UNIVERSITY OF ECONOMICS – VARNA
FACULTY OF ECONOMICS
DEPARTMENT OF "BUSINESS, INVESTMENT, REAL ESTATE"

Miglena Stefanova Staneva-Todorova

MANAGEMENT OF ENTREPRENEURIAL RISKS IN THE IMPLEMENTATION OF INVESTMENT PROJECTS

A B S T R A C T

of dissertation
or acquiring an educational and scientific degree "Doctor"
in professional direction 3.8 "Economics"
Doctoral program "Economics and Management
(Construction and Real Estate)"

Varna
2024

The dissertation consists of 280 pages, of which:
Preface – 5 pages
Main text (three chapters) – 243 pages
Conclusion – 3 pages
Appendices – 16 pages
List of used sources – 120 titles
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Tables – nr.38
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The public defense of the dissertation will take place on 11.10.2024 at 14.00 PM in the Hall 205 of the University of Economics – Varna, at a meeting of the Scientific Jury, appointed by Order No. RD-06-93 of 27.06.2024 of the Rector of the University of Economics – Varna. The defense materials are available to the interested parties on the website of the University of Economics – Varna, www.ue-varna.bg

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Varna

2024

The dissertation has been discussed and is scheduled for defense at a meeting of the The Department of Business, Investment, Real Estate at the University of Economics – Varna.

The author is a doctoral candidate, affiliated with the same department. The research and development have been conducted within the same university.

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I. GENERAL CHARACTERISTICS OF THE DISSERTATION

1. Relevance of the Research

In the contemporary context of globalization and dynamic economic changes, investment projects, particularly in the field of residential construction, require specialized attention and in-depth research. Issues related to investments and entrepreneurial risks in this sector are often examined. Reducing the negative impacts of entrepreneurial risks is essential for the success of investment projects. Managing these risks is a fundamental prerequisite for achieving planned results, increasing the likelihood of success, and reducing the risk of inefficient project implementation, which contributes to economic prosperity.

Theoretical developments and achievements in international practice are indisputable, whereas in Bulgaria, the approaches and methods for risk management in the theoretical realm and the practice of construction entrepreneurship are not as well known or applied. The existing methods for risk management are often not adapted to the specific needs of residential construction investment projects, which hinders their understanding and effective application.

The management of entrepreneurial risks is voluntary for construction entrepreneurs in Bulgaria. However, at the international level, risk management is a current and recommended practice, as it leads to better results, increases the likelihood of achieving set goals, reduces losses, improves competitiveness, sustainability, and strategic decision-making.

2. Object and Subject of Research

The research object of the dissertation is residential construction investment projects.

The research subject is entrepreneurial risks in the implementation of residential construction investment projects.

3. Aim and Tasks of the Research

The aim of the author of the dissertation is to examine and identify, both theoretically and practically, the entrepreneurial risks in the implementation of residential construction investment projects. Based on this examination, innovative strategies will be formulated to enhance the management process of entrepreneurial risks, aiming to minimize their negative impacts on the effective execution of residential construction investment projects.

The tasks through which the set aim will be achieved are:

– to examine the nature of entrepreneurial risks in residential construction investment projects;

– to identify the entrepreneurial risks characteristic of residential construction investment projects;

– to analyze the entrepreneurial risks during the implementation of residential construction investment projects;

– to outline innovative strategies for managing entrepreneurial risks in the implementation of residential construction investment projects.

4. Research Thesis of the Dissertation

The author's thesis of the dissertation is that through successful management of entrepreneurial risks, construction entrepreneurs could more effectively address various problems in the implementation of residential construction investment projects.

In order to defend the stated thesis, the theoretical and practical exploration of entrepreneurial risks aims to establish realistic opportunities for enhancing the process of identifying and managing these risks. The goal is to minimize their negative impacts on the effective execution of residential construction investment projects.

Through a systematic analysis of the essence of entrepreneurial risks, their impacts on project budgets, quality, and timelines, and by proposing innovative methods and tools for management, the author aims to demonstrate the necessity of developing comprehensive strategies for addressing entrepreneurial risks in the field of residential construction. Such strategies are considered a prerequisite for positively influencing the

operations of construction enterprises, ensuring sustained competitive advantage, and fostering economic growth.

5. Research Methods

The dissertation was developed based on the methods described in detail at the end of Chapter One. Throughout the research, a comprehensive approach was applied, focusing on uncovering and highlighting the main cause-and-effect relationships. The study heavily emphasizes the historical approach, deduction method, comparative analysis, qualitative and quantitative analysis, empirical approach, as well as statistical and mathematical methods.

6. Research Limitations

The dissertation imposes limitations on the study due to the lack of official statistical data on entrepreneurial risks in residential construction investment projects in Bulgaria. Another aspect of the limitations is related to the defined aim, object and subject of the dissertation, which also determine its scope. It is confined to issues concerning the management of entrepreneurial risks in the implementation of residential construction investment projects in Bulgaria. All matters regarding investment projects for non-residential construction remain outside the stated scope.

