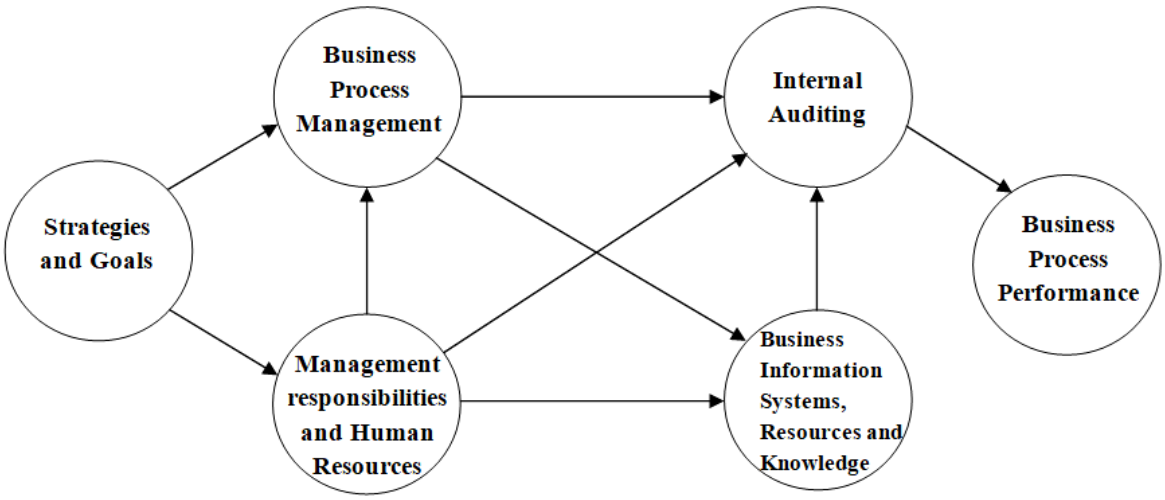

Figure 1: The hypothetical model of risk management.

4. MODELLING RESULTS

For the purposes of researching risk management in business processes, the method of surveying respondents was used. The research was conducted on a sample of 387 respondents, employed in manufacturing and service companies. The questionnaire consists of 58 questions, which were answered electronically. The questions are divided into three parts. The first part consists of general questions related to the company and the respondent. The second set of questions consists of 6 categories, which are actually constructs of the theoretical model of risk management. Respondents' subjective estimates were collected with a five-point Likert scale. The first category has questions related to strategic approach and goals (*ST*), the second category has questions related to business process management (*BP*), the third category has questions related to managerial responsibility and human resources management (*UO*), the fourth category has questions related to business information systems, resources and knowledge (*IS*), the fifth category has questions related to internal audit (*IR*) and the sixth category was related to the business performance of the company (*PP*).

4.1 Construction of the hypothetical model

The methodology and statistical analysis used in this step of the research is Confirmatory Factor Analysis (CFA). The confirmatory factor analysis provides statistical testing of the hypothetical model, i.e. the correctness of the construction of constructs from the variable samples and their interconnections and interdependence. The hypothetical model is tested statistically with the help of data obtained from the research sample and there are several statistical parameters on the basis of which the adequacy of the hypothetical model is assessed. Factor validity of individual subscales using a factor analysis of the scale was conducted, and the validity of each of the subscales was also checked. In order to confirm the factor validity of Item, the main components method was conducted on the each individual item by reducing to the first main component.

By setting the hypothetical model, it was determined that certain issues do not describe at least 70 % variance, that is, they do not build well their assumed constructs. In order to increase the reliability of the scale, 10 items are switched off. After the questions were removed, the analysis of the validity and confidence of constructs was performed. Before the analysis of validity and reliability, constructors must undergo the analysis of the validity of the questionnaire. Cronbach's Alpha is a measure of internal consistency, i.e. how close the items is closely linked as a group. It is considered a measure of scale reliability. The general rule is that the Cronbach's Alpha of 0.70 and more above is good, 0.80 and above is better, and 0.90 and above is the best. The results of the analysis are shown in Table I.

