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Financial controlling in the energy sector in the Republic of Serbia

Research Article

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Abstract: One of the biggest problems faced by the world business is the constant struggle to stay competitive in the market. The acquired knowledge and satisfied numerous technical and organizational conditions have resulted in the development of a whole range of modern management techniques whose meaningful application should enable the acquisition and presentation of relevant management models. Namely, in the light of these new circumstances, in addition to strategic and operational management, companies introduce controlling into the basic activities of corporate management. The aim of this article is to understand the importance of the controlling introduction, its role in the business process, its place in the organizational structure of the company, and the potential benefits that controlling brings. This study addresses a research gap in the literature by examining the implementation of financial controlling practices in the energy sector of a non-EU transition economy. While extensive research has been conducted in the Western European contexts, empirical studies focusing on Southeast European countries, particularly Serbia, remain limited. The article contributes to filling this gap by providing survey-based insights into managerial perceptions, controlling functions, and risk management tools in a transitional regulatory and institutional environment. The added value of this study lies in its empirical examination of financial controlling within a transition economy context, offering sector-specific insights from Serbia's energy industry. Unlike existing studies focusing on developed markets, this article highlights managerial attitudes, applied tools, and risk-related practices in an underexplored regulatory environment. The aim of this work is to determine the influence of controlling in Serbia based on the results of practical research. Testing of statistical hypotheses proved the importance of controlling in the company. The value of this work is that it was observed that traditional management approaches, based on information obtained from conventional systems, are not sufficient and that they need to be upgraded with modern controlling techniques.

Keywords: *Controlling • Energy • Company • Management • Corporate*

1. Introduction

Controlling represents an important support for company management in achieving the most important goals of the company, such as company strategy, business goals, company identity, employee motivation, cost reduction, and employee engagement. Integrating internal company information with data on external risks enhances the accuracy of forecasting and planning, allowing for better prediction of financial outcomes.

After unstable economic periods, the practice of forecasting and planning based on risk management gains importance. The information flow between the company and external stakeholders increases the quality of business decision-making. In this way, knowledge about financial and strategic planning and risk management is integrated, which leads to positive results for the company (Ittner & Michels, 2017). Risk-based forecasting and planning support the management of earnings projections. One of the most significant

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problems of the growth and development of a modern company is the reduction of transparency over the entire business, and the decreasing compliance of individual organizational units within the company. It is increasingly difficult to successfully manage a company that has grown in this way. Controlling is a management function without which it is difficult to imagine a modern company. Controlling solves the increasingly present problems of coordination and integration. Managers' awareness that strategic decisions should be made in the context of risk assessment and application of controlling is increasing. How managers combine strategic risk reporting and performance information is a measure of success in eliminating risk (Cheng et al., 2018). The interaction between strategic risk profiles and the presentation format significantly influences managers' strategic judgments, particularly when using the Balanced Scorecard framework. To mitigate the shortcomings that affect the company's profit while at the same time maintaining the advantages that the company has, the importance of the existence of the employees' awareness of behaviors that affect risks was highlighted. In this way, the theory of risk sharing and organizational culture management is developing (Stulz, 2009). The involvement of employees in making decisions about the company's risks contributes to the fact that employees behave in accordance with the company's tendencies toward certain risks. In this way, risks are reduced and control is extended in relation to certain aspects of risk. Relaying on complementarity theory, it was found that there is a complementarity between risk-focused output control and risk-focused information sharing, regardless of the company's potential risks. The aforementioned strategy has proven to be good for companies that have a high level of risk in business (Posch, 2020). Firms can improve the existing performance measurement system by introducing key indicators for risks that will occur in the future. The interplay between strategic risk profiles and presentation format on managers' strategic judgments using the balanced scorecard (Mikes & Kaplan, 2015).

In the context of this article, *controlling* is defined as a comprehensive managerial function that combines planning, monitoring, and coordination of internal processes to support strategic and operational decision-making. As noted by Horváth (2003), controlling acts as the "information and steering subsystem" of management, ensuring that actions align with objectives through the provision of timely, relevant, and structured information. According to Weber (1993), controlling integrates both financial and nonfinancial indicators, facilitating forward-looking control and feedback mechanisms.

The importance of controlling lies in its ability to provide management with real-time insights into organizational performance, enabling the anticipation of risks, optimization of resources, and improvement of planning accuracy. In practice, controlling is implemented through tools such as budgeting, variance analysis, key performance indicators, Balanced Scorecards, and integrated risk management systems. Particularly in complex sectors like energy, controlling ensures alignment between regulatory compliance, market fluctuations, and internal performance metrics.

Employees' awareness of risks and their impact on the company's performance can be encouraged through the organization of meetings to identify risks. Kaplan & Mikes (2012) also highlight the importance of organizing workshops focused on risk identification and management. Promoting employee awareness encourages more responsible employee behavior and develops a positive business culture, which enables more successful controlling (Lam, 2014).

During the great economic crisis in the period from 1929 to 1931, there was a need for controllers, in addition to their established tasks in the previous period, to devote more attention to planning tasks. Controlling is becoming increasingly important, as evidenced by the first controlling institution in America, founded in 1931 under the name of the Controllers Institute, later renamed Financial Executive Institute. Today, this controlling institute has around 15,000 members, of which 1,500 are controllers. The importance of controlling is also reflected in the fact that today in the Ministry of Finance in the United States, the highest official title is the title of controller, while in the Ministry of Finance in France, a function called Controller of Engaged Expenditures has been established.