7. Information Provision for the Research

For the development of the dissertation, various sources were used, including Bulgarian and foreign literature, regulatory documents, specialized websites, primary data from expert evaluations, as well as data from two empirical studies conducted by the author.

8. Approval

The dissertation was discussed at meetings of the Department Council of the Department of Business, Investments, Real Estate.

Parts of the dissertation have been published in 3 publications (1 article in a refereed journal and 2 scientific reports) in specialized scientific journals.

9. Content of the Dissertation

INTRODUCTION

CHAPTAR ONE. THEORETICAL-METHODICAL ASPECTS OF ENTREPRENEURIAL RISKS IN RESIDENTIAL CONSTRUCTION INVESTMENT PROJECTS

1.1. THEORETICAL BASIS OF INVESTMENTS AND RESIDENTIAL CONSTRUCTION INVESTMENT PROJECTS
1.1.1. Definition of "Investments"
1.1.2. Nature and Specifics of Real Estate Investments and Residential Construction Investment Projects
1.1.3. Sequence of the Life Cycle of Residential Construction Investment Projects
1.2. ECONOMIC NATURE OF ENTREPRENEURIAL RISKS IN RESIDENTIAL CONSTRUCTION INVESTMENT PROJECTS
1.2.1. A Retrospective study of the Nature of Risk
1.2.2. Contemporary Understanding of Risk
1.2.3. Significance of the Concept of "Entrepreneurial Risk"
1.3. METHODOLOGY FOR RESEARCHING ENTREPRENEURIAL RISKS IN THE RESIDENTIAL CONSTRUCTION INVESTMENT PROJECTS
1.3.1. Development Process of the Scientific Research Methodology: "Research Onion"
1.3.2. Research Concept for Data Collection and Analysis

CHAPTER TWO. ANALYSIS OF ENTREPRENEURIAL RISKS IN THE RESIDENTIAL CONSTRUCTION INVESTMENT PROJECTS

2.1. ANALYSIS OF ENTREPRENEURIAL RISKS IMPACTING THE BUDGET OF THE RESIDENTIAL CONSTRUCTION INVESTMENT PROJECTS
2.1.1. Assessment of the Impact of Entrepreneurial Risks on the Budget in Various Phases of the Life Cycle of Residential Construction Investment Projects
2.1.2. Identification and Ranking of the Top 20 Entrepreneurial Risks Based on Their Significance to the Budget of the Residential Construction Investment Projects
2.2. ANALYSIS OF ENTREPRENEURIAL RISKS IMPACTING THE QUALITY OF INVESTMENT PROJECTS FOR RESIDENTIAL CONSTRUCTION
2.2.1. Assessment of the Impact of Entrepreneurial Risks on the Quality in Various Phases of the Life Cycle of Residential Construction Investment Projects
2.2.2. Identification and Ranking of the Top 20 Entrepreneurial Risks Based on Their Significance to the Quality of the Residential Construction Investment Projects
2.3. ANALYSIS OF ENTREPRENEURIAL RISKS IMPACTING THE TIME OF THE RESIDENTIAL CONSTRUCTION INVESTMENT PROJECTS

II. BRIEF PRESENTATION OF THE DISSERTATION WORK

INTRODUCTION

The introduction outlines the relevance of the dissertation topic. The object and subject of research, main aim, tasks, and research thesis are defined. Research methods, scope limitations, and information provision are presented.

CHAPTER ONE
THEORETICAL-METHODICAL ASPECTS OF ENTREPRENEURIAL RISKS IN RESIDENTIAL CONSTRUCTION INVESTMENT PROJECTS

Chapter one of the dissertation is dedicated to the theoretical foundations of investments, investment projects for residential construction, and entrepreneurial risks. It examines the essence of these concepts and refines some key terms in the field of investment projects and entrepreneurial risks. Chapter one concludes with a detailed description of the methodology developed for researching entrepreneurial risks in residential construction investment projects.

In the first paragraph of the first chapter, the theoretical foundations of investments and residential construction investment projects are presented. This paragraph examines various definitions of the concept of *"investments"* by Bulgarian and foreign authors, allowing for the identification of key aspects of these definitions and their analysis within the research context. Based on this study, the author has refined the concept of "investments" for the purposes of the dissertation, ensuring clarity in the scope of the research, namely: "*Investments are financial resources (either own or attracted) invested in acquiring assets (tangible, intangible, or financial) or in implementing an investment project with an expectation of delayed return and profit in any sector, while accounting for possible risks and their manifestations*".

In this paragraph, a classification of investments is presented, summarizing 34 types according to 12 criteria, which are outlined in Table 1.