Table I: Construct reliability and validity.

Key factors (dimensions)	Cronbach's Alpha	rho_A	Composite reliability	Average variance extracted (*AVE*)
Business information systems, resources and knowledge (*IS*)	0.891	0.896	0.915	0.605
Internal audit (*IR*)	0.914	0.918	0.933	0.700
Business process performance (*PP*)	0.897	0.909	0.920	0.658
Strategic approach and goals (*ST*)	0.868	0.870	0.901	0.602
Management responsibility and HR management (*UO*)	0.883	0.886	0.909	0.588
Business process management (*UP*)	0.882	0.885	0.911	0.631

The composite reliability of the sample was applied and in the analysis of the obtained data no shortcomings were observed. In addition to the composite reliability of the sample in the analysis of data obtained by research, the convergent validity of the sample was applied using the average extracted variance (*AVE*). In addition to the convergent and composite validity of the sample, the simplicity of each of the model constructors was calculated, i.e. discriminant validity was performed. Discriminant validity is done for each pair of constructors and the analysis is satisfied if at least one item is constituted by a construct. From Table II, we can conclude that the conditions for validity of the structure are met.

Table II: Analysis of discriminant validity.

Key factors (dimensions)	Business information systems, resources and knowledge	Internal audit	Business process performance	Strategic approach and goals	Management responsibility and HR management	Business process management
Business information systems, resources and knowledge	**0.778**	-	-	-	-	-
Internal audit	0.621	**0.837**	-	-	-	-
Business process performance	0.718	0.514	**0.811**	-	-	-
Strategic approach and goals	0.621	0.511	0.689	**0.776**	-	-
Management responsibility and HR management	0.687	0.55	0.771	0.745	**0.767**	-
Business process management	0.672	0.746	0.631	0.678	0.711	**0.794**

In order for the research sample to meet discriminant validity, the value of all constructs in the model should be over 0.700. The results of the research showed that the discriminant

validity of the construct was found in an interval from 0.767 to 0.837, and thus satisfies the mentioned condition. Statistical analysis of the testing of the sample reliability, after the exclusion of certain items, i.e. questions from the survey, has proven that the sample meets the composite validity of the sample because the values of the reliability for all constructs are higher than 0.7, and it meets also convergent validity conditions because reliability values are higher than 0.5. In addition to previous testing, the discriminant validity of the sample was also confirmed which means that each of the factors form one construct and no factor participates with other factors in the formation of a construct.

4.2 Empirical model of risk management in business process

After testing the hypothetical model and determining the validity of the sample, the empirical model of business risk measurements was made. The task in this chapter is to determine direct and indirect statistical interdependence between the constructs of the model. Each construct has all the necessary features proven through the analysis of the reliability of the influence of each item to the characteristics of the construct. Based on the obtained results (*T* statistics, ≥ 1.96), it can be concluded that all relationships are statistically significant, in terms of influence between the latent variables, because the obtained results are in the interval of 3.441 observing interdependence of influence from business information systems, resources and knowledge towards internal audit up to 20.463 observing direct interdependence from strategic approach and goals towards managerial responsibilities and human resources management. In all other connections between the constructors, *T* statistics (|*O/STDEV*|) has value $\geq$ 1.96. Only at one interdependence, *T* statistics (|*O/STDEV*|) is less than 1.96 – management responsibilities and human resources management to the internal audit is negative and is 0.826. By applying *T* statistics, we see that there is no direct interdependence between these two constructs. The obtained results are shown in Table III.

Table III: Structural model statistics.