Weber's definition represents controlling as a specific function within the management system of such companies whose execution system is primarily coordinated by plans. "The function of controlling is coordination. The goal of controlling consists of increasing the effectiveness and efficiency of management, as well as to manage the ability to adapt to changes in the external and internal world of the company" (Weber, 1993).

Controlling, as a function, specifically deals with the collection and analysis of data related to business results, which are presented to management in the form of reports as a basis for decision-making. Therefore, controlling is considered a management function of measuring and correcting individual and organizational performance to ensure compliance between realization and plans. This goal can be achieved by measuring the success of the business, considering the set goals and plans, determining deviations from the set standards and proposing measures to overcome the observed deviations (Weihrich & Koontz, 1994). Measurement should be linked to a higher-level organizational goal to ensure that processes are directed

toward that goal and to assess their contribution to that goal. In addition, process measurement should also refer to the evaluation of the performances of the people involved (Jeston & Nelis, 2008).

The needs of modern society are increasing, and seen through the lens of controlling, ubiquitous globalization initiates a more rational consideration of costs. From the outside, it would be said that the responsibility of each manager is personal and implies that he is responsible for business processes at all times. However, it is somewhat different in practice. For instance, during his research, an engineer will look for creative solutions for development and will not immediately think about expenses. On the other hand, the expected reaction of a professional controlling expert is completely opposite. That is why the controller is the one who should remind him of the expenses and give the right economic advice, and for this reason, Dr. Deyhle believes that the controllers are the "economic conscience of the organization" (Deyhle, 2005).

This article focuses on the experience of companies operating in the Republic of Serbia, a non-EU transition economy where controlling practices are still evolving.

By measuring the company's performance, we find out how efficient and effective we were in business. The basic function of controlling is to signal to the management, with relevant indicators, all deviations from the plan and indicate the causes of deviations, so that the top of the company can redirect its business decisions and adapt them to the new situation. Because of all this, continuous monitoring of business processes and activities is necessary because the controller is like an anchor that provides strong support to the company during management. Also, it is considered that when making decisions, the management has full confidence in the reporting and advice of the controller, its practical action, with the aim of achieving the set business result, and the best possible positioning of the company on the market is not questionable. Therefore, if the ship is not moving on the right path, the controller revises the business strategy and in the earliest stages indicates further optimization.

2. Theoretical framework

The purpose of this theoretical framework is to ground the empirical hypotheses in established models and to clarify how controlling practices align with strategic, operational, and risk dimensions. Four core conceptual constructs inform this work:

1. COSO integrated framework (COSO, 2013): Widely adopted for internal control systems, this framework emphasizes the importance of risk assessment, monitoring, and information flow. It is relevant for analyzing internal procedures and compliance aspects of financial controlling.
2. Balanced Scorecard (Kaplan & Norton, 2005): This model supports linking strategic objectives with performance indicators across financial and nonfinancial dimensions, thereby operationalizing controlling beyond budgeting.
3. Complementarity theory (Posch, 2020): Suggests that combining controlling instruments (e.g., budgeting, reporting, risk systems) enhances their effectiveness. It forms the theoretical foundation for analyzing synergistic effects of multiple tools.
4. Management control systems theory (Roslender & Hart, 2003; Simons, 1994): Emphasizes the role of formal and informal controls in aligning behavior with strategy. It helps interpret managerial perceptions reported in our study.

In addition to these theoretical underpinnings, research in modern business practice in developed economies emphasizes the growing importance of controlling as a strategic management function, particularly in aligning financial planning with organizational goals and risk environments. For example, Hiebl (2014) show that chief financial officer influence on corporate controlling in Germany significantly enhances strategic alignment. Weber and Schäffer (2000, 2013, 2022) document how digitalization and behavioral considerations are reshaping the controller role in German-speaking countries. In addition, Simons (1994, 2019) and Roslender and Hart (2003) highlight how management control systems are leveraged to create competitive advantage and integrate forward-looking risk controls within Balanced Scorecards.

In the Serbian business context, the term controlling lacks a standardized or widely accepted definition, leading to varied interpretations among practitioners and academics. This study adopts the definition aligned with German-speaking literature (e.g., Horváth, 2003; Weber, 1993), where controlling is viewed as a proactive, information-based support system for managerial decision-making. Given the transitional nature of Serbia's economy, the interpretation and implementation of controlling vary significantly across companies.

The main problem that companies face in practice, or will face in the future, is that financial accounting is traditionally oriented toward external reporting and external users of business reports, and it is informational set and organized. It is a structured informational system, but it often lacks the capacity to provide specific and actionable insights to support managerial decision-making. Controlling is a process that takes place at the level of the entire organization, in which financial indicators, events in the organization, the efficiency and effectiveness of human resources, the communication system within the organization, i.e., factors influencing

from the external and internal environment, are constantly monitored and reported. Regarding controlling, it is often pointed out in the literature that it can thank periods of economic or political crises for its development (Horváth, 2003).

During the business cycle of a company, controlling collects and selects relevant information on the basis of which it forms a report that must be a quality and relevant guideline for management to make timely decisions (Constantinescu et al., 2021).