Table 1[1]

Types of investments

№	Criteria	Types
1.	Sphere of Investment	– Financial Investments – Real Investments (Tangible and Intangible)
2.	Expected Effects of Investments	– Economic – Social – Environmental
3.	Investment Period	– Short-term – Long-term
4.	Profitability Level	– High-yield – Medium-yield – Low-yield – Non-yield
5.	Liquidity of Investment	– Highly liquid – Moderately liquid – Less liquid – Illiquid
6.	Degree of Risk	– Risk-free – Low-risk – Medium-risk – High-risk
7.	Ownership Form	– Government – Municipal – Private
8.	Territorial Feature	– Local – Foreign
9.	Nature of Capital Use	– Primary – Reinvestment – Disinvestment
10.	Participation in Investment Process	– Direct – Indirect
11.	Dependence on Income	– Production-related – Autonomous
12.	Compatibility with Execution	– Independent – Interdependent – Mutually exclusive

Source: Compiled by the author based on reviewed specialized literature

This classification serves as the basis for clarifying the essence and characteristics of more specific categories such as *"real estate investments"* and *"residential construction investment projects"*. Real estate investments are characterized, and based on an analysis of their characteristics, the concept of "real

[1] In the abstract, the figures and tables are numbered sequentially and differently from those in the dissertation itself, as not all figures and tables from the dissertation are included.

estate investments" is defined for the purposes of the dissertation as follows: "*Real estate investments are financial resources (either own or attracted) used to acquire real estate (land and/or improvements on it and property rights) or to implement an investment project for creating new real estate or renovating existing ones, with an expectation of delayed return and profit, taking into account possible risks and their manifestations*".

The main features and dependencies of real estate investments are graphically presented as follows (see Fig. 1).

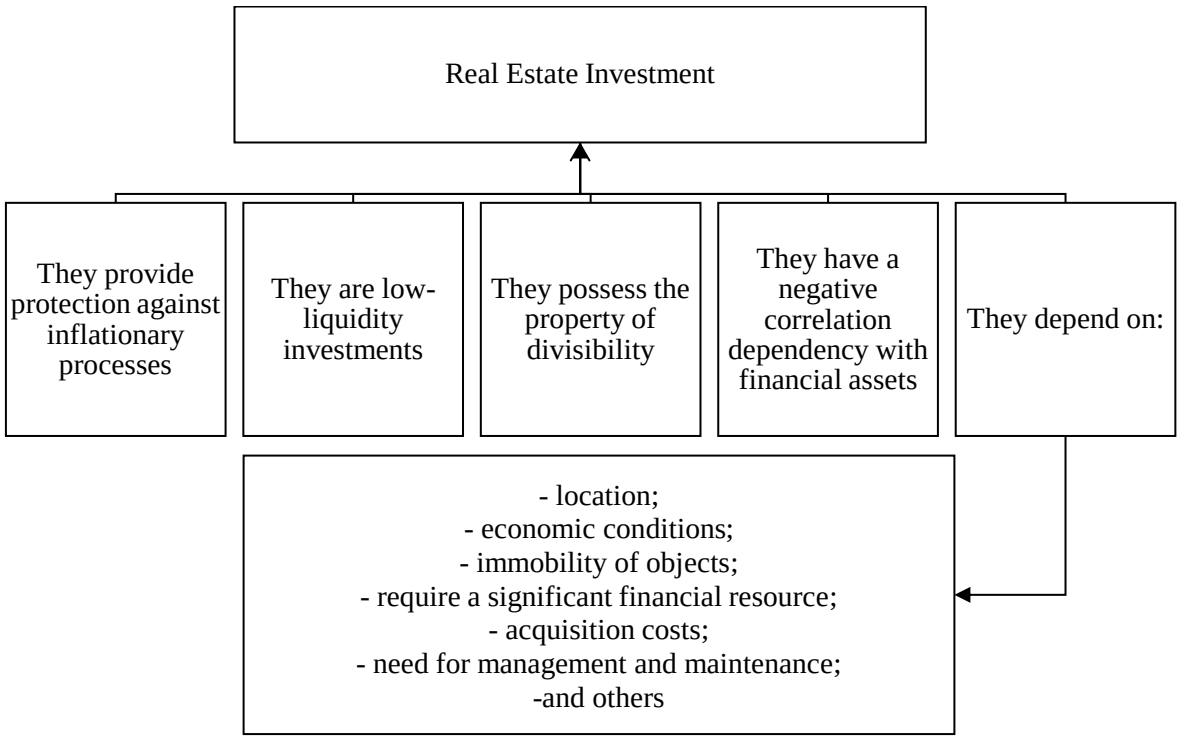

Fig. 1. Characteristics and Dependencies of Real Estate Investments
Source: Adapted by the author based on reviewed specialized literature.

The identified characteristics and dependencies of real estate investments underscore the need for a detailed study of the essence of investment projects as a tool to achieve investment goals. The conducted study of the essence and specifics of investment projects aims to contribute to understanding their characteristics and specific challenges. As a result, a definition of the concept *"residential construction investment projects"* has been formulated, reflecting their fundamental features and parameters: „*Residential construction investment projects are a complex of activities aimed at the construction of new residential buildings or the renovation of existing ones, including*

new construction, expansion, reconstruction, modernization and major repairs. The main distinguishing feature of investment projects for residential construction is the execution of risky construction and installation works within a certain period of time in compliance with the budget and quality requirements, in the presence of and expectations of return".