Interdependence between the constructs	Original sample (*O*)	Sample mean (*M*)	Standard deviation (*STDEV*)	*T* statistic (|*O/STDEV*|)	*P* value
ST->UP	0.331	0.333	0.082	4.04	0.0000
ST->UO	0.745	0.747	0.036	20.463	0.0000
UO->UP	0.465	0.463	0.087	5.334	0.0000
UP->IR	0.627	0.624	0.077	8.115	0.0000
UP->IS	0.372	0.373	0.08	4.65	0.0000
UO->IR	-0.063	-0.062	0.076	0.826	0.4090
UO->IS	0.422	0.424	0.084	5.053	0.0000
IS->IR	0.242	0.246	0.07	3.441	0.0010
IR->PP	0.514	0.519	0.052	9.81	0.0000

Constructing the empirical model using statistical methods, an analysis of direct interdependence of the constructs of the model was performed. The analysis showed that there is no direct impact between constructs management responsibility and human resource management and internal audit. In order to prove whether there is interdependence between these two constructs, an analysis of indirect interdependence of the model constructs is performed. Based on all above, the final model of business risk assessment was created (Fig. 2).

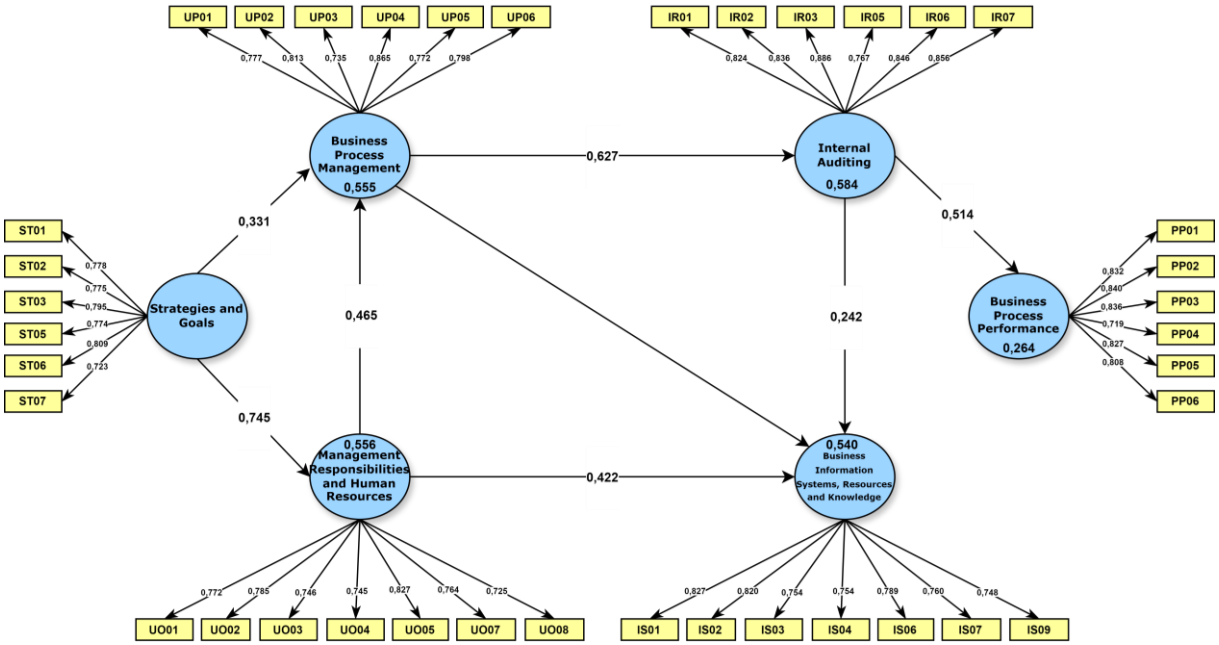

Figure 2: The final model of risk management.

5. DISCUSSION

The results of the analysis of the statistical significance between dimensions of hypothetical models given in the previous chapter show that this research supports the results previously obtained by other researchers [17, 18, 23, 28, 33]. The research shown in this paper was aimed at developing a business risk assessment model, in order to eliminate some of the shortcomings of existing models that we have studied and analysed. Based on the analysis of the obtained results, we can state that there is a high opinion on the need for risk management in the company. Respondents expressed their opinion that it is necessary to manage business risk and that it is necessary to develop a model that would be eligible for all companies.

