

Article

Determinants of the Effectiveness of Risk Management in the Project Portfolio in the FinTech Industry

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Abstract: Risk management in the project portfolio can contribute to more effective implementation of the goals of the projects, the portfolio, and the entire organization. However, in the literature on the subject, relatively little attention is paid to the determinants of this process. Moreover, the process course is rarely analyzed in a strategic context relating to the entire organization. For these reasons, this article's primary goal is to identify the determinants of the effectiveness of risk management in the project portfolio. Research in this area was carried out in the FinTech industry, and the results were analyzed using structural equation modeling. The results indicated that the most important dimensions of the examined effectiveness are the strategic orientation of the organization and the risk management process in the project portfolio. At the level of strategic orientation, this highlights the need for coherence between the organization's strategy and the project portfolio. At the level of risk management in the project portfolio, the primacy of ownership and control of individual risks is clearly visible.

Keywords: project portfolio; risk management; effectiveness of risk management in the project portfolio; project management in the FinTech industry



Citation: Khalil-Oliwa, Oliwia, and Izabela Jonek-Kowalska. 2024.

Determinants of the Effectiveness of Risk Management in the Project Portfolio in the FinTech Industry. *Risks* 12: 111. <https://doi.org/10.3390/risks12070111>

Academic Editors: Salvador Cruz Rambaud and Ramona Rupeika-Apoga

Received: 24 April 2024

Revised: 27 June 2024

Accepted: 1 July 2024

Published: 4 July 2024



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1. Introduction

Today's large organizations carry out many different projects. Their coordination—usually taking place within project portfolios—requires multi-faceted knowledge and experience (Kock et al. 2024; Hofman et al. 2017). In addition to the complexity of business ventures, the growing number of internal and external threats poses additional challenges (Hopmeyer et al. 2020, traditionally perceived as the risk of doing business (Clegg et al. 2018; Hadjinicolaou and Dumrak 2017).

Meanwhile, many enterprises do not introduce and implement risk management procedures, even though they could significantly improve the results of implemented projects (Ahmadi-Javid et al. 2020). This is also pointed out by Amoah and Pretorius (2020) in their research in the construction industry. Similar observations result from research by Jonek-Kowalska (2022) on a representative sample of large and medium-sized Polish enterprises.

In turn, research on risk management in the project portfolio—if it is introduced—focuses largely on the description of methods and tools (Guan et al. 2017; Relich and Pawlewski 2016; Kettunen and Salo 2017) concerning risk identification (Ghasemi et al. 2018) or the interdependencies between risk and project implementation. In this context, according to Micán et al. (2020), there is a lack of mechanisms for assessing risk management in the project portfolio and its impact on the strategic aspects of the organization's functioning.

The issue of project risk management is particularly important in the FinTech industry for several reasons. In this industry, project management is widely used and determines the success of financial institutions. Additionally, FinTech, due to the constant search for

and implementation of innovations ([Almubarak and Aljughaiman 2024](#)), is a sector that is extremely exposed to risk, in particular, technological and market risk ([Shi and Lu 2024](#); [Al Hammadi et al. 2024](#); [Colombage 2023](#); [Balaskas et al. 2024](#)). Moreover, most FinTech institutions operate in the globalized financial market, which, as confirmed by the recent economic crises, induces above-average challenges for risk managers in this industry.

Given the above, we decided to conduct research on risk management in a portfolio of projects in the FinTech industry. The obtained results identify the main determinants of this process, thus setting the basis for its improvement. In today's turbulent environment, this approach is justified and useful theoretically and practically.

The main goal of this study was to identify the determinants of the effectiveness of risk management in the project portfolio. To achieve this goal, we first defined the dimensions of determinants affecting the risk management process. Then, we examined their impact on the effectiveness of risk management in the portfolio, selecting those that are most important. On the diagnostic side, we gained knowledge about the directions and strengths of the impacts of individual management components on the results achieved in the project portfolio. In this article, we also provide information on the connections between individual dimensions and their joint impact on the effectiveness of risk management. Such research has not been conducted before. In the literature, the topic of risk management in the project portfolio is discussed very rarely. An additional advantage of our work is that it is embedded in the FinTech industry, in which it sets the basis for making industry recommendations.

The originality of the considerations and analyses presented in this article are underpinned by the following:

- Defining the dimensions and determinants of the effectiveness of risk management in the project portfolio;
- Development of a universal model for assessing the effectiveness of risk management in a project portfolio;
- Providing knowledge on the impacts of individual dimensions of organizational management and risk management on the effectiveness of the risk mitigation tools adopted, with a particular emphasis on the FinTech industry;
- Closing the research gap related to the identification of connections between project management, risk management in the project portfolio, and the strategic management of the organization;
- Focusing on the effectiveness of risk management in the project portfolio and not on management instruments or the identification of risks related to projects and portfolios;
- Embedding research in the FinTech industry, which is rich in projects and project portfolios ([Győri et al. 2021](#));
- Obtaining results on the effectiveness of risk management in the project portfolios of international FinTech organizations;
- Providing a replicable tool for comparative analyses of risk management in the project portfolio.

The survey research described in this article was conducted in the FinTech industry among 105 project managers. The article herein presents the assumptions for the developed research model based on the literature review. Then, the methodological section describes the survey questionnaire and the assumptions of structural equation modeling used to analyze the obtained results and identify the determinants of the effectiveness of risk management in the project portfolio. The article finally closes with a discussion and a summary including the research limitations and directions for further research.

2. Background

Developing a model for assessing the effectiveness of risk management in a project portfolio requires defining the areas in which potential determinants of effectiveness are located. Accordingly, this section presents the key areas of project portfolio management, treating them as several determinants of the effectiveness of risk management. This

approach will make it possible to systematize the examined factors and place them in the field of project management. The identification of individual dimensions was based on literature studies and the adopted portfolio risk management methodology.

The literature on the subject presents the following five dimensions of project portfolio management: (1) strategic orientation; (2) organizational context; (3) senior management involvement; (4) adjusting the portfolio to the organization's governance; and (5) the risk management process in the project portfolio. A detailed description of the mentioned dimensions is presented in the following Sections 2.1–2.5.

2.1. Strategic Orientation

Integration of organizational strategy with portfolio management is important, especially in the following areas: selection of project evaluation methods and criteria; prioritization of projects in the portfolio (Archer and Ghasemzadeh 1999); allocating resources between projects and monitoring and modifying components in the portfolio (Strojny et al. 2023); and verification of projects' implementation of the organization's strategic goals (Kozarkiewicz 2012).

At the stage of selecting projects for the portfolio, it is necessary to determine the compliance of the project goals with the organization's strategy, the compliance of the allocation of resources between projects with the organization's strategy, and the compliance of the entire project portfolio with the strategy (Kozarkiewicz 2007).

The authors of the study "Project Portfolio Management: Leading the Corporate Vision" (Rajegopal et al. 2007) point to a clear relationship between an organization's strategy and its project portfolio. The projects included in the portfolio are understood as an investment of the company, the aim of which is to implement its strategy.

Also, Prasad Kodukula points out that project portfolio management is a complex process, which allows the transformation of the organization's strategy into the results expected by the organization. Changes in the organization's environment lead to a revision of the organization's strategy and its goals, which, in turn, leads to the emergence of new business initiatives. Projects and programs are elements of these initiatives and contribute to the creation of new products and services, and thus bring the expected value to the organization. The project portfolio, in turn, ensures that the organization's resources will be allocated to the right projects at the right time (Kodukula 2014). The role of portfolio management is presented in Figure 1.

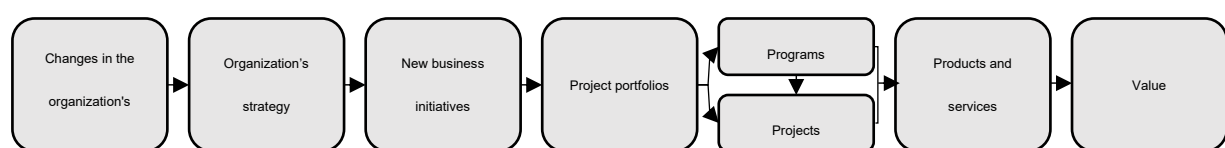


Figure 1. The role of portfolio management in the organization. Source: Kodukula 2014.

The need to define the relationship between the strategy and the organization's goals is also emphasized by the standards and methodologies widespread in portfolio management practice, including PMI from the Standard for Portfolio Management. Figure 2 shows the relationship between the mission, vision, and strategy of the organization and portfolio management, operational activities, as well as project and program management. The project portfolio acts as an intermediary between the organization's strategy and its projects, programs, and operational activities.