The author traces *the life cycle of residential construction investment projects*, presenting this cycle graphically (see Fig. 2). Additional phases have been interpolated into the life cycle to emphasize their importance and avoid their underestimation. The successful completion of residential construction investment projects depends on the degree of realization of these phases in their life cycle. Enhanced execution of individual project phases is a key factor for its success.

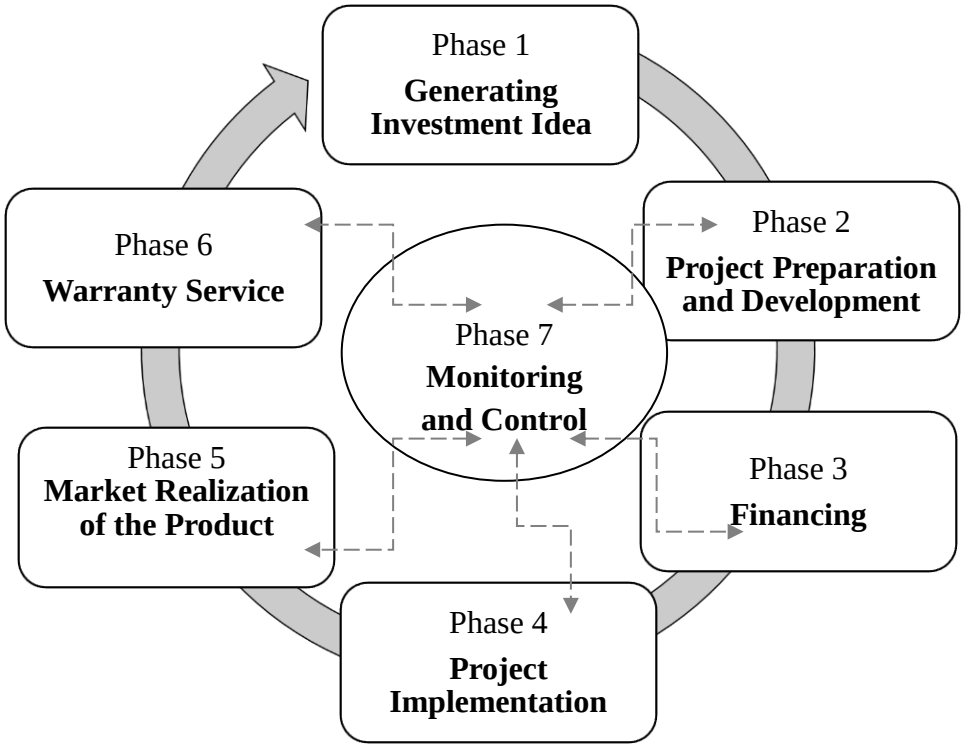

Fig. 2. Life Cycle of Residential Construction Investment Projects
Source: Compiled by the author based on reviewed specialized literature.

The examined theoretical foundations of investments and residential construction investment projects in section 1.1 provide the author with grounds to draw the following main conclusions:

1. The concept of *"investments"* has been defined for the purposes of the dissertation, including a classification of investments based on 12 criteria, which enhances understanding of their diversity and specificity.

2. A clear definition of *"real estate investments"* has been formulated, highlighting the main characteristics of this category.

3. Studying residential construction investment projects aids in understanding their characteristics and challenges, leading to the author's definition of their essence.

4. The life cycle of residential construction investment projects has been presented, including important additional phases, and a precise definition of *"investment project financing"* has been outlined.

The second paragraph of Chapter One is dedicated to the economic essence of entrepreneurial risks in residential construction investment projects.

Retrospective examination of risk in early economic theories provides a fundamental understanding of the concept and its significance in the economic context. (see Table 2).

Table 2

A retrospective study of the essence of risk in the earliest economic theories of entrepreneurial activity (up to the 1930s)

№	Author	Understanding of the essence of risk
1.	Richard Cantillon (1680-1734)	Mentions risk as an essential attribute of entrepreneurial activity
2.	Adam Smith (1723-1790)	Presents risk as a factor of profit, whose value depends on the certainty or uncertainty of the return received.
3.	David Ricardo (1772-1823)	Describes risk with undefined nature and uncertain value, where assuming risk is associated with a desire for compensation.
4.	Jean-Baptiste Say (1767-1832)	Considers risk as a determinant of expected market changes.
5.	James Mill (1773-1836)	Define risk as the probability of incurring losses from a chosen decision.
6.	William Senior (1790-1864)	
7.	Alfred Marshall (1842-1924)	View risk through the prism of the concept of marginal utility.
8.	Arthur Pigou (1877-1959)	
9.	John Keynes (1883-1946)	Introduces three main types of risk: entrepreneur or borrower risk; lender risk; risk of adverse changes in value.
10.	Frank Knight (1885-1972)	Proposes a distinction where risk is a calculable probability, whereas uncertainty is what cannot be subjected to probabilistic assessment.