The aim and contribution of research is that the integrated model for business risk assessment was developed. The first step in the development of the model was to define constructs and all their properties and characteristics. Before designing the model, a hypothetical model with all constructs and items as well as connections and interdependences between constructs was proposed. After determining the reliability of the sample and the characteristics of the model, certain items were removed and the hypothetical model was obtained. The hypothetical model itself showed that there is direct statistical interdependence between all constructs, except that the management responsibility and management of human resources are in a positive relationship with internal audit, because the determined value of 0.4000, obtained by using *T* statistics, is more than 0.

In addition to direct statistical interdependence, T statistics is also used to inspect indirect interdependence to determine whether all indirect connections are well defined. The connections were found to be well defined, and it turned out that constructs management responsibility and management of human resources are in a positive relationship with internal audit. The basic advantage of the developed model is that it can help reporting risks through financial indicators, which has not been possible with existing models. The models that apply in practice evaluated the risks using the probability of the occurrence or frequency and the consequences of the risk and were reported using defined values without financial indicators.

Another significant contribution of the developed model is that internal control in the model is implemented for the first time through the construct internal audit. In this way, the model allows us to precisely evaluate the work of internal controls in the company. Beside the

presented benefits of the developed model, another advantage of the model is that we can improve the management of the organization and its business processes, applying an integrated risk management model, because the model defines all direct and indirect connections between constructs. In this way, communication within the company increases, all employees are acquainted with risks and actively participate in their recognition. In addition to communication, the model also contributes to successful management of both organization and business processes because it reduces the possibility of possible surprise from unwanted events and damage that can occur.

6. CONCLUSION

The risk measurement methodologies are mainly descriptive, where language attributes are used to express input risk, internal control and remaining risk after application of control. Descriptions are based on subjective knowledge on business processes and internal control systems of the given entity in the past and the present moment. For these reasons for the practical functioning of the integrated risk management model in business processes in industrial systems, we offer access to "agile risk management". Unlike existing models, in the proposed model, the size of inherent risk, reductions of the inherent risk based on the control environment and the system of internal controls as well as residual risk are quantified. Thanks to the evaluation of the materiality of the entities based on existing business balance sheets designed and analysing of business continuity, the entity management is turned to the future. The integrated risk management model in industrial systems is one of usable tools for redesigning and reengineering business processes, especially in high-risk material-influential risk levels, when it is difficult to improve internal control for risk reduction. Likewise, we believe that continuous improvement in business processes can be achieved thanks to precisely measured inherent and residual risks in it. In addition to positive rating, the results also indicate some shortcomings. Primarily, shortcomings can be linked to the evaluation of internal controls as one of the essential factors of business risk assessment models. Through the internal audit construct, the importance of the work of internal audit and its role in assessing business risks is analysed and thus reducing the shortcomings of this model. However, the need for additional research should be emphasized, in order for assumptions to be empirically tested.

ACKNOWLEDGEMENT

This research has been supported by the Ministry of Science, Technological Development and Innovation (Contract No. 451-03-65/2024-03/200156) and the Faculty of Technical Sciences, University of Novi Sad through project “Scientific and Artistic Research Work of Researchers in Teaching and Associate Positions at the Faculty of Technical Sciences, University of Novi Sad” (No. 01-3394/1).

REFERENCES

[1] Verbano, C.; Venturini, K. (2011). Development paths of risk management: approaches, methods and fields of application, *Journal of Risk Research*, Vol. 14, No. 5, 519-550, doi:10.1080/13669877.2010.541562

[2] Beasley, M. S.; Branson, B. C.; Hancock, B. V. (2010). Are you identifying your most significant risks?, *Strategic Finance*, Vol. 92, No. 5, 29-35

[3] Yeoh, P. (2010). Causes of the global financial crisis: learning from the competing insights, *International Journal of Disclosure and Governance*, Vol. 7, No. 1, 42-69, doi:10.1057/jdg.2009.18