Company risk management, as an integral part of controlling and decision-making, is not a separate process but is embedded in strategy adoption, planning, and operational activities. For the risk to be acceptable for the achievement of the company's goals, and the controlling to be effective, threats for individual parts of the organization and for the entire organization have to be analyzed. In the process of identifying risks, after the consent of the administration, the management should work out the risk possibility and, with controlling, communicate the tendency toward critical situations, monitor, and update the risks (Weber & Schäffer, 2008).

In the Serbian business context, the term *controlling* lacks a standardized or widely accepted definition, leading to varied interpretations among practitioners and academics. This study adopts the definition aligned with German-speaking literature (e.g., Horváth, 2003; Weber, 1993), where controlling is viewed as a proactive, information-based support system for managerial decision-making. Given the transitional nature of Serbia's economy, the interpretation and implementation of controlling vary significantly across companies. "Controlling is the process of navigating towards economic goals, where management and position definition is carried out by means of timetables and monitoring plans" (Rittenberg & Martens, 2012). The term controlling must not be equated with the term control, because "control" refers only to one aspect of the controlling function. The term 'controlling' must not be confused with 'control', which refers only to one aspect of the function. In English, 'to control' implies managing, regulating, or directing processes by systematically linking planning, assessment of current conditions, risks, and corrective actions. According to Deyhle, controlling in short means: "calculating, planning and assuring co-workers to cooperate." The goal of risk management is not the elimination of all risks, but to align strategic risks with the company's risk tendencies and successfully conduct the controlling process. Understanding and communicating risk appetite. The committee of sponsoring organizations of the treadway commission (COSO) emphasizes that the goal of risk management is not the elimination of all risks but aligning them with the company's risk appetite (COSO, 2013; Deyhle, 2003).

The origin of controlling is linked to the Middle Ages, when controllers appeared in France under the name "contre-rouler" (Saebi et al., 2017). At the end of the eighteenth century, the American Congress passed certain laws regulating the work of controllers in government services (Witt, 2002). The controller had to perceive and balance between the state budget and the use of state funds. In later years, more precisely in 1880, the Atchinson Topeka & Santa Fe Railway Systems transport company was the first private company to establish the position of controller. The tasks of the controller in this company were of a financial nature. In 1892, the General Electric Company was the first industrial company to create the position of controller in its company. Until the twentieth century, controlling penetrated companies more slowly, and from the nineties of the twentieth century, controlling in the United States experienced a great boom. The process of market liberalization changes the regulatory tasks, so that prices set by electricity producers are no longer subject to approval by the regulatory body, and consumers are given the opportunity to choose their electricity suppliers. However, despite liberalization, there remains a need for regulation in the electricity supply sector (Birgen et al., 2024; Tanţău & Regneală, 2014).

Given the fact that energy is one of the most important sectors of developed economies, the European Union has initiated a dynamic process of change in the energy sector through directives for the liberalization of the electricity and natural gas markets (Clodnițchi & Chinie, 2015; Dudau & Nedelcu, 2016).

3. Materials and methods

3.1 The aim of the research

The goal of the practical research is to collect information on the basis of the compiled questionnaire, first, on whether and to what extent the controlling function is represented in the energy sector in the Republic of Serbia. In organizations that were found to have introduced controlling, the goal is to determine whether controlling contributed to more efficient decision-making and better operations. Furthermore, the goal of the research is to obtain information about risk management models, about the persons responsible for risk management, as well as the methods used for risk identification and assessment. Finally, the goal of this research is to obtain information about risk management in the organization by analyzing attitudes using a five-point Likert scale. Based on the data

obtained from the analysis of the questionnaire, the following hypotheses should be confirmed or rejected:

- Hypothesis 1: Establishing a controlling system creates a basis for consistent and controlled activities and improvement of the decision-making process.
- Hypothesis 2: Implementing a risk management function incurs additional costs, but also promises potential revenue increases and/or cost reductions.
- Hypothesis 3: It is possible to define a unique risk management model.

To test the proposed hypotheses, we applied one-sample *t*-tests to determine whether the mean response to Likert-scaled items significantly deviated from the neutral value (3.00). This approach is commonly used in empirical management research when the goal is to evaluate attitudes or perceptions against a hypothetical midpoint (e.g., Hiebl, 2014; Simons, 1994).

Each hypothesis (H1–H3) was operationalized through a subset of questionnaire items, and the statistical significance of observed mean scores was tested against the null hypothesis that $\mu = 3$ (neutral attitude). For example, H1 ("Controlling improves decision-making") was evaluated using responses to items about internal coordination, planning support, and reporting effectiveness.

The one-sample *t*-test is appropriate in this context due to the ordinal scale structure (treated as interval for inferential purposes), the sufficiently large sample size (N = 137), and the assumption of approximate normality supported by prior Likert-based studies. The method has been successfully applied in studies such as Lam (2014) and Posch (2020), where risk management and control system perceptions were statistically evaluated.

In addition, effect sizes (Cohen's *d*) were computed to supplement *p*-values and better interpret practical significance, following APA and empirical social science recommendations (Cohen, 2013; Nunnally & Bernstein, 1994).

The subject of this research is the analysis of data obtained by surveying a certain number of respondents (137) who answered 40 questions regarding general data (gender, age, education, companies they work for), controlling functions and risk management in the organizations where they are employed.