Source: Compiled by the author based on specialized literature research

Analyzing the roots of the risk concept in early economic thought reveals the ways in which it was perceived and explained. The primary aim of this analysis is to comprehend how risks have been perceived and analyzed in economic science, leading to a fundamental understanding of their impact on economic decisions and entrepreneurial behavior. The outcome of this analysis provides essential insights into how risks have been interpreted and understood throughout the history of economic science, which is crucial for the development of modern economic theories and practices (see Table 2).

In contemporary times, despite the continuous development in understanding the concept of *"risk"*, scholars are faced with the challenge related to the multitude of modern definitions of it. Among economists, there is still no unanimous definition of the concept of *"risk"* due to its usage across various fields of human activity. This leads to a lack of clear understanding of its essence, driven by the multidimensionality of the concept.

Based on the theoretical analysis conducted in the dissertation, a significant diversity of definitions of the concept of *"risk"* proposed by both Bulgarian and foreign authors is noted. Through this analysis of contemporary literature, the aim is to clarify current scientific perspectives on the essence of risk. This requires the scholarly literature to differentiate existing definitions based on the various interpretations encompassed within the concept. The proposed differentiation is adapted in accordance with the distinctions presented by A. Damodaran.[2]:

– Risk and probability: Some definitions focus on the probability of an event occurring, while more comprehensive ones also include its consequences.

– Risk and threat (danger): A threat is an event with a low probability and significant negative consequences, while risk is an event with a higher probability for which there is sufficient information to assess its probability and consequences.

– All outcomes and negative outcomes: Some definitions consider risk only as the possibility of a negative outcome, while others include positive changes as well.

[2] Damodaran, A. Strategic risk taking. USA (New Jersey): Pearson Education, 2008, p.6.

Risk should not be viewed solely as a potential adverse outcome but also as an opportunity for success if potential risks are identified in time and managed effectively.

– Risk and uncertainty: "Sometimes individual authors use the terms *"risk"* and *"uncertainty"* as synonyms, since risk arises in decision-making under conditions of uncertainty"[3]. Uncertainty is the source of all risks. It is the unknown probability and impact of future events. However, the two concepts have fundamental differences (see Table 3).

Table 3

Key Differences Between the Concepts of „Risk" and „Uncertainty"

№	Differences	Risk	Uncertainty
1.	Measurability	Quantitatively	Not quantitatively
2.	Outcomes	Outcomes are known	Outcomes are unknown
3.	Manageability	Manageable	Unmanageable
4.	Minimization	Yes	No
5.	Probability	Known	Unknown

Source: Adapted by the author from F. Saunders [4]

The need for a deeper understanding of risk requires an examination of its classification, as many approaches exist for this purpose. The lack of unified criteria for classification is due to the specificity of the activities of economic entities, the different levels of manifestation, and the use of various terms for the same risk. Table 4 offers a sample distribution of risks into specific groups, derived from the classifications studied in the literature.

Table 4

Classification by types of risks

№	Criteria	Types of risks
1.	According to the factors of occurrence	– Economic risks – Non-economic risks
2.	According to the sources of occurrence	– External (exogenous) risks – Internal (endogenous) risks
3.	According to the possible deviations	– Pure risks – Speculative risks
4.	According to the will of the subject	– Objective risks – Subjective risks
5.	According to the possibility of quantitative assessment	– Measurable risks – Immeasurable risks

[3] Dochev, D., Nikolaev, R. Theory of Risk. Varna: Science and Economics, 2007, p. 19.

[4] Saunders, F. Differentiating between Risk and Uncertainty in the Project Management Literature, 2016, p. 3. [Accessed on: 20.05.24]. Available at: http://fionasaunders.co.uk/wp-content/uploads/2016/07/Differentiating-between-Risk-and-Uncertainty-in-the-Project-Management-Literature.pdf.

6.	According to the impact of the risk	– Insurable risks – Non-insurable risks
7.	According to the manifestation over time	– Short-term risks – Long-term risks
8.	According to the time of occurrence	– Retrospective risks – Current risks – Future risks
9.	According to the manifestation of consequences	– Impulsive risks – Cumulative risks
10.	According to predictability	– Known risks – Unknown risks
11.	Dependent on reaction	– Primary risks – Secondary risks
12.	According to the magnitude of possible damages	– Minimal risks – Moderate risks – Major risks – Catastrophic risks
13.	According to the rate of return change	– Desired risks – Semi-acceptable risks – Undesirable risks – Unacceptable risks
14.	According to the scale of the risk	– Individual risk – Organizational risks – National risks – International risks

Source: Compiled by the author based on specialized literature research

Understanding the classification of risks allows for the exploration of various subcategories, including entrepreneurial risk. Thus, the presented historical and contemporary economic essence of the concept of *"risk"* is amplified in the significance and content of the more specific concept of *"entrepreneurial risk"* within the framework of the dissertation.

Entrepreneurial risks encompass all sectors of the economy, with the construction sector being particularly crucial in Bulgaria. This sector is filled with "unknowns" but is also one of the most dynamically developing sectors, attracting both local and foreign investors. In the construction sector, an *investor-entrepreneur* is understood as *a "natural or legal person who (using their own or attracted funds) constantly seeks and finds parcels (regulated or unregulated land plots) and implements construction projects for the creation (new construction, expansion) or renovation of existing real estate (modernization, reconstruction, redevelopment, change of use, major repairs), which (or the objects within them) are intended for sale or lease"*[5].