[4] Dionne, G. (2013). Risk management: history, definition, and critique, *Risk Management and Insurance Review*, Vol. 16, No. 2, 147-166, doi:10.1111/rmir.12016
[5] Muehlen, M. Z.; Ho, D. T. Y. (2006). Risk management in the BPM lifecycle, Bussler, C. J.; Haller, A. (Eds.), *Business Process Management Workshops, Lecture Notes in Computer Science*, Springer, Berlin, 454-466, doi:10.1007/11678564_42
[6] Torben, J. A. (2009). Effective risk management outcomes: exploring effects of innovation and capital structure, *Journal of Strategy and Management*, Vol. 2, No. 4, 352-379, doi:10.1108/17554250911003845
[7] Zhao, X.; Hwang, B.-G.; Low, S. P. (2016). An enterprise risk management knowledge-based decision support system for construction firms, *Engineering, Construction and Architectural Management*, Vol. 23, No. 3, 369-384, doi:10.1108/ECAM-03-2015-0042
[8] Oliveira, K.; Méxas, M.; Meiriño, M.; Drumond, G. (2019). Critical success factors associated with the implementation of enterprise risk management, *Journal of Risk Research*, Vol. 22, No. 8, 1004-1019, doi:10.1080/13669877.2018.1437061
[9] COSO. Enterprise Risk Management, from *https://www.coso.org/guidance-erm*, accessed on 14-10-2023
[10] Frigo, M. L.; Anderson, R. J. (2011). Strategic risk management: a foundation for improving enterprise risk management and governance, *The Journal of Corporate Accounting & Finance*, Vol. 22, No. 3, 81-88, doi:10.1002/jcaf.20677
[11] Khan, F.; Rathnayaka, S.; Ahmed, S. (2015). Methods and models in process safety and risk management: past, present and future, *Process Safety and Environmental Protection*, Vol. 98, 116-147, doi:10.1016/j.psep.2015.07.005
[12] Ravesteyn, P.; Versendaal, J. (2007). Success factors of business process management systems implementation, *Proceedings of the 18th Australasian Conference on Information Systems*, 396-406
[13] Suriadi, S.; Weiss, B.; Winkelmann, A.; ter Hofstede, A. H. M.; Adams, M.; Conforti, R.; Fidge, C.; la Rosa, M.; Pika, A.; Rosemann, M.; Wynn, M. (2014). Current research in risk-aware business process management-overview, comparison, and gap analysis, *Communications for the Association of Information Systems*, Vol. 34, Paper 52, 933-984, doi:10.17705/1CAIS.03452
[14] Jakoubi, S.; Tjoa, S.; Goluch, G.; Kitzler, G. (2010). A formal approach towards risk-aware service level analysis and planning, *Proceedings of the 2010 International Conference on Availability, Reliability and Security*, 180-187, doi:10.1109/ARES.2010.86
[15] Thabet, R.; Lamine, E.; Boufaied, A.; Korbaa, O.; Pingaud, H. (2018). Towards a risk-aware business process modelling tool using the ADOxx platform, Matulevičius, R.; Dijkman, R. (Eds.), *Advanced Information Systems Engineering Workshops, CAiSE 2018, Lecture Notes in Business Information Processing*, Springer, Cham, 235-248, doi:10.1007/978-3-319-92898-2_20
[16] Persson, M.; Törngren, M.; Qamar, A.; Westman, J.; Biehl, M.; Tripakis, S.; Vangheluwe, H.; Denil, J. (2013). A characterization of integrated multi-view modeling in the context of embedded and requirements engineering cyber-physical systems, *Proceedings of the 2013 International Conference on Embedded Software (EMSOFT)*, 10 pages, doi:10.1109/EMSOFT.2013.6658588
[17] Castro, B. K. d. A; Dresch, A.; Veit, D. R. (2019). Key critical success factors of BPM implementation: a theoretical and practical view, *Business Process Management Journal*, Vol. 26, No. 1, 239-256, doi:10.1108/BPMJ-09-2018-0272
[18] Rummler, G. A.; Brache, A. P. (2013). *Improving Performance: How to Manage the White Space on the Organization Chart*, 3rd edition, Jossey-Bass, San Francisco
[19] Onega, G.; Ravesteyn, P. (2020). Business process management maturity and performance: a multi group analysis of sectors and organization sizes, *Business Process Management Journal*, Vol. 26, No. 1, 132-149, doi:10.1108/BPMJ-08-2018-0224
[20] Kujansivu, P.; Lonnqvist, A. (2008). Business process management as a tool for intellectual capital management, *Knowledge and Process Management*, Vol. 15, No. 3, 159-169, doi:10.1002/kpm.307
[21] Gudelj, M.; Delic, M.; Kuzmanovic, B.; Tesic, Z.; Tasic, N. (2021). Business process management model as an approach to process orientation, *International Journal of Simulation Modelling*, Vol. 20, No. 2, 255-266, doi:10.2507/IJSIMM20-2-554