3.2 Content of the survey/questionnaire and interpretation of the results

Based on the research objective, a questionnaire is created to determine the impact of controlling in the energy sector in the Republic of Serbia. The questionnaire is divided into three sections.

The first section contains questions about general data (7 questions), the second is dedicated to controlling functions in the organization of respondents (21 questions), and the third section is dedicated to risk management in the organization (12 questions).

Description of the sample: The questionnaire was filled out by 137 respondents, of which 56.8% were men and 43.2% were women. The age structure shows that 25% of the respondents are in the 25–34 age range, 47% in the 35–44 range, 14% in the 45–54 range, and the same percentage (14%) is for the 55–64 range. Respondents predominantly have higher education – 67.6%, of which 32.4% have postgraduate academic titles (doctorate and master's degree).

The section with general questions includes questions about the respondents' company. The answers indicate that 41.7% of the respondents are employed in public and 58.3% in private enterprises, of which 16.2% are manufacturing, 54.1% service, and 35.1% mixed enterprises. When asked if they think they are successful in the work they are currently doing, 2.7% answered that they do not agree at all, 8.1% that they partially agree, 59.9% mostly agree, and 29.7% completely agree. Of the total number of respondents, 2.7% stated that they do not follow the improvement of their company's business at all and do not have relevant information about the achieved goals, while 21.6% partially follow and have relevant information, 35.1% mostly follow and have information, and 40.5% fully follow and own the information.

The questionnaire used in this study was adapted from several established instruments in the literature, including the risk typology and control integration model of Kaplan and Mikes (2012), and the enterprise risk management implementation framework of Lam (2014). Additional items relating to controlling practices and strategic decision-making were inspired by the Balanced Scorecard model (Kaplan & Norton, 2005) and COSO (2013) internal control principles.

Content validity was evaluated through expert consultations with four professionals in corporate finance and two academic researchers. Minor wording adjustments were made, and the final version of the instrument was pilot-tested on 12 managers from the energy sector.

Internal consistency reliability was assessed using Cronbach's alpha, with the overall scale achieving α = 0.89, and all subscales exceeding the recommended threshold of 0.70 (Nunnally & Bernstein, 1994).

A five-point Likert scale was chosen for most items (1 = strongly disagree to 5 = strongly agree) to allow nuanced

assessment of perceptions. Dichotomous (yes/no) items were used only in the demographic section. The formats were derived from the prior research (Hiebl, 2014; Lam, 2014) and validated for usability among Serbian energy sector managers.

3.2.1 Analysis of the results of the questionnaire on controlling functions in the organization

The second section of the questionnaire is devoted to questions about the functions of controlling in the respondents' organizations. The answers represent the respondents' personal attitudes represented by a five-point Likert scale of attitudes (1 – strongly disagree, 2 – mostly disagree, 3 – partly agree, 4 – mostly agree, and 5 – strongly agree).

The survey responses reveal a generally favorable perception of controlling among managers in the Serbian energy sector. Over 60% of the respondents mostly or strongly agree that controlling is successfully implemented and provides substantial managerial support, indicating a widespread functional integration of controlling practices. This suggests that controlling is no longer a marginal or auxiliary process but a central management instrument.

The clarity and transparency of reporting, attributed to controlling teams, also scored highly: 83.7% of the respondents partially to strongly agreed that information flows have improved, and 86.4% perceive controlling tools as enhancing visibility into real business performance. These results point to the growing analytical role of controllers and the technological modernization of controlling functions (e.g., digital dashboards, enterprise resource planning integration).

Interestingly, 91.8% of the participants agree that controlling provides a clearer picture of operations and 88.9% agree that each strategic decision is now supported with quantitative indicators. This underlines controlling's role in strategy operationalization, aligning with the Balanced Scorecard principles (Kaplan & Norton, 2005).

However, the role of the controlling team leader remains ambiguous: only 27.8% strongly agree that they act as financial advisors to the CEO, with a high proportion (33.3%) merely partly agreeing. This suggests a gap between functional competence and strategic influence of the controlling function.

When asked whether controlling improves decision-making and business performance, over 50% of the respondents responded positively, confirming H1. Furthermore, 77.6% confirmed that the controlling function actively intervenes when the strategic direction is off course, supporting the corrective and proactive dimension of controlling.

The results also reveal institutional limitations: although synergy between controlling and management is acknowledged by most, only 40.5% of the respondents report that controlling heads attend executive board meetings, which may explain weaker agreement on managerial collaboration and trust.

Finally, the data show that controlling is widely perceived as essential for risk mitigation and operational efficiency. Nearly 96% of the participants agree that controlling helps achieve business goals, and 94% agree that it contributes to risk reduction, directly supporting H2 and H3.

3.2.2 Analysis of the results of the questionnaire on risk management in the organization

In the third section of the questionnaire, questions related to the data and attitudes of respondents about risk management in their organization were processed. Based on the answers to the first question, it was concluded that 7.9% of the organizations apply the COSO model of risk management, 23.7% apply the ISO 31.000:2009 Standard, and 31.6% of organizations apply some other models, which do not belong to standard solutions in this area. In 18.4% of the cases, respondents indicated that there are indications of their imminent implementation, while in the same percentage, there is no risk management process. The answers to this question are presented in Figure 1.