[5] Stoyanov, S., Iliev, P., Kalchev, R., Petko, M., Zhelev, I., Chaparov, B., Gospodinova, A., Antonova, V. Real Estate Economics. Varna: Science and Economics, 2013, p.92.

Some definitions of *"entrepreneurial risk"* are one-sided, associating it solely with negative outcomes and perceiving it as a threat to the entrepreneur. Other authors describe it as the probability arising from uncertainty. Various scientific sources emphasize the positive aspect of entrepreneurial risk, viewing it as an opportunity for success. Authors present it as a dual category – a source of either success or failure. From the above, it can be summarized that the concept of "entrepreneurial risk" encompasses various meanings depending on specific elements and properties of the risk. *The key economic essences characterizing it include*: danger of loss; opportunity for success; external factors leading to unfavorable or favorable outcomes; probability of deviation between actual and planned results (negative, positive, or neutral); association with the object threatened by an adverse event; turning point between loss and profit; mode of action under uncertain conditions; deviation from the expected goal.

Based on the theoretical study conducted, the following synthesized definition of the concept of *"entrepreneurial risk*" can be proposed: *"Entrepreneurial risk is an economic category that qualitatively and quantitatively reflects the probability of deviations and their consequences (negative and/or positive) between the actual and pre-planned results of entrepreneurial activities (including in the sphere of investment projects in residential construction), conducted under conditions of uncertainty"*.

Entrepreneurs operate within a complex socio-economic system where their activities are exposed to *external (exogenous)* and *internal (endogenous)* risks. These risks are an inevitable part of entrepreneurial activity, which traverses through various phases of the life cycle of residential construction investment projects. Dividing entrepreneurial risks across these phases (see Fig. 3) is recommended for several key reasons:

1. Enhanced Risk Understanding: By segmenting risks according to phases of the life cycle, a more detailed analysis of each phase becomes possible. This facilitates the identification and assessment of specific risks associated with each phase.

2. Improved Risk Management: Entrepreneurs can take targeted measures to manage risks more effectively when they understand the risks associated with each phase.

3. Increased Likelihood of Success: Analyzing and managing risks across the life cycle phases enhances the probability of successfully completing the project.

Therefore, segmenting risks according to the phases of the life cycle is crucial for effective risk management and the success of residential construction investment projects.