[22] Jeston, J.; Nelis, J. (2006). *Business Process Management: Practical Guidelines to Successful Implementations*, 1st edition, Butterworth-Heinemann, Oxford, doi:10.4324/9780203081327
[23] Trkman, P. (2010). The critical success factors of business process management, *International Journal of Information Management*, Vol. 30, No. 2, 125-134, doi:10.1016/j.ijinfomgt.2009.07.003
[24] Hammer, M. (2007). The process audit, *Harvard Business Review*, Vol. 85, No. 4, 17 pages
[25] Rosemann, M.; vom Brocke, J. (2010). The six core elements of business process management, Brocke, J. V.; Rosemann, M. (Eds.), *Handbook on Business Process Management 1, International Handbooks on Information Systems*, Springer, Berlin, 107-122, doi:10.1007/978-3-642-00416-2_5
[26] Janković, A.; Adrodegari, F.; Saccani, N.; Simeunović, N. (2022). Improving service business of industrial companies through data: conceptualization and application, *International Journal of Industrial Engineering and Management*, Vol. 13, No. 2, 78-87, doi:10.24867/IJIEM-2022-2-302
[27] Stainer, L. (2006). Performance management and corporate social responsibility: the strategic connection, *Strategic Change*, Vol. 15, No. 5, 253-264, doi:10.1002/jsc.761
[28] Spitzer, D. R. (2007). *Transforming Performace Measurement: Rethinking the Way We Measure and Drive Organizational Success*, American Management Association, New York
[29] Hernaus, T.; Pejić Bach, M.; Bosilj Vukšić, V. (2012). Influence of strategic approach to BPM on financial and non-financial performance, *Baltic Journal of Management*, Vol. 7, No. 4, 376-396, doi:10.1108/17465261211272148
[30] Cotes, J.; Ugarte, S. M. (2021). A systemic and strategic approach for training needs analysis for the International Bank, *Journal of Business Research*, Vol. 127, 464-473, doi:10.1016/j.jbusres.2019.05.002
[31] Škrinjar, R.; Trkman, P. (2013). Increasing process orientation with business process management: critical practices, *International Journal of Information Managemen*t, Vol. 33, No. 1, 48-60, doi:10.1016/j.ijinfomgt.2012.05.011
[32] Kummer, T.-F.; Mendling, J. (2021). The effect of risk representation using colors and symbols in business process models on operational risk management performance, *Journal of the Association for Information Systems*, Vol. 22, No. 3, 649-694, doi:10.17705/1jais.00676
[33] Inayat, S. M.; Zaidi, S. M. R.; Ahmed, H.; Ahmed, D.; Azam, M. K.; Arfeen, Z. A. (2023). Risk assessment and mitigation strategy of large-scale solar photovoltaic systems in Pakistan, *International Journal of Industrial Engineering and Management*, Vol. 14, No. 2, 105-121, doi:10.24867/IJIEM-2023-2-327