The majority of organizations assign risk management responsibilities to all employees (86.0%), followed by top managers (11.0%), internal audits (2%), or no designated personnel (1%).

Figure 2 shows data on the persons responsible for risk management in the organization, and the largest number (86.0%) is all employees, depending on the responsibilities they perform in the organization, followed by top managers (11.0%), also depending on the competence, and in a much smaller number of internal audits (2%) or not implemented (1%).

Jurisdiction of risk management

- Top managers (by jurisdiction)
- All employees (by competence)
- Exclusively internal audit
- No one

There is considerable dispersion in the sample and in the methods used to identify risks in the organization. Of the total number of respondents, 38.9% stated that their organization uses the analysis of financial reports, 13.9% exchange information with other departments and external partners, and 8.6% each stated that it is done through a questionnaire, by analyzing the contract or not at all. The analysis of experience is used in the case

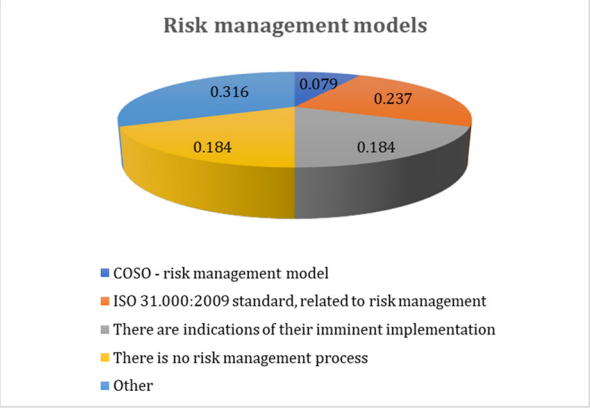

Figure 1. Overview of risk management models implemented in the organization.

Source: Authors' own research.

of 11.1% of the organizations, and 5.6% each use a field survey and a flow chart. The data are shown in Figure 3.

Methods used for risk identification

- Questionnaires
- Financial reports analysis
- Field inspection
- Flow chart
- Contract analysis
- Analysis of past experience
- Exchange of information with other departments and external partners
- None of the above

The methods used for risk assessment are also varied. Of the total number of respondents, 25% stated that statistical methods are used in their organization to assess the intensity and effects, as well as the frequency of risks, 5.6% probability theory, 16.7% strengths, weaknesses, opportunities, threats (SWOT) analysis, 25% scenario analysis, and 22.2% of other analyses not specified in the survey. Analyzing the data in Figure 4, we observe that 5.6% of the organizations do not use any of the above methods for assessing the intensity and frequency of risks.

The second segment of the third part of the survey analyzed respondents' attitudes using a Likert scale. Key findings indicate that the majority of respondents recognize global risks caused by market conditions and economic trends.

The results indicate a notable diversity and fragmentation in the application of risk management models within the Serbian energy sector. Only 7.9% of the organizations reported using the COSO framework, and 23.7% adopted the ISO 31.000:2009 Standard. However, the dominant share (31.6%) relies on *nonstandardized or unspecified models*, while an additional 18.4% have no formal risk management process in place. This heterogeneity reflects institutional underdevelopment and regulatory ambiguity, especially in nonlisted or privately owned entities.

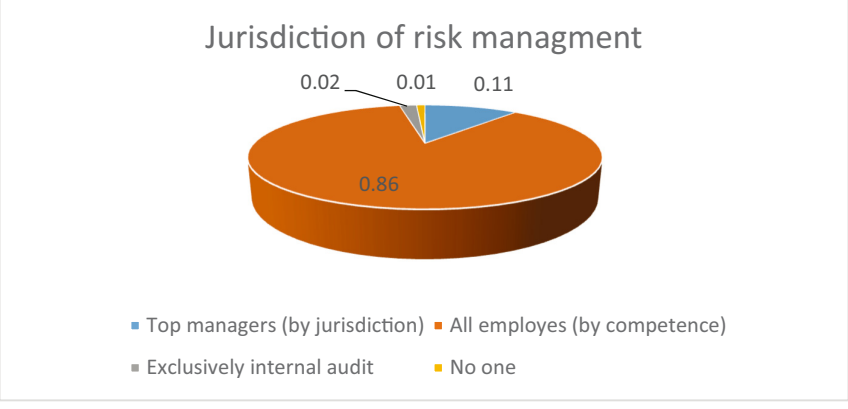

Figure 2. Persons responsible for risk management in the organization.

Source: Authors' own research.

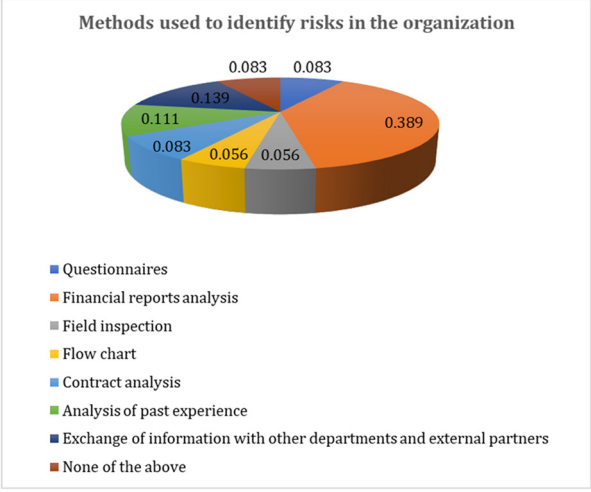

Figure 3. Methods used to identify risks in the organization.