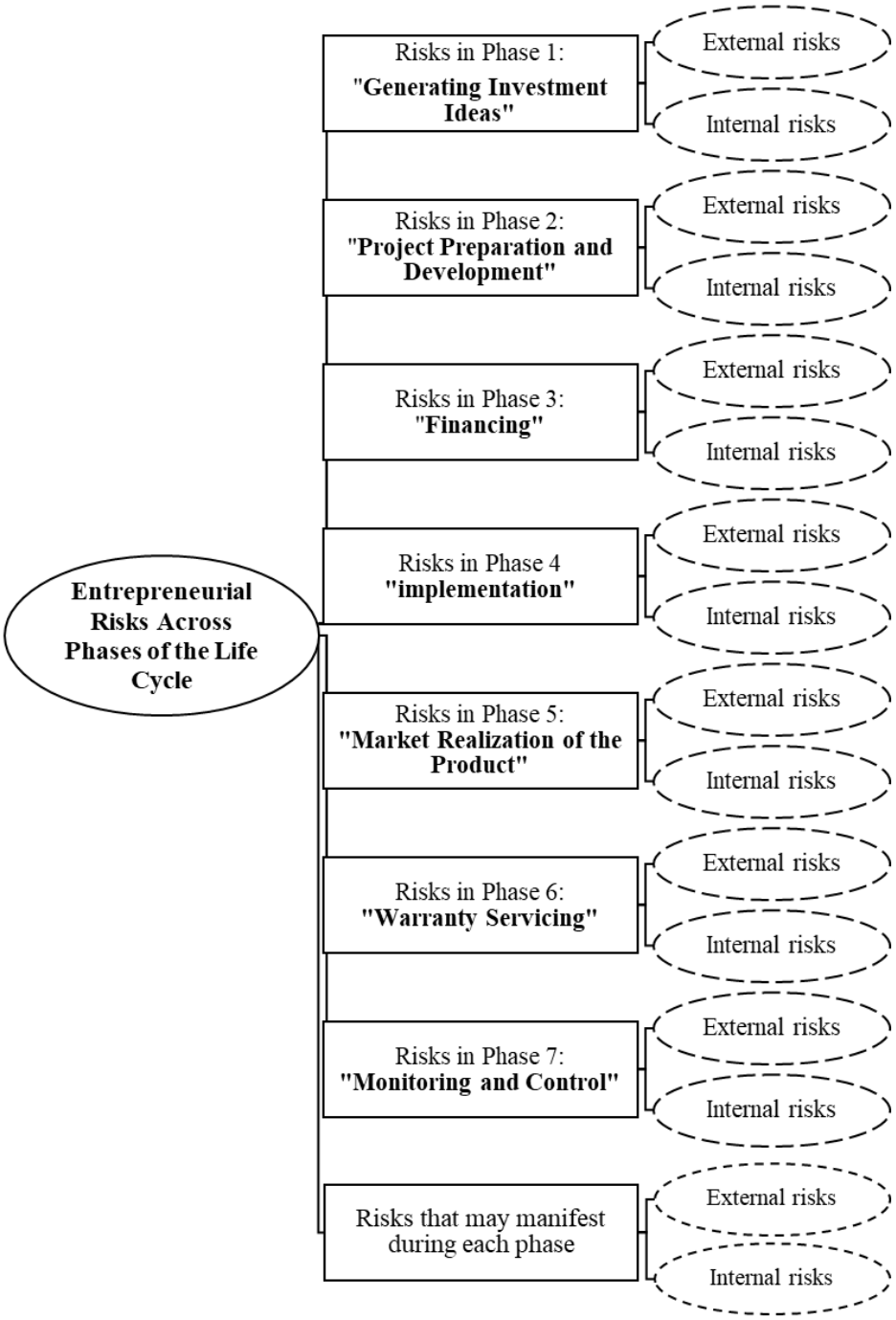

Figure 3. Entrepreneurial Risks Across Phases of the Life Cycle of Residential Construction Investment Projects

Source: Developed by the author based on reviewed literature

Based on the content presented in section 1.2, the author draws the following conclusions:

1. Development of the concept of risk: Retrospective study of risk in early economic theories provides an understanding of the evolution of the concept.

2. Synthesis of contemporary literature: Analysis of contemporary literature provides clarity on the different definitions and perspectives of risk.

3. Classification of risks: The author systematizes 35 types of risks into 14 groups, enriching understanding of risk characteristics.

4. Study of entrepreneurial risk: The research adds new insights into this specific type of risk, offering an author-defined definition and key economic essences. The author proposes dividing entrepreneurial risks according to the phases of the life cycle of residential construction investment projects, crucial for effective risk management and project success.

In the third paragraph of the first chapter, the developed methodology for researching entrepreneurial risks in residential construction investment projects is presented.

This study is based on the process developed by M. Saunders and his team[6] for constructing a scientific research methodology, known as the "*Research onion",* presented in Fig. 4. The "Research Onion" provides an effective process through which a scientific research methodology can be developed. Its utility lies in its adaptability to nearly any type of research methodology and its applicability across various contexts, despite its initial design for business research.

The layers of the *"Research Onion"* consist of six stages: research philosophy, research approach, research strategy, research choices, time and horizons, data collection techniques, and procedures for analysis. Depicting it as an onion aims to emphasize that in developing a research methodology, before reaching the core (data collection techniques and procedures for analysis), there are crucial layers that need to be "peeled", meaning carefully considered by the researcher. All layers must be

[6] Saunders, M., Lewis, P., Thornhill, A. Research methods for business studies. Eighth edition. England: Pearson, 2019, p. 130.

meticulously planned and designed to ensure valid and reliable data collection and results.

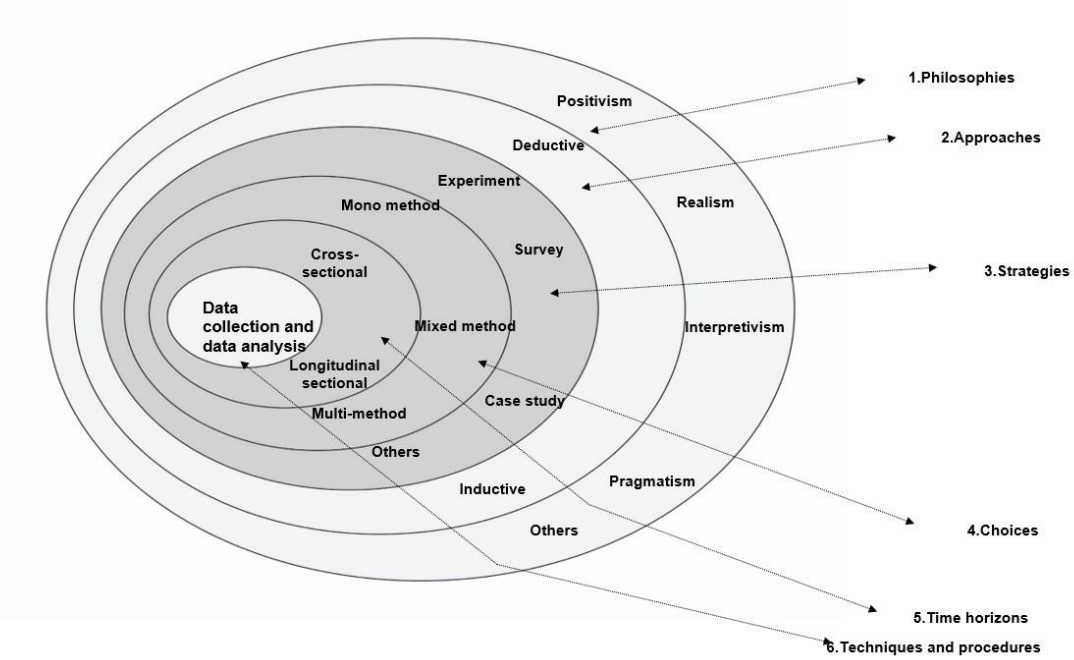

Figure 4. "Research Onion"
Source: Adapted from Saunders, M., Lewis, P., Thornhill, A. Research methods for business studies. Eighth edition. England: Pearson, 2019, p. 130.