Figure 2. The organizational context of portfolio management. Source: the Standard for [Project Management Institute \(2017, p. 8\)](#).

The organization's strategy provides the long-term direction, goals, and vision of the organization. The business goals specified in the strategy may be implemented through operational activities or programs and projects. Therefore, project portfolio management is part of the organization's strategic plan. An organization's strategy translates into a set of initiatives. In turn, the project portfolio is monitored in terms of achieving strategic goals, which may potentially change the organization's strategic orientation ([Project Management Institute 2017](#)).

According to the Standard for Portfolio Management, the portfolio management process, which is continuous in nature, as opposed to the temporary nature of project management, should be integrated with other processes operating throughout the organization, such as annual planning or a strategic review of the organization on a quarterly basis ([Hyväri 2014](#)). The primary goal of combining portfolio management with strategy is to define an actionable plan that will enable the organization to achieve its goals.

The relationship between the organization's strategy and the project portfolio also forms the basis for the Management of Portfolios (M_o_P) standard. According to the guidelines, implementing a portfolio management standard in an organization allows for the implementation of only those projects that contribute to the achievement of strategic goals at a level acceptable to the organization ([Grinold 2011](#)). The portfolio itself is defined according to the standard as a set of the organization's investments in changes, aimed at achieving the organization's strategic goals. On the other hand, portfolio management has been defined as a set of processes and strategic decisions, whose task is to achieve a balance between the implementation of changes and the current activities of the organization.

The M_o_P methodology defines five basic principles of portfolio management, which constitute its foundation. One of the principles is compliance with the organization's

strategy, understood as the appropriate allocation of organizational resources to initiatives (Chadam and Kański 2019).

Also, as provided in *Portfolio Management: A Practical Guide*, portfolio management is an integral element of strategic planning. Thanks to portfolio management, the goals of projects within the portfolio contribute to the achievement of the strategic goals of the entire organization. In turn, the PortfolioStep methodology points to the need to ensure coherence between the strategic goals of the organization and the goals of the projects constituting elements of the portfolio (Association for Project Management 2019).

Notably, the project portfolio strategy itself may define a set of projects in the portfolio that will bring the greatest benefits to the organization while maintaining a specific level of risk (Rad and Rowzan 2018; Bai et al. 2022). The limitations, which should be taken into account when selecting the most advantageous set of projects, are primarily the need to implement the organization's strategy and the limited availability of resources, including financial ones (Cabała 2018).

2.2. Organizational Context

The organizational context consists of the internal and external factors that should be taken into account in the process of portfolio management in the organization. The external conditions, in which the organization is embedded, include factors such as the industry and market in which the organization operates, as well as legal regulations that should be applied (AXELOS 2010). Even though they do not belong to the organization, external factors can influence its activities and goals.

Internal conditions, which are also treated as organizational context, include the organization's culture, stakeholders and their interdependencies, as well as both formal and informal structures. Organizational culture is understood as the social norms applicable in a given organization and systems of patterns of thinking and behavior that function in the organization and are important for achieving its goals (Nogalski 1998; Deshpande and Webster 1989; Sikorski 2012).

A particular importance of organizational culture is emphasized by one of the principles of the Management of Portfolios methodology. A culture of vigorous change is understood as the scope within which an organization is able to mobilize its potential in order to implement the tasks assigned to it (AXELOS 2011).

One of the important elements of organizational culture in project management is proactive communication, i.e., regular presentation of portfolio goals, as well as progress in their implementation. To ensure organizational trust is also important, which involves collecting and disseminating the organization's experience in portfolio management for future use (Project Management Institute 2017). In the human resources context, organizational culture is influenced by employees' awareness of what behaviors are desired in the organization. The external determinant of organizational culture is, in turn, regulatory and market requirements that may affect the project portfolio (Ropponen and Lyytinen 2000).

An organization's risk management culture includes the organization's overall awareness of risks, acceptance of and commitment to risk management procedures, as well as appropriate communication and coordination among stakeholders. In the context of risk management in a project portfolio, some components of the organizational context may also be important (Project Management Institute 2017). When analyzing them from an external perspective, it is necessary to mention regulatory requirements that may affect the level of risk in projects in the portfolio and market research of the organization's environment, which may likewise affect the level of risk. From an internal perspective, benchmarking portfolio risk management processes and collecting risk information in the project portfolio (what risks were identified; how the risks were identified, assessed, and controlled) will be important.

2.3. Senior Management Involvement

In the context of project portfolio management, a group of decision makers who make key decisions about the project portfolio is considered the senior management (Unger et al. 2012). As part of portfolio management, the senior management makes decisions regarding the selection and prioritization of project proposals that may become part of the portfolio and changes in priorities in project portfolios. Its activities also include the allocation and reallocation of resources to projects, taking into account portfolio priorities (Blichfeldt and Eskerod 2008), and allocating budgets for projects implementing strategic goals (Cooper and Kleinschmidt 1995).

The above points, as well as the definition by decision makers of the principles and procedures applicable to the portfolio (Unger et al. 2012), constitute passive support for portfolio management (Swink 2000). The senior management can also actively support project management in the portfolio, including through personal involvement in projects (Malhotra and Nippani 2024).

The Management of Portfolios standard also indicates that the involvement of senior management in portfolio management is crucial primarily in three dimensions. The first one concerns providing a mechanism for prioritizing the project portfolio, so that the projects are aligned with the organization's strategic goals. The second one refers to creating a clear decision-making structure with a specified scope of responsibility, which affects, on the one hand, the pace of decision-making and, on the other hand, its compliance with the organization's strategy. The third aspect involves support by decision makers for initiatives implemented in the organization (AXELOS 2011).

In the Management of Risk (M_o_R) methodology, one of the eight principles of risk management in the entire organization, as well as in the project portfolio, is "support in the decision-making process". It can be assumed that risk affects all decisions made in a project portfolio and, therefore, it is crucial for decision makers to understand the benefits, threats, and opportunities associated with making a portfolio decision. This principle can be considered to be met if decisions are made based on a consideration of the impact of risk (AXELOS 2010).

2.4. Adjusting the Portfolio to the Organization's Governance

According to the Praxis standard, the organization's governance of the project, program, and portfolio should be a key element of the organization's structure. This minimizes the risks associated with implemented projects, as well as increases the benefits that can be achieved (Praxis Standard). The goal of the organization's governance as one of the practices in the M_o_P methodology is to determine the time, place, and criteria for making decisions (AXELOS 2011).

Important elements related to the organization's governance in the project portfolio include the following:

1. Organizational structure for project portfolio management (Kodukula 2014);
2. Defining the standards and process of project portfolio management;
3. Defined roles and responsibilities in the project portfolio management process;
4. Specific escalation paths (AXELOS 2011);
5. A Portfolio Office within an organization, which monitors the performance of the project portfolio (Kendall and Rollins 2003).

Moreover, according to empirical research (Martinsuo and Lehtonen 2007), project portfolio management is also influenced by the management of the projects included in the portfolio. The effectiveness of the project management process translates directly into the success of project portfolio management (Surco-Guillen et al. 2022; Teller 2013).

2.5. Portfolio Risk Management Process

Risk management is considered one of the key processes in project portfolio management (Rajegopal et al. 2007; Sarfraz et al. 2008). However, it should not be equated with project risk management, which focuses primarily on the project constraints triangle

(Lee et al. 2009; Pritchard 2014), i.e., concerning the project schedule, scope, or budget, because portfolio risk management must also address such issues as the selection and implementation of appropriate projects within the portfolio and the compliance of projects with the organization's strategy. Holistically, a portfolio balance is also important (Elonen and Artto 2003).

Given the above, risk management in a project portfolio is complex, because the risks in the portfolio may include, among others, those resulting from the interdependencies between the projects included in it (De Bakker et al. 2010). In addition, elements related to the entire organization, such as existing management practices, a large number of projects in the portfolio, as well as the organization's high dependence on internal and external stakeholders, may also have an impact on the level of risk in the portfolio (Micán et al. 2019). The indicated circumstances mean that the risk management process in a single project cannot be implemented for the whole project portfolio (Olsson 2008).

Portfolio risk management should include risk information from individual projects included in the portfolio (Aritua et al. 2009), which will make it possible to detect similar risks identified in different projects (Kodukula 2014), reduce unnecessary duplication of efforts on risk mitigation activities, and thus use resources in the organization more efficiently and allow more conscious decisions to be made in the organization (McFarlan 1981).

According to the Standard for Portfolio Management, risk management in a project portfolio is a process of assessing and analyzing portfolio risks (Rojas Rincón et al. 2024), the aim of which is to take advantage of potential opportunities or mitigate events and circumstances that may negatively affect the portfolio. In turn, the M_o_P methodology indicates that risk management in the project portfolio ensures the management of the portfolio's exposure to risk collectively at the level of the entire portfolio and at the individual level.