Source: Authors' own research.

Responsibility for managing risk appears highly decentralized: 86% of the respondents stated that risk management is dispersed across all employees by functional competence, while only 11% identified top managers as having formal jurisdiction. This may reflect a lack of formal accountability structures, or possibly an overreliance on operational-level vigilance rather than strategic oversight.

In terms of risk identification methods, a clear preference exists for traditional internal financial tools – notably, 38.9% of the organizations use financial report analysis, while much lower percentages employ more proactive tools such as scenario planning, contract review, or field inspection. Only 13.9% reported external cooperation (information exchange with other departments or partners), suggesting a relatively inward-looking and reactive posture toward risk.

Regarding risk assessment, statistical methods and scenario analysis are the most common (each 25%), while more sophisticated or theory-based tools (like probability theory or SWOT) are underused. In addition, 5.6% of the organizations do not apply any formal risk assessment techniques, which further underscores methodological inconsistencies and operational vulnerability.

The attitudinal component of the survey, based on the Likert-scale analysis, reveals relatively strong awareness of global and operational risk exposure: 75% of the respondents mostly or strongly agree that market and economic changes pose tangible threats. However, only 16.2% strongly agree that communication channels between management and operational risk owners are adequate, suggesting a critical gap in vertical information flow.

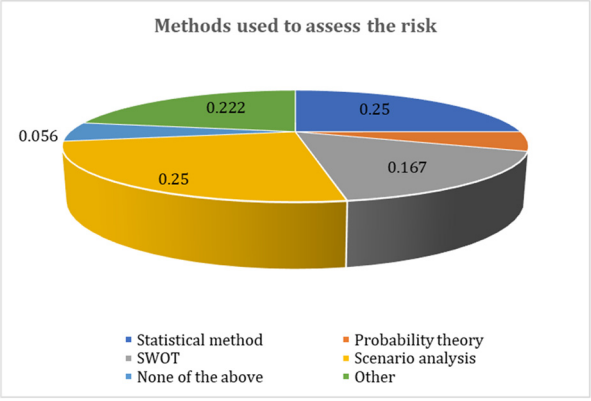

Figure 4. Methods used to assess risk (intensity/effects) and frequency.

Source: Authors' own research.

A more encouraging trend is seen in the use of insurance for property risk – reported by 97.2% of the organizations – which confirms alignment with basic enterprise risk practices. Furthermore, the majority agrees that their organization has procedures for quick response to business irregularities (94.4%) and a formalized risk strategy aligned with organizational specificities (89.1%).

In sum, the data suggest that awareness of risk is high, but institutionalization and systematization remain partial and uneven, particularly in linking risk data to strategic decision-making. This highlights the relevance of H2 and H3, as the effectiveness of controlling depends not only on technical tools but also on structural integration with enterprise-wide risk culture.

3.2.3 Hypotheses testing

Since our questionnaire is divided into three units, the aforementioned hypotheses were formed according to them. As the first section contains general data questions (seven questions), the basic hypotheses derived from these questions are as follows:

- Hypothesis H0: Establishing a controlling system creates a basis for consistent and controlled activities and improvement of the decision-making process.
- Hypothesis H1: Establishing a controlling system does not create a basis for consistent and controlled activities and improvement of the decision-making process.

The second segment of questions is dedicated to controlling functions in the respondents' organization (21 questions), so hypothesis H2 was derived from it.

- Hypothesis H0: The implementation of the risk management function causes additional costs, but it also promises a potential increase in income and/or a reduction in costs.
- Hypothesis H2: The implementation of the risk management function does not cause additional costs, but it also does not promise a potential increase in income and/or a reduction in costs.

Finally, hypothesis H3 was formed from the range of questions about risk management (12 questions).

- Hypothesis H0: It is not possible to define a unique risk management model.
- Hypothesis H3: It is possible to define a unique risk management model.

We will use the SPSS (Statistical Package for the Social Sciences) program to conduct hypothesis testing. SPSS is a software program used by researchers in various disciplines to quantitatively analyze complex data.

In the analytical part of this program, in the submenu "Compare means," we will select one-sample *T*-test. The one sample *T*-test is used when we want to know whether our sample comes from a certain population, but we do not have complete information about the population available to us. For example, we may want to know whether a certain sample of employees from the observed firm is similar or different from the employees (population) of firms operating in the same sector, which in our example is the energy sector.

4. Results

We will begin by testing hypothesis H1. The inputs we will use are the questions asked in the questionnaire, more precisely, randomly selected five of seven questions (Table 1). In the following, we will create an equal sample of five questions for each of the hypotheses and compare the test results.

- Hypothesis H0: Establishing a controlling system creates a basis for consistent and controlled activities and improvement of the decision-making process.
- Hypothesis H1: Establishing a controlling system does not create a basis for consistent and controlled activities and improvement of the decision-making process.

The *T*-value (Table 2) of the test ranges from 2.911 to 3.978, which represented in *p*-values (or two-sided significance value) is less than 0.05. This will be a significant result for any realistic alpha level. The standard alpha level is 0.05, and all *p*-values are less than 0.05, so we will reject the null hypothesis that claims that the establishment of a controlling system does not create a basis for consistent and controlled activities and improvement of the decision-making process. Therefore, there is no difference between the mean value of our sample and the mean value of the population (in our example between employees in the observed company and employees in the energy sector).