A formal risk management process defined in the organization can contribute to increasing the efficiency and effectiveness of risk management in the project portfolio. When creating it, the organization should firstly define a portfolio risk management strategy and objectives and then the level of risk tolerated in the organization, i.e., the level of risk that the organization is able to accept (the level of acceptable risk is the maximum that the organization is able to bear in connection with factors such as reputation, capital, assets, or the ability to obtain additional financing). Risk tolerance levels, understood as threshold levels of risk exposure, can only be exceeded after obtaining the required acceptance, and, if exceeded, there may be certain consequences (AXELOS 2010).

Moreover, in accordance with the M_o_R standard, the formal risk management process should also include some additional components as specific roles and responsibilities in the risk management process and defined steps in the process, i.e., activities required at individual stages of the process. These elements are supplemented by a glossary of terms (AXELOS 2010).

The dimensions of risk management in the project portfolio described above were further used to develop a research model allowing for the assessment of the effectiveness of risk management.

3. Methods and Materials

3.1. Structuring the Research Model

As already mentioned, there is no assessment of the effectiveness of risk management in the project portfolio in the literature and practice (Trzeciak and Jonek-Kowalska 2021; Jonek-Kowalska 2019; Sanchez et al. 2008). However, this effectiveness should be considered in the context of the basic and universal task of risk management, which is to reduce the negative impact of risk on the degree of achievement of the goals (intents) of the project portfolio (De Reyck et al. 2005). Without such an assessment, the organization cannot obtain an answer to the question: to what extent does the implementation of selected risk management tools and methods contribute to reducing threats and preventing negative deviations in the implementation of strategic and operational plans? It is also impossible to assess the validity of implementing selected risk management methods and tools, as

well as to make the desired modifications and improvements in this area. Moreover, it is difficult to identify the determinants influencing the effectiveness defined in this way.

Given the above, the following measures of the effectiveness of risk management in the project portfolio are proposed:

1. Projects withheld at the initiation stage, due to the identified level of risk.
2. Projects withheld at the implementation stage, due to the identified level of risk (Teller 2013).
3. Identified dependencies between projects as a result of risk management at the portfolio level (De Bakker et al. 2010).
4. Similar identified risks in different projects (Jonas et al. 2012).
5. Decisions regarding projects in the portfolio are made based on a comprehensive picture of the risks in the portfolio (Sanchez et al. 2008).
6. A portfolio balance, understood as the appropriate selection of projects in the portfolio, so that they constitute a set of initiatives with different levels of risk.
7. Mitigation actions taken regarding risks identified at the portfolio level (Teller 2013).

To identify the determinants of the effectiveness of risk management in a project portfolio, the dimensions of project portfolio management were determined based on a literature review. The final form of the research model is shown in Figure 3.

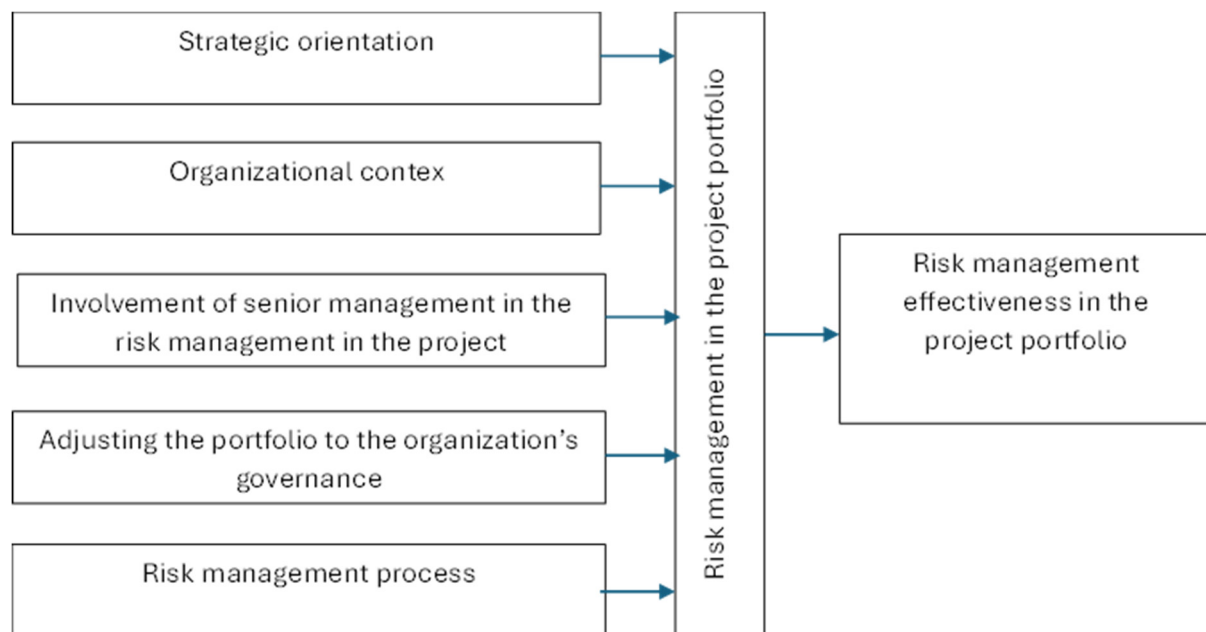


Figure 3. Conceptual research model. Source: own work.

Reducing the dimensions of portfolio management allowed for identifying the dimensions of risk management in the portfolio, which involved uncovering a list of hidden variables in the model. These variables were refined to the level of determinants of the effectiveness of risk management in the project portfolio and then operationalized into specific questions in the survey questionnaire.

Partial least squares estimation modeling (PLS-SEM) was used to estimate the relationship between latent variables. In the 1970s, two analytical approaches were developed in SEM (structural equation modeling): covariance-based SEM (or CB-SEM) and modeling using partial least squares SEM (or PLS-SEM) (Rakowska and Macik 2016).

Unlike structural equation modeling based on covariance (CB-SEM), PLS-SEM focuses on explaining hidden dependent variables, while in the CB-SEM method, the emphasis is on rebuilding the covariance matrix in a theoretical approach.

Although the PLS-SEM method is less popular than CB-SEM, it is increasingly used in marketing research and management disciplines. The choice of PLS-SEM as a research

method was made since the study was exploratory in nature and intended to clarify, not verify, the theory. Furthermore, the premise for choosing this model was the specificity of the research sample (portfolio managers from the FinTech industry) and, therefore, the relatively small sample size (the recommended minimum sample size for PLS-SEM is from 30 to 100). Additionally, data collected during this research were based on an ordinal scale with a small number of values (five-point Likert scale).

3.2. Survey Research Process

This research used a survey questionnaire. It contains questions regarding each of the identified dimensions and a group of questions regarding the assessment of the effectiveness of risk management in the project portfolio. All questions are listed in Tables 1–6.

Table 1. Determinants of the effectiveness of risk management in the project portfolio: strategic orientation.

Strategic Orientation	
Symbol	Question
OR1	Defined long-term strategy of the organization.
OR2	Defined short-term strategy of the organization.
OR3	Defined strategy for the project portfolio.
OR4	Cohesiveness of the project portfolio strategy with the overall organization strategy.
OR5	Integration of the portfolio management process with other processes in the organization, such as the quarterly strategy review.
OR6	Selection of projects for the portfolio in the organization based on specific criteria that support the strategy.
OR7	Ongoing review of projects in the portfolio for alignment with the organizational strategy.
OR8	Allocating resources in the organization to projects in the portfolio following the organization's strategy.
OR9	Defined risk management strategy for the organization.

Source: own work.

Table 2. Determinants of the effectiveness of risk management in the project portfolio: organizational context.

Organizational Context	
Symbol	Question
KO1	Defined social norms, applicable in the organization.
KO2	Identified key stakeholders of the project portfolio.
KO3	Regular presentation of portfolio objectives to key stakeholders.
KO4	Regular presentation of progress on portfolio objectives to key stakeholders.
KO5	Gathering the organization's experience in portfolio management so that it can be used in the future.
KO6	Acceptance of uncertainty in the organization.
KO7	Prudent approach to risk in the organization.
KO8	Gathering information about risk in the organization.
KO9	Gathering information in the organization on how the risk management process, i.e., identifying, assessing, and controlling risks, is carried out.
KO10	Identification of regulatory requirements that may affect the level of risk in projects in the portfolio.
KO11	Conducting market research of the organization's environment that may affect the level of risk in the portfolio.
KO12	Conducting benchmarking of the portfolio's risk management processes against other organizations.

Table 3. Determinants of the effectiveness of risk management in the project portfolio: senior management involvement.

Senior Management Involvement	
Symbol	Question
ZWK1	Involvement of senior management in the process of selecting projects for the project portfolio.
ZWK2	Involvement of senior management in the reprioritization of the project portfolio.
ZWK3	Involvement of senior management in the process of allocating resources to projects.
ZWK4	Involvement of senior management in monitoring the progress of the project portfolio.
ZWK5	Involvement of senior management in the portfolio risk management process.
ZWK6	Senior management decision-making on the project portfolio based on risk analysis and assessment.

Source: own work.

Table 4. Determinants of the effectiveness of risk management in the project portfolio: adjusting the portfolio to the organization's governance.

Adjusting the Portfolio to the Organization's Governance	
Symbol	Question
DP1	Defined organizational structure for project portfolio management.
DP2	Defined process for project portfolio management.
DP3	Defined roles in the project portfolio management process.
DP4	Defined responsibilities for roles in the project portfolio management process.
DP5	Defined escalation paths for the project portfolio.
DP6	Formalized project management process.
DP7	A functioning project portfolio office in the organization.
DP8	Experience of Project Managers in the project management process.
DP9	Experience of Portfolio Managers in the portfolio management process.
DP10	Risk management as a component of portfolio project management.
DP11	Risk management as a component of project portfolio management.
DP12	Experience of Project Managers in the process of risk management in projects.
DP13	Experience of Portfolio Managers in the process of portfolio risk management.

Source: own work.

Table 5. Determinants of the effectiveness of risk management in the project portfolio: portfolio risk management process.

Portfolio Risk Management Process	
Symbol	Question
PZR1	A defined risk management strategy.
PZR2	A definition of risk at the project level.
PZR3	A definition of risk.
PZR4	Clearly defined risk management steps.
PZR5	Defined roles in the project portfolio risk management process.
PZR6	Defined responsibilities for roles in the project portfolio risk management process.
PZR7	Defined risk management process for projects.
PZR8	Defined ownership for risks identified.

Table 5. Cont.

Portfolio Risk Management Process	
Symbol	Question
PZR9	Defined control process for risks identified.
PZR10	Defined tolerable risk level, i.e., the level of risk the organization is willing to accept.
PZR11	Defined level of tolerable risk.
PZR12	Defined risk tolerance levels.
PZR13	Consideration of risk assessment when prioritizing projects.
PZR14	Regular review of risks in the projects.
PZR15	Defined dependency management process.
PZR16	Prepared portfolio reports for senior management.
PZR17	Information on the level of risks in the projects included in the portfolio as part of the portfolio reports prepared for senior management.
PZR18	Information on the level of risks across the portfolio as part of portfolio reports prepared for senior management.
PZR19	Visualization of risks in the portfolio as an element of portfolio reports prepared for senior management
PZR20	Linking project portfolio risk management to other risk management processes in the organization.
PZR21	Collaboration between those responsible for managing risks in the project portfolio and those responsible for risk management in the organization.
PZR22	Use of dedicated IT tools in the portfolio risk management process.

Source: own work.

Table 6. Determinants of the effectiveness of risk management in the project portfolio: effectiveness of the project portfolio risk management process.

Effectiveness of the Project Portfolio Risk Management Process	
Symbol	Question
S1	Risk management in the project portfolio contributes to reducing project delays.
S2	When each project in the portfolio has a separate budget, risk management in the project portfolio helps avoid budget overruns of individual projects.
S3	When the portfolio budget is managed holistically for all projects in the portfolio, project portfolio risk management avoids budget overruns for the entire portfolio.
S4	Managing risk in a portfolio of projects reduces the likelihood that portfolio goals will not be met.
S5	Portfolio risk management allows you to make decisions in a more informed manner.
S6	Portfolio risk management keeps the parties involved in the portfolio informed of existing risks to the portfolio.
S7	Risk management facilitates project decision-making based on a holistic view of the risks in the project portfolio.
S8	Risk management facilitates the selection of projects in the portfolio, so that they represent a set of projects with variable levels of risk.
S9	Portfolio risk management provides a better understanding of the projects in the portfolio
S10	Portfolio risk management has a positive impact on the efficiency of the entire organization.
S11	Portfolio risk management facilitates the organization's strategic goals.
S12	Risk management contributes to increasing the number of identified risks in the project portfolio.
S13	Risk management contributes to mitigating actions on risks identified at the project portfolio level.
S14	Risk management may contribute to the withholding of projects at the initiation stage.
S15	Risk management may contribute to the withholding of projects at the implementation stage.

Source: own work.

The survey questionnaire includes 77 observable variables, which constitute a measurement tool for latent variables. These variables describe the identified dimensions of project portfolio management from a risk management perspective. Observable variables were assessed on a five-point Likert scale (1—insignificant variable, 5—very significant variable). In the case of questions about the effectiveness of risk management in the project portfolio, 1 meant “strongly disagree” and 5 meant “strongly agree”. This questionnaire was validated as part of pilot studies to verify the substantive content. The supplemented and corrected version was used to conduct research on a group of 105 project portfolio managers in the FinTech area. Then, the survey results were developed using descriptive statistical methods, and the parameters of the research model were determined along with the assessment of the goodness of fit of the model.

3.3. Modeling with PLS-SEM

The first step in modeling using PLS-SEM is the graphical development of a diagram that allows for the visual presentation of the studied variables and the determination of the relationships between them (Bedyńska and Książek 2012). The elements that make up such a path chart are as follows:

1. A rectangle denoting observable variables;
2. An ellipse, which is the marking of a latent variable;
3. Arrow defining cause-and-effect relationships between dependent and independent variables. The arrow connects observable variables with latent variables and creates connections between unobservable variables. As a result of modeling, the arrows receive a specific value, understood as the strength of the relationship between the variables.

The construct using PLS-SEM consists of two models. The first, i.e., the structural internal model, determines the cause-and-effect relationships between latent variables, both direct and indirect. In turn, the second model is referred to as the measurement (external) model and its purpose is to determine how hidden variables can be measured, i.e., what are the loadings of individual variables shaping the latent variable (Osińska et al. 2011).

Variables can be connected to each other directly or indirectly, understood as the influence of one variable on another, but through another or other variables. Thanks to this estimation of the coefficients, it is possible to determine the composite impact, which is the sum of direct and indirect connections.

The model presented in this study contains 43 observable variables and 6 latent variables. They were selected based on the assumptions described below.

The level of multicollinearity should not be higher than 10 (Chatterjee and Hadi 2015). Values above this ceiling indicate the possibility of a strong correlation between the predictors, which results in a deterioration of the model parameters. Moreover, when explanatory variables with collinearity are included in the model, there is a risk of an artificially high level of fit of the verified model to the data, i.e., too high an R^2 coefficient (Zelias 1988). No multicollinearity level above 10 was observed in the verified model.

Model loadings should not exceed the value of 0.708 (Hair et al. 2023), which indicates a sufficient level of reliability of the indicators. In other words, this level provides 50% of the variance of the indicator (Purwanto and Sudargini 2021). Indicators that show an external bias of up to 0.708 should be removed if this will increase the AVE factor above the threshold value (García-Machado 2017). Since the removal of variables in the model resulted in a change in the AVE value above 0.5, it was decided that variables that did not meet the condition with a loading of up to 0.708 were to be excluded from further analysis.

The structure of the model—consistent with the substantive assumptions described above—is shown in Figure 4.