Technically speaking, the result shows that, assuming the null hypothesis is true, any difference we have

	N	Mean	Std. deviation	Std. error mean
Question 1	5	19.9800	15.34493	6.86246
Question 2	5	20.5200	14.61496	6.53601
Question 3	5	19.9800	13.84655	6.19237
Question 4	5	19.9800	11.23018	5.02229
Question 5	5	19.9800	12.16499	5.44035

Table 1. One-sample statistics (hypothesis H1).
Source: Author's calculation. Output from SPSS.

	t	df	Sig. (two tailed)	Mean difference	95% confidence interval of the difference	
					Lower	Upper
Question 1	2.911	4	0.044	19.9800	0.9267	39.0333
Question 2	3.140	4	0.035	20.5200	2.3731	38.6669
Question 3	3.227	4	0.032	19.9800	2.7872	37.1728
Question 4	3.978	4	0.016	19.9800	6.0359	33.9241
Question 5	3.673	4	0.021	19.9800	4.8752	35.0848

Table 2. One-sample test (hypothesis H1).

Source: Author's calculation. Output from SPSS.

between mean value of our sample and of the population is unlikely to have arisen purely by chance. The conclusion is that employees in the observed company believe that the establishment of a controlling system creates a basis for consistent and controlled activities and improvement of the decision-making process.

We will continue with testing hypothesis H2 (Table 3).

- Hypothesis H0: The implementation of the risk management function does not cause additional costs, but it also does not promise a potential increase in income and/or a reduction in costs.
- Hypothesis H2: The implementation of the risk management function causes additional costs, but also promises a potential increase in revenue and/or a reduction in costs (Table 4).

	N	Mean	Std. deviation	Std. error mean
Question 8	5	19.9800	10.65584	4.76544
Question 9	5	20.5200	14.11003	6.31020
Question 10	5	19.9800	14.98439	6.70122
Question 11	5	19.9800	16.22843	7.25758
Question 12	5	19.9800	14.98439	6.70122

Table 3. One-sample statistics (hypothesis H2)

Source: Author's calculation. Output from SPSS.

The *T* value (Table 5) of the test ranges from 2.753 to 4.193, which represented in *p*-values (or two-sided significance value) is less than 0.05, except for question number 11, which is on the borderline of acceptance. The standard alpha level is 0.05, and even four of five *p*-values are less than 0.05, except for question number 11, which reads: "There is a good synergy in the company: Controlling is responsible for the quality of reporting to management and the comprehensibility of information, and management for the quality of business decision." Therefore, based on the results of the *t*-tests, we decide to reject the null hypothesis, which claims that the implementation of the risk management function does not cause additional costs, but also does not promise a potential increase in income and/or a reduction in costs. The understanding of question number 11 among employees is at the limit, they are not sufficiently aware of whether controlling is responsible for the quality of reporting to management and the comprehensibility of information, and whether it provides synergy and creates costs.

As the last hypothesis, we also test the third hypothesis H3 (Table 5).

	t	df	Sig. (two tailed)	Mean difference	95% confidence interval of the difference	
					Lower	Upper
Question 8	4.193	4	0.014	19.9800	6.7490	33.2110
Question 9	3.258	4	0.031	20.5200	3.0401	38.0799
Question 10	2.982	4	0.041	19.9800	1.3744	38.5856
Question 11	2.753	4	0.051	19.9800	−1.703	40.1303
Question 12	2.982	4	0.041	19.9800	1.3744	35.5856

Table 4. One-sample test (hypothesis H2).

Source: Author's calculation. Output from SPSS.

	N	Mean	Std. deviation	Std. error mean
Question 17	5	20.0000	10.98476	4.91253
Question 18	5	19.9800	16.26736	7.27498
Question 19	5	19.9800	12.60643	5.63777
Question 20	5	20.0000	22.35196	9.99610
Question 21	5	19.9800	19.61917	8.77396

Table 5. One-sample statistics (hypothesis H3).
Source: Author's calculation. Output from SPSS.

- Hypothesis H0: It is not possible to define a unique risk management model.
- Hypothesis H3: It is possible to define a unique risk management model.

The *t*-value (Table 6) of the test ranges from 2.001 to 4.071, which represented in *p*-values (or two-sided significance value) in most questions is more than 0.05. As the standard alpha level is 0.05, and most *p*-values are greater than 0.05, and in this case, we will accept the null hypothesis, which claims that it is not possible to define a unique risk management model. The conclusion is that it is not possible to define a unique controlling model in the energy sector due to the heterogeneity of the divisions that make it up.

The results of our hypothesis testing, especially for H1 and H2, are broadly consistent with findings from international research on the implementation of controlling and risk management in transitional and postsocialist economies. For example, Posch (2020) and Hiebl (2014) demonstrated that the presence of a formalized controlling system in Central European enterprises is positively associated with improved decision-making processes and greater transparency in reporting. Our findings – specifically the statistical confirmation of H1 and H2 – mirror these trends, but also reflect certain distinctive features of the Serbian context.