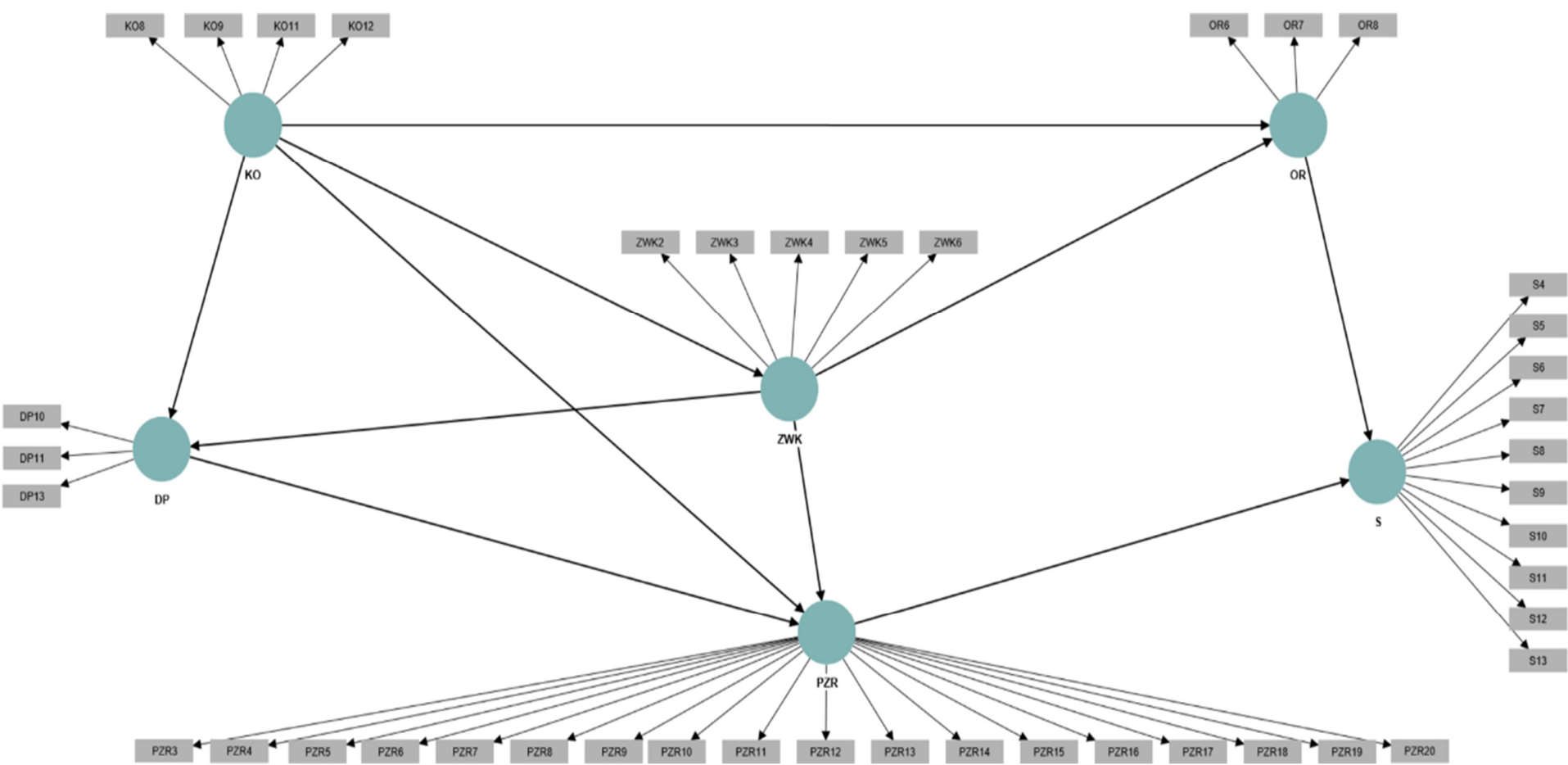


Figure 4. Conceptual research model. Source: own work using SmartPLS v. 4.0.9.6. in the professional version.

Additionally, the value of statistical significance was assumed to be 0.05. Only path coefficients, for which the statistical significance value was less than 0.05, were used for modeling. Values below the 0.001 level indicate a very high probability (90%) that the relationships between factors are not accidental (Mieszajkina 2018).

To verify the quality of the model, the following indicators were taken into account:

- a. Standardized root mean square residual (SRMR) providing a measure of model fit. A value less than 0.10 is considered a good fit (Kock 2020). The SRMR can be considered a measure of the goodness of fit for PLS-SEM, which can be used to avoid model misspecification (Henseler et al. 2011);
- b. R² determination coefficient, which allows for assessing the explanatory power of the model (Sagan 2015);
- c. For reliability analysis:
 - Cronbach's alpha coefficient, for which a level of 0.6 can be considered sufficient, >0.8 very good, and >0.9 excellent (Nunnally and Bernstein 1994);
 - Composite reliability (CR)—which should exceed the level of 0.7 (Hair et al. 2019);
- d. For convergent validity, the average variance extracted (AVE)—which should exceed the level of 0.5 (Purwanto and Sudargini 2021);
- e. For discriminant validity:
 - Cross-loading values for individual indicators, which should have higher values in relation to the corresponding constructs in the model than all others (Ab Hamid et al. 2017);
 - Fornell–Larcker criterion, according to which the square root values of AVE should be higher than the highest correlation with another construct (Kacprzak 2018);
 - Heterotrait–Monotrait ratio (HTMT) criterion (Henseler et al. 2014, the value of which should not exceed 0.9. If the HTMT value is higher than this threshold, it can be concluded that there is no discriminant validity (Teo et al. 2008).

The rest of the article presents the results regarding the determinants of risk management in the project portfolio. Structural equation modeling for the purposes of this work was performed using SmartPLS v. 4.0.9.6. in the professional version.

4. Results

4.1. Assessment of Model Quality and Fit

To determine the relationships between the dimensions of risk management in the project portfolio and its effectiveness, several dozen models were prepared and validated. After analyzing various associations between unobservable variables, the model that best fit the data was selected.

The quality indicators of the selected model allowed us to conclude that there was a satisfactory fit with the collected data. The standardized root mean square residual (SRMR), i.e., the model fit measure, was 0.084, which can be considered a good model fit. Moreover, the results obtained of the R² coefficient in the analyzed model indicated that 61.3% of the variance of the risk management effectiveness variable in the project portfolio was explained (60.5% for the adjusted R²). The value indicated moderate or significant explanatory power for this variable. The highest value of the coefficient was obtained for the risk management process in the project portfolio—71.8% (71.0% for adjusted R²). For the senior management's involvement in risk management in the project portfolio variable, the values of the R² and adjusted R² coefficients were 17.8% and 17.0%, respectively, which proved the low explanatory power of this variable. The values of the analyzed coefficients are presented in Table 7.

Table 7. Value of R^2 and adjusted R^2 coefficients for the studied constructs.

Specification	R-Square	Adjusted R-Square
Adjusting the portfolio to the organization's governance	0.494	0.484
Strategic orientation	0.384	0.372
Risk management process in the project portfolio	0.718	0.710
Risk management efficiency in the project portfolio	0.613	0.605
Involvement of senior management in the risk management in the project portfolio	0.178	0.170

Source: own work.

The presented model also met the criteria for reliability analysis, i.e., based on the level of Cronbach's alpha coefficient and the composite reliability. The model analysis showed that all defined dimensions were characterized by a high level of reliability ($\alpha > 0.7$). Similar results were obtained for composite reliability—all dimensions exceeded the required level, i.e., 0.7. Detailed information about the indicators is presented in Table 8.

Table 8. Values of reliability indicators for the studied constructs.

Specification	Cronbach's Alpha Coefficient	Composite Reliability (rho_a)	Composite Reliability (rho_c)
Adjusting the portfolio to the organization's governance	0.867	0.877	0.919
Organizational context	0.810	0.815	0.875
Strategic orientation	0.761	0.762	0.863
Risk management process in the project portfolio	0.960	0.961	0.964
Risk management efficiency in the project portfolio	0.941	0.943	0.950
Involvement of senior management in the risk management in the project portfolio	0.864	0.874	0.902

Source: own work.

The data presented in Table 9 confirm that the verified model met the convergent validity conditions. For the AVE value, all constructs exceeded the minimum threshold, i.e., 0.5. The highest level, i.e., 0.792, was obtained for the construct of portfolio fit with the organization's governance. In turn, the lowest value, i.e., 0.598, was identified for the variable regarding the risk management process in the project portfolio.

Table 9. Values of average variance extracted (AVE) for the studied constructs.

Specification	Average Variance Extracted (AVE)
Adjusting the portfolio to the organization's governance	0.792
Organizational context	0.637
Strategic orientation	0.679
Risk management process in the project portfolio	0.598
Risk management efficiency in the project portfolio	0.654
Involvement of senior management in the risk management in the project portfolio	0.648

Source: own work.

To verify the discriminant validity of the tested model, three methods were taken into account: assessment of cross-loadings and fulfillment of the Fornell–Larcker and heterotrait–monotrait ratio criteria. In the case of the first method, the requirement regarding cross-loadings was met, i.e., the values for specific indicators were higher in relation to the

corresponding constructs in the model (bold data) than for all others. A detailed analysis is presented in Table 10.

Table 10. Values of cross-loadings for the studied constructs.

Specification	Adjusting the Portfolio to the Organization's Governance	Organizational Context	Strategic Orientation	Risk Management Process in the Project Portfolio	Risk Management Efficiency in the Project Portfolio	Involvement of Senior Management in the Risk Management in the Project Portfolio
DP10	0.917	0.576	0.491	0.714	0.632	0.532
DP11	0.936	0.531	0.507	0.741	0.641	0.615
DP13	0.813	0.378	0.353	0.666	0.543	0.507
KO8	0.340	0.779	0.300	0.440	0.372	0.306
KO9	0.443	0.757	0.349	0.518	0.398	0.403
KO11	0.498	0.847	0.435	0.550	0.532	0.301
KO12	0.489	0.805	0.288	0.529	0.521	0.335
OR6	0.438	0.421	0.858	0.496	0.504	0.484
OR7	0.391	0.309	0.857	0.424	0.481	0.465
OR8	0.429	0.337	0.753	0.480	0.477	0.492
PZR3	0.583	0.520	0.321	0.753	0.508	0.350
PZR4	0.604	0.571	0.410	0.735	0.533	0.421
PZR5	0.591	0.594	0.470	0.773	0.594	0.444
PZR6	0.600	0.560	0.436	0.751	0.604	0.460
PZR7	0.610	0.526	0.479	0.754	0.579	0.470
PZR8	0.614	0.362	0.591	0.744	0.664	0.593
PZR9	0.693	0.441	0.550	0.839	0.682	0.518
PZR10	0.563	0.519	0.436	0.799	0.619	0.450
PZR11	0.540	0.483	0.471	0.757	0.577	0.506
PZR12	0.564	0.458	0.472	0.747	0.549	0.484
PZR13	0.760	0.499	0.450	0.834	0.676	0.607
PZR14	0.670	0.467	0.442	0.753	0.561	0.604
PZR15	0.647	0.518	0.462	0.755	0.552	0.620
PZR16	0.574	0.433	0.330	0.720	0.486	0.499
PZR17	0.683	0.489	0.403	0.840	0.588	0.555
PZR18	0.664	0.429	0.368	0.824	0.609	0.571
PZR19	0.538	0.520	0.330	0.768	0.604	0.409
PZR20	0.511	0.582	0.452	0.756	0.514	0.417
S4	0.465	0.351	0.390	0.601	0.697	0.514
S5	0.542	0.425	0.522	0.632	0.869	0.469
S6	0.605	0.461	0.553	0.648	0.874	0.508
S7	0.586	0.476	0.551	0.570	0.795	0.486
S8	0.460	0.412	0.443	0.541	0.818	0.382
S9	0.597	0.509	0.418	0.606	0.822	0.501
S10	0.597	0.631	0.465	0.709	0.810	0.411
S11	0.576	0.596	0.474	0.667	0.798	0.490
S12	0.529	0.357	0.513	0.581	0.790	0.417
S13	0.532	0.398	0.445	0.535	0.799	0.342
ZWK2	0.460	0.163	0.457	0.446	0.381	0.765
ZWK3	0.416	0.292	0.446	0.478	0.305	0.785
ZWK4	0.481	0.285	0.409	0.465	0.391	0.869
ZWK5	0.544	0.532	0.560	0.598	0.599	0.839
ZWK6	0.567	0.353	0.452	0.584	0.518	0.762

Source: own work.

The data in Table 11 confirm the fulfillment of the Fornell–Larcker criterion. The bold data (located on the diagonal of the matrix) contain values calculated on the basis of the square root of the average variance extracted (AVE) for the examined constructs.

Off-diagonal values represent correlation coefficients between constructs and should be lower than the bold values.

Table 11. Assessment of the fulfillment of the Fornell–Larcker criterion for the studied constructs.

Specification	DP	KO	OR	PZR	S	ZWK
Adjusting the portfolio to the organization’s governance (DP)	0.890	-	-	-	-	-
Organizational context (KO)	0.561	0.798	-	-	-	-
Strategic orientation (OR)	0.510	0.434	0.824	-	-	-
Risk management process in the project portfolio (PZR)	0.795	0.642	0.568	0.773	-	-
Risk management efficiency in the project portfolio (S)	0.682	0.577	0.593	0.758	0.809	-
Involvement of senior management in the risk management in the project portfolio (ZWK)	0.621	0.422	0.584	0.649	0.561	0.805

Source: own work.

The last criterion verifying discriminant validity is the heterotrait–monotrait ratio (HTMT) criterion. As shown in Table 12, this criterion was also met for all constructs, i.e., the HTMT value did not exceed 0.9. Only for the relationship between the risk management process in the project portfolio and the portfolio’s adjustment to the organization’s governance was the HTMT value high and approaching the level of 0.9 (i.e., 0.868).

Table 12. Assessment of the fulfillment of the heterotrait–monotrait ratio criterion for the studied constructs.

	Heterotrait–Monotrait Ratio (HTMT)
Organizational context $\rightleftharpoons$ Adjusting the portfolio to the organization’s governance	0.657
Strategic orientation $\rightleftharpoons$ Adjusting the portfolio to the organization’s governance	0.623
Strategic orientation $\rightleftharpoons$ Organizational context	0.546
Risk management process in the project portfolio $\rightleftharpoons$ Adjusting the portfolio to the organization’s governance	0.868
Risk management process in the project portfolio $\rightleftharpoons$ Organizational context	0.727
Risk management process in the project portfolio $\rightleftharpoons$ Strategic orientation	0.661
Risk management efficiency in the project portfolio $\rightleftharpoons$ Adjusting the portfolio to the organization’s governance	0.752
Risk management efficiency in the project portfolio $\rightleftharpoons$ Organizational context	0.649
Risk management efficiency in the project portfolio $\rightleftharpoons$ Strategic orientation	0.698
Risk management efficiency in the project portfolio $\rightleftharpoons$ Risk management process in the project portfolio	0.791
Involvement of senior management in the risk management in the project portfolio $\rightleftharpoons$ Adjusting the portfolio to the organization’s governance	0.707
Involvement of senior management in the risk management in the project portfolio $\rightleftharpoons$ Organizational context	0.481
Involvement of senior management in the risk management in the project portfolio $\rightleftharpoons$ Strategic orientation	0.712
Involvement of senior management in the risk management in the project portfolio $\rightleftharpoons$ Risk management process in the project portfolio	0.697
Involvement of senior management in the risk management in the project portfolio $\rightleftharpoons$ Risk management efficiency in the project portfolio	0.603

Source: own work.

Additionally, an analysis of multicollinearity between constructs was performed using the variance inflation factor (VIF) coefficient. This showed that no values exceeded level 3, meaning the possibility of multicollinearity was excluded. The highest value, i.e., 1.975, occurred for the relationship between the portfolio adjustment to the organization’s governance and the risk management process in the project portfolio. Details of the VIFs for the remaining relationships are presented in Table 13.

Table 13. Multicollinearity coefficients for the studied constructs.

Specification	DP	KO	OR	PZR	S	ZWK
Adjusting the portfolio to the organization's governance (DP)	-		-	1.975	-	-
Organizational context (KO)	1.217		1.217	1.478	-	1.000
Strategic orientation (OR)	-		-	-	1.476	-
Risk management process in the project portfolio (PZR)	-		-	-	1.476	-
Risk management efficiency in the project portfolio (S)	-		-	-	-	-
Involvement of senior management in the risk management in the project portfolio (ZWK)	1.217		1.217	1.648	-	-

Source: own work.

4.2. Structural Modeling Results

Summarizing the above analyses, it can be concluded that the selected model meets the criteria for reliability and convergent and discriminant validity. Figure 5 presents the concept of our model, which determines the relationships between the identified dimensions of risk management in the project portfolio and its effectiveness. The model takes into account a total of 43 observable variables, for which the loading does not exceed 0.708, including the following:

- Strategic orientation—3;
- Organizational context—4;
- Involvement of senior management in the risk management in the project portfolio—5;
- Adjusting the portfolio to the organization's governance—3;
- Risk management process in the project portfolio—18;
- Risk management efficiency in the project portfolio—10.

Based on the above variables, modeling was carried out, in which positive values were obtained for the identified path coefficients.

The model, including the estimated parameters, is presented in Figure 5 along with the level of statistical significance. All coefficients turned out to be statistically significant ($p < 0.05$). The direct impact of the strategic orientation and the risk management process in the project portfolio can be written as the following equation:

$$\text{Risk management efficiency in the project portfolio} = 0.240 \times \text{strategic orientation} + 0.622 \times \text{risk management process in the project portfolio}$$

The importance of the strategic orientation for portfolio and risk management in the project portfolio is also justified in the literature on the subject. Projects that are part of the portfolio implement the organizational strategy. It can, therefore, be concluded that the set of projects that make up the portfolio should bring the greatest possible benefits to the organization, but while maintaining the level of risk tailored to the organization.

If the organization has a clearly defined strategy, it may translate into project portfolio management, i.e., the organization will initiate and conduct projects that support the implementation of strategic goals. The model uses three variables regarding the dimension of strategic orientation:

- a. Selection of projects for the organization's portfolio based on specific criteria supporting the strategy (OR6);
- b. Ongoing review of projects in the portfolio for alignment with the organizational strategy (OR7);
- c. Allocating resources in the organization to projects in the portfolio following the organization's strategy (OR8).