In particular, the high levels of agreement among respondents regarding the benefits of controlling (e.g., clarity of information, support in decision-making, and operational efficiency) indicate that Serbian enterprises have begun to internalize the functional logic of controlling, despite lacking uniform standards and regulatory requirements like those enforced in EU countries. This confirms the original contribution of our study: that controlling is maturing in a less institutionalized environment, adapting pragmatically to the organizational realities of Serbian energy firms.

Regarding H3, the inability to statistically confirm a unique controlling model aligns with findings by Tanţău and Regneală (2014), who observed that regulatory and structural fragmentation in energy markets leads to divergent controlling practices. Similarly, Saebi et al. (2017) suggest that in contexts with low institutional harmonization, organizations tend to adopt hybrid or ad hoc controlling mechanisms, which explains the rejection of H3 in our case.

Therefore, the study highlights a dual trend: on the one hand, Serbian firms recognize the importance of controlling and risk management, but on the other hand, they lack systematic alignment with standardized models such as COSO or ISO 31000. This nuanced dynamic differentiates Serbia from both highly regulated Western markets and from other Western Balkan countries, underscoring the need for context-sensitive controlling strategies. Future research should focus on identifying sector-specific best practices and institutional enablers that would support the formalization and harmonization of controlling in the Serbian energy sector.

Given that this research does not cover all aspects of controlling, further research into controlling in the energy sector in the Republic of Serbia should be focused on finding a unique controlling model, to enable its faster affirmation.

The authors should discuss the results and how they can be interpreted from the perspective of previous studies and of the working hypotheses. The findings and their implications should be discussed in the broadest context possible. Future research directions may also be highlighted.

	T	df	Sig. (two tailed)	Mean difference	95% confidence interval of the difference	
					Lower	Upper
Question 17	4.071	4	0.015	20.0000	6.3606	33.6394
Question 18	2.746	4	0.052	19.9800	−0.2186	40.1786
Question 19	3.544	4	0.024	19.9800	4.3271	35.6329
Question 20	2.001	4	0.116	20.0000	−7.7536	47.7536
Question 21	2.277	4	0.085	19.9800	−4.3804	44.3404

Table 6. One-sample test (hypothesis H3)

Source: Author's calculation. Output from SPSS.

5. Limitations and further research

This study has several limitations that should be acknowledged. First, the research is based on a convenience sample, which refers to a nonprobability sampling method where participants are selected due to their accessibility and willingness to participate, rather than being randomly chosen. While such sampling is practical and cost-effective, it introduces the risk of sampling bias and limits the generalizability of findings to the broader population of the Serbian energy sector (Etikan et al., 2016).

Second, the statistical analysis relies primarily on null hypothesis significance testing using *p*-values. Although *p*-values indicate whether observed effects are statistically significant, they do not convey the magnitude or practical relevance of the effect. To improve interpretability in future studies, it is recommended to report effect-size measures such as Cohen's *d*, eta squared (η^2), or odds ratios, which provide additional insight into the strength of the relationships under investigation. These measures offer deeper insight into the strength and direction of relationships, thereby enhancing the interpretability and impact of empirical results (Cohen, 2013; Sullivan & Feinn, 2012).

Moreover, future research should consider applying probability sampling methods, such as stratified or cluster sampling, to enhance representativeness. It is also advisable to complement quantitative analysis with qualitative data, such as expert interviews or case studies, to contextualize controlling practices in the energy sector more deeply (Lohr, 2021).

6. Conclusions

Corporate strategy encompasses all other strategic directions and objectives, while management is tasked with operationalizing it through competitive strategies. Porter's three generic strategies – cost leadership, differentiation, and focus – have been expanded in modern practice to include additional dimensions such as diversity, cost, time, scope, controlling, and competitive alignment, making controlling an essential component in today's dynamic environment.

Organizations collect a vast amount of data annually, with a key role of controlling being the selection of accurate, timely, and relevant information for decision-making purposes. When irrelevant data are used, it often results in poor managerial decisions.

The aim of this article is to examine the impact of controlling in the Republic of Serbia based on a survey of 137 respondents. Most participants reported that controlling was effectively implemented in their organizations, enhancing transparency and supporting strategic decision-making.

Key findings include the following:

- Controlling contributes to more efficient decision-making and risk reduction.
- It ensures effective communication with other organizational units.
- Its global relevance is growing, and implementation is essential.
- Risk management is a shared responsibility among all employees.
- Diverse methods are used for risk identification and assessment (e.g., financial report analysis, scenario analysis, SWOT, and probability theory).
- Organizations acknowledge the importance of reacting to global market-related risks and maintain internal communication on strategic risks.

The value of this research lies in highlighting the limitations of traditional management approaches and the necessity of modern controlling systems. In practice, inconsistencies in projections and actual operations can lead to flawed decisions and compromised stakeholder interests. Rapid environmental changes demand efficient information management, and integrated performance measurement, coupled with controlling, can significantly improve competitive management practices.

The findings of this article contribute to both academic discourse and practical applications by identifying controlling gaps and providing benchmarks for policy-makers and decision-makers. The study may serve as a reference for institutions in transition economies seeking to improve financial coordination, transparency, and risk management in the energy sector.

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Conflict of interest statement

Authors state no conflict of interest.

Data availability statement

The data supporting the findings of this study are available from the corresponding author upon reasonable request.

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