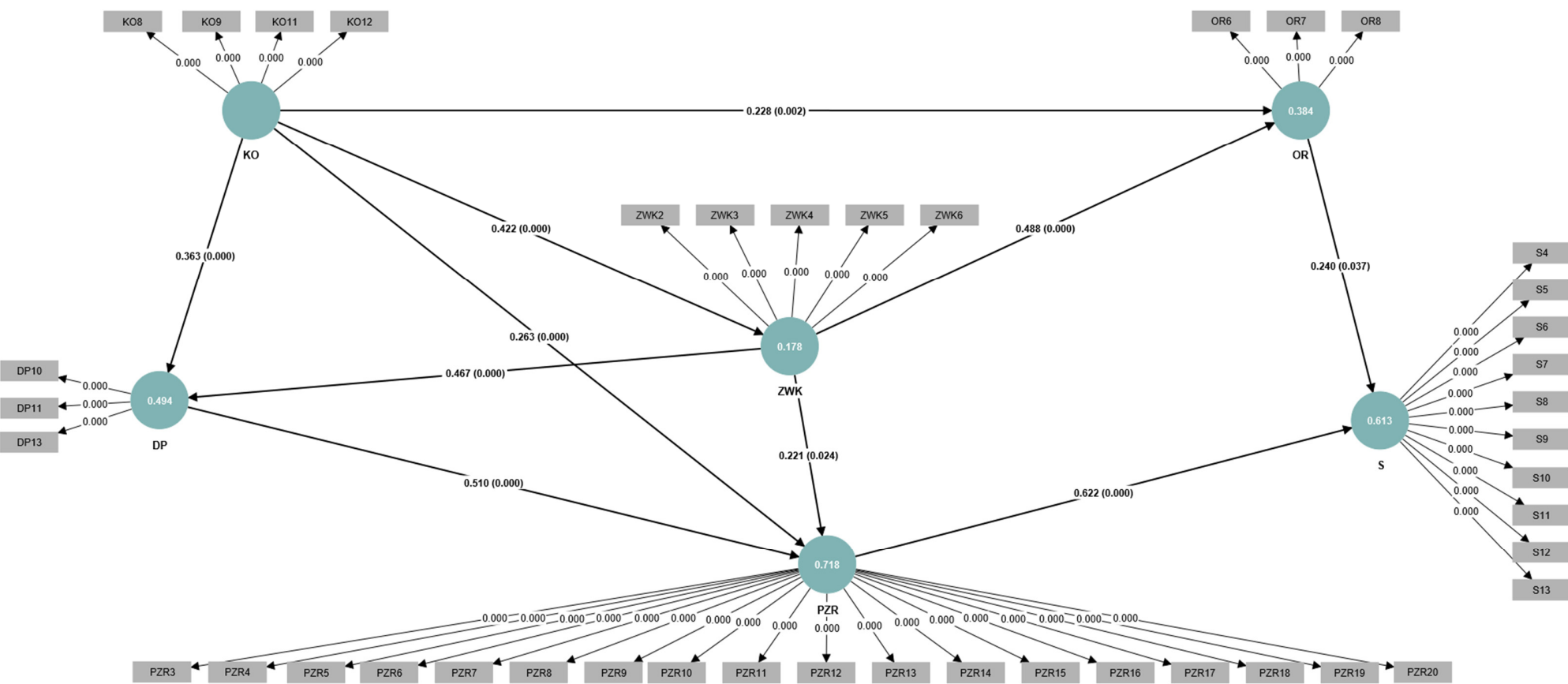


Figure 5. Conceptual research model and results. Source: own work using SmartPLS v. 4.0.9.6. in the professional version.

From a practical perspective, to strengthen the effectiveness of risk management in the project portfolio, the most important thing for the dimension of strategic orientation seems to be the linking of the organization's strategy at the time of initiating projects, as well as during the validation of projects in the portfolio. This approach is also reflected in international portfolio management standards, including in Management of Portfolios. The standard also indicates the proper allocation of resources in the organization, in accordance with the strategy.

The second dimension in the model that directly and to a large extent affects the effectiveness of risk management in the project portfolio is the risk management process in the portfolio. Risk management in a project portfolio involves a holistic view of risk, which is not the same as risk management at the project level. The model uses 18 observable variables in this dimension:

- a. A definition of risk at the project portfolio level (PZR3);
- b. Clearly defined risk management steps in the project portfolio (PZR4);
- c. Defined roles in the project portfolio risk management process (PZR5);
- d. Defined responsibilities for roles in the project portfolio risk management process (PZR6);
- e. Defined risk management process for projects in the portfolio (PZR7);
- f. Defined ownership for risks identified in the portfolio (PZR8);
- g. Defined control process for risks identified in the portfolio (PZR9);
- h. Defined tolerable risk level, i.e., the level of risk the organization is willing to accept (PZR10);
- i. Defined level of tolerable risk, i.e., the maximum level of risk that the organization can bear in combination with factors such as reputation, capital, assets, or ability to raise additional funds (PZR11);
- j. Defined risk tolerance levels, i.e., risk exposure levels that can only be exceeded with the required approval (PZR12);
- k. Consideration of risk assessment when prioritizing projects in the portfolio (PZR13);
- l. Regular review of risks in the projects in the portfolio (PZR14);
- m. Defined dependency management process in the project portfolio management process (PZR15);
- n. Prepared portfolio reports for senior management (PZR16);
- o. Information on the level of risks in the projects included in the portfolio as part of the portfolio reports prepared for senior management (PZR17);
- p. Information on the level of risks across the portfolio as part of portfolio reports prepared for senior management (PZR18);
- q. Visualization of risks in the portfolio as an element of portfolio reports prepared for senior management, e.g., in the form of a risk matrix (PZR19);
- r. Linking project portfolio risk management to other risk management processes in the organization (PZR20).

The impact of the formal risk management process in the organization on increasing the effectiveness of risk management in the portfolio is also confirmed in the literature on the subject. Since risk management in the portfolio treats risk more holistically and allows for the detection of similar risks in different projects, it affects the possibility of combining mitigating activities and thus allows organizations to reduce the duplication of similar activities. Furthermore, a formal process increases the organization's ability to deal with risks and makes decisions about projects in the portfolio better informed. Therefore, in FinTech organizations that operate in a regulated market and often implement regulatory projects, increasing transparency regarding portfolio risks may be particularly important.

The FinTech sector is highly internationalized. All surveyed organizations are international corporations and have implemented standardized procedures for managing projects and project portfolios. Therefore, the studied relationships can also be generalized to other regions. Moreover, in the FinTech industry, the principles and rules of project and portfolio management are based on the universal procedures and tools described in the theoretical

part of this article, which guarantees the comparability of the researched environments and the obtained conclusions.

From a practical point of view, a challenge in the risk management process in a project portfolio may be the need to comprehensively cover the risks in the portfolio or low awareness of portfolio risks. Based on the presented model, the portfolio risk management process should include the following:

1. Clearly defined steps;
2. Specific roles and responsibilities, including ownership of risks identified in the portfolio;
3. Taking the risk into account in the process of prioritizing projects in the portfolio;
4. A defined dependency management process;
5. Regular portfolio risk reviews;
6. How portfolio risk is communicated to senior management.

When analyzing the composite effects, one can also note the impact of the remaining dimensions on the effectiveness of risk management in the project portfolio. For the organizational context, the total effect is 0.503. The model uses four determinants related to this dimension:

- a. Gathering information about risk in the organization (KO8);
- b. Gathering information in the organization on how the risk management process, i.e., identifying, assessing, and controlling risks, is carried out (KO9);
- c. Conducting market research of the organization's environment that may affect the level of risk in the portfolio (KO11);
- d. Conducting benchmarking of the portfolio's risk management processes against other organizations (KO12).

An organization's risk management culture, comprising the contextual dimension, can support engagement in the risk management process and the organization's overall risk awareness. In the case of FinTech organizations that often implement innovative, high-risk projects and operate in a regulated market, organizational culture may be of key importance. It can be assumed that, for enterprises in which employees are highly aware of risk management, that collect risk information, and that examine the organizational environment, the effectiveness of the risk management process in the portfolio may be greater.

For senior management involvement in risk management in the project portfolio, the total effect on project portfolio risk management effectiveness was 0.402. The model uses five determinants related to the involvement of decision makers:

- a. Involvement of senior management in the reprioritization of the project portfolio (ZWK2);
- b. Involvement of senior management in the process of allocating resources to projects (ZWK3);
- c. Involvement of senior management in monitoring the progress of the project portfolio (ZWK4);
- d. Involvement of senior management in the portfolio risk management process (ZWK5);
- e. Senior management decision-making on the project portfolio based on risk analysis and assessment (ZWK6).

The literature on the subject indicates the importance of senior management involvement in both the decision-making processes regarding the portfolio and the definition of policies and procedures for the portfolio. From a practical perspective, the involvement of senior management may influence the decision to launch a project within the portfolio, the prioritization of projects in the portfolio, and the allocation and reallocation of resources to projects based on their priorities. Senior management may also be involved in projects within the portfolio.

Senior management involvement may be particularly important in FinTech organizations' portfolios. Knowledge about the projects included in the portfolio, as well as the ability to make quick decisions, such as the launch or suspension of projects, and

established escalation paths may be of key importance in the case of innovative projects, as are often implemented by FinTechs.

As part of the dimension of portfolio adjustment to organizational governance, the model uses three determinants:

- a. Risk management as a component of portfolio project management (DP10);
- b. Risk management as a component of project portfolio management (DP11);
- c. Experience of portfolio managers in the process of portfolio risk management (DP13).

The composite effect for this dimension on the effectiveness of risk management in the project portfolio was 0.317. Based on the literature on the subject and previously conducted empirical research, project management in a portfolio may have an impact on the management of the entire portfolio. Therefore, in practice, the effectiveness of risk management as an inherent element of project management may translate into the success of managing the entire portfolio. The situation is similar in the case of risk management as an element of project portfolio management, as well as the experience of portfolio managers in the risk management process.

Additionally, an increase in the organizational context by one unit increases the fit of the portfolio to the organization's governance by 0.363, the risk management process in the project portfolio by 0.263, the involvement of senior management in risk management in the project portfolio by 0.422, and the strategic orientation by 0.228. Additionally, an increase in adjusting the portfolio to the organizational governance by one unit will result in an increase in the risk management process in the project portfolio by 0.510, and an increase in senior management's involvement in risk management in the project portfolio by one unit will increase the adjustment of the portfolio to organizational governance by 0.467, the risk management process in the project portfolio by 0.221, and the strategic orientation by 0.488.

5. Discussion

The research shows that the strategic orientation is of greatest importance for the effectiveness of risk management in a project portfolio. The importance of this factor was previously pointed out by [Rad and Rowzan \(2018\)](#) and [Archer and Ghasemzadeh \(1999\)](#). This means that coherence between the strategy, portfolio, and projects contributes to both more effective protection of the organization against risk and better achievement of project portfolio goals. This is a direct reference to the project portfolio management pyramid presented in Figure 2.

The other key determinant of the effectiveness of risk management in a project portfolio is the process of risk management in the portfolio itself. This conclusion leads to two clear implications. The first is the need to implement risk management in the organization, which allows for limiting the scale of threats ([Ahmadi-Javid et al. 2020](#); [Jonek-Kowalska 2022](#)). The other refers to the need to implement risk management at the project portfolio level, but this management cannot be identical with project risk management ([Lycett et al. 2004](#)). In this dimension, managers consider ownership and control of individual risks to be particularly important. This highlights the need to precisely define the responsibilities for individual goals, tasks, and risks in the project portfolio.

The most important risk management factors in the portfolio indicated by the surveyed managers may provide guidance for managers in organizations in the FinTech industry. The specific strategy for the project portfolio and risk management in the organization should be considered when initiating and reviewing projects in the portfolio. For the organizational context dimension, decision makers should focus on identifying key project portfolio stakeholders and then regularly presenting progress toward portfolio goals to these stakeholders. For FinTech organizations, in the context of portfolio risk management, the collection of risk information as well as the analysis of regulatory requirements that may affect the level of risk in projects included in the portfolio may be of particular importance.

The organization's senior management should be involved in the portfolio management process, including active participation in making decisions based on the analysis and assessment of risks regarding the launch or suspension of projects, as well as changes

in portfolio priorities. However, to support the dimension of matching the portfolio to organizational governance, portfolio managers should focus on defining the scope of responsibilities for roles in the portfolio management process, defining escalation paths for the portfolio, and engaging experienced project managers.

The respondents also paid attention to the aspect of experience in terms of matching the portfolio to the organizational governance in the context of risk management. Therefore, portfolio decision makers should incorporate risk management into portfolio management and projects included in it and engage experienced portfolio managers. Furthermore, the organization should define a risk management process that includes information on ownership of risks in the portfolio and the control process and taking into account risk assessment in prioritizing projects in the portfolio.

As mentioned in the introduction, the FinTech industry is characterized by high risk exposure (Shi and Lu 2024; Al Hammadi et al. 2024; Colombage 2023) due to its above-average level of innovation and internationality (Shi and Lu 2024; Al Hammadi et al. 2024; Colombage 2023; Balaskas et al. 2024). For these reasons, risk management in this industry is particularly important. The multitude and diversity of projects and programs may complicate this process. Taking into account the research results, the authors recommend the following actions to increase the effectiveness of risk management:

- Identify and assess the coherence of implemented projects with the organization's strategy, and therefore ensure that financial innovations are closely related to the direction of development of a given organization;
- Assess the effectiveness of the adopted risk management methods and select those assessed as the most effective;
- Strictly define risk ownership in order to identify responsibility for risk;
- Conduct periodic inspections of risk management and the effects of this process;
- Engage senior management in the risk management process, as this determines both the strategic orientation and the risk management process itself in the project portfolio.

The above recommendations can be implemented through various activities. These may include training for both management and employees, which would make them aware of the importance of risk management and its determinants. In addition, periodic monitoring of the effectiveness of risk management can be implemented, including an assessment of the usefulness of risk management instruments. It would also be worth considering a procedural arrangement of the ownership of individual risks. A way to improve the effectiveness of risk management may also be to ensure the appropriate level of communication, which helps with identifying threats and builds team involvement in the process of mitigating them.

It is also worth adding that innovations in the FinTech industry influence and revolutionize services for many societies; hence, the security of implementing projects in this field has a significant impact on the development of civilization and technological progress.

6. Conclusions

This article has presented a structural model that allowed for determining the strength of direct influence (for the dimensions of strategic orientation and the risk management process in the project portfolio) and indirect influence (for the dimensions of the organizational context, the involvement of senior management, and the fit of the portfolio to the organizational governance). The basis for recognizing the model as cognitively valuable was the value of the R^2 coefficient for the analyzed model, which indicates 61.3% of the variance of the risk management effectiveness in the project portfolio (60.5% for the adjusted R^2). The statistical value of the presented model was also confirmed by verifying the standardized root mean squared residual (SRMR) structural equation model, reliability analysis, and checking the convergent validity and discriminant validity.

Importantly, however, the research procedure presented in this article has limitations that may result from the sample size, as well as the research method and tools. Operationalizing latent variables and assessing phenomena using descriptive statements may be

susceptible to subjectivity. Respondents' assessments of unobservable factors are based on the respondents' subjective assessment. On the other hand, thanks to the use of a survey, it is possible to attempt to quantify phenomena that are inherently unmeasurable.

The added value of the presented research results from three main contributions. Firstly, it deepens our knowledge of risk management in the project portfolio. There is relatively little research in this area, especially on a broad organizational scale. Secondly, the research concerns the effectiveness of the risk management methodology in the project portfolio. Such research has not been conducted before. Thirdly, we propose our own, universal model for assessing the effectiveness of risk management in a project portfolio, which can be replicated in other industries and organizations.

Given the presented analyses, the following directions for further research are indicated:

1. Extending and conducting research on a larger sample size, which raises the possibility of verifying the model using modeling based on the variance–covariance matrix (CB-SEM);
2. Model verification in industries other than FinTech;
3. Comparative research between two groups of organizations from different industries;
4. Conducting research in FinTech start-ups that may not implement formalized risk management processes;
5. Selection of other variables or modification of the proposed variables, e.g., by extending the described model;
6. Application of the developed model in a FinTech enterprise;
7. Verification of the methods of implementing the risk management process in project portfolios in industries other than FinTech;
8. In-depth research on how to measure and understand the effectiveness of risk management in a project portfolio.

Author Contributions: Conceptualization, O.K.-O.; methodology, O.K.-O.; validation, O.K.-O. and I.J.-K.; formal analysis, O.K.-O.; resources, I.J.-K.; data curation, O.K.-O.; writing—original draft preparation, I.J.-K.; supervision, I.J.-K.; funding acquisition, I.J.-K. All authors have read and agreed to the published version of the manuscript.

Funding: This research was funded by Silesian University of Technology, statutory research no. BK-264/ROZ1/2024 (13/010/BK_24/0081).

Data Availability Statement: Data is available on request at corresponding author.

Conflicts of Interest: The authors declare no conflicts of interest.

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