The research concept for data collection and analysis in the current dissertation, aiming to investigate entrepreneurial risks management in residential construction investment projects, is built upon three logically interconnected core activities.

Main Task 1. Theoretical Foundation of Entrepreneurial Risks in Investment Projects. By establishing theoretical foundations, the research problem contributes to comparing the research idea with existing knowledge and confirms the viability of the dissertation. The theoretical foundation is fundamental for the subsequent core activities of the research concept for data collection and analysis.

Main Task 2. Designing and Administering a Survey:

Subtask 2.1. Defining Research Questions.

Defining research questions is a crucial stage at the beginning of any study, involving analysis of theory and literature to identify key aspects for investigation. Based on this analysis, a questionnaire has been developed for the survey, used to collect data from participants. The questionnaire is structured into two main sections: the first

gathers general information about respondents, including demographic data such as age, gender, education, and professional status, which supports profiling for subsequent analysis; the second section focuses on analyzing entrepreneurial risks related to key project objectives such as budget, quality, and time. Following an in-depth theoretical analysis by the author, 140 entrepreneurial risks in residential construction investment projects have been identified and distributed across phases. The questionnaire includes questions allowing participants to assess the likelihood and impact of entrepreneurial risks on defined project objectives. The assessment is conducted using a five-point scale with qualitative descriptions and values ranging from 1 to 5.

Subtask 2.2. Testing the Questionnaire by Collecting Expert Evaluations.

After selecting experts who meet specified criteria, expert evaluations of the 140 entrepreneurial risks identified by the author were conducted. The purpose of these evaluations is to identify the risks that experts consider most significant in the phases of the life cycle of residential construction investment projects. Following the evaluations, only those entrepreneurial risks deemed most essential by the experts were included in the final version of the survey, reducing the number to 55. The risks are divided into 7 subcategories representing the phases of the life cycle of residential construction investment projects and one general category for risks that may arise in any of the phases.

Subtask 2.3. Selection of the Target Audience for the Survey.

The target audience for the survey includes 50 construction and investment companies in the four largest cities in Bulgaria: Sofia, Plovdiv, Varna, and Burgas.

Subtask 2.4. Distribution of the Survey and Data Collection.

To gather information, the "direct standardized interview" method was used at the respondent's workplace. The survey was conducted with a standardized questionnaire programmed on tablets.

Main Activity 3. Analysis of Collected Data.

For the purposes of the dissertation research, the method for analyzing the collected data called the *“Relative Impact Index”* is adopted, which other authors describe as the “Relative Importance Index”. In this study, the name proposed by Z.

Mancheva and her team[7] is adopted — *"Relative Impact Index" (RII)* — along with the notations presented in the mathematical formula of the index. This method is used to rank various factors in terms of their level of importance.

The mathematical formula applied for calculating the Relative Impact Index (RII) is as follows:

$$r_{ij}^{k} = \alpha_{ij}\beta_{ij} \qquad (1)$$

r_{ij}^{k} is the significance level determined by respondent *j* for the impact of risk factor *i* on project objective *κ*.

α_{ij} – the probability of occurrence of risk factor *i*, determined by respondent *j*.

β_{ij} – the impact level of risk factor *i* on project objective *k*, determined by respondent *j*.

n – the total number of valid responses for risk factor *i*.

Although this formula provides useful information about the importance of various risks, it has limitations that may lead to the underestimation of risks with a low probability of occurrence but a high impact on the project. This oversight can result in inadequate risk management and serious consequences for the project.

For the purposes of this dissertation, the author has implemented a modification to the Relative Impact Index formula, introducing a correction that takes into account both the impact of risk factors and the probability of their occurrence. These changes enable the method to more effectively address risks that, despite their rarity, are crucial to the successful completion of the project. The proposed modification leads to a more comprehensive and nuanced consideration of risk factors and their importance to the project, thereby enhancing the quality of risk analysis and management.

In the standard formula (see formula (1)), the significance level r_{ij}^{k} s determined as the product of the probability of occurrence α_{ij} and the impact level β_{ij}, as evaluated by respondent *j*. In this dissertation, the author proposes a modified formula for calculating the Relative Impact Index, which includes additional corrections aimed at

[7] Mancheva, Zh., Rangelova, F., Popova, V. Risk Factors Influencing Costs and Schedule Performance of Infrastructure Road Projects in Bulgaria. Annual Journal of UACEG, vol. 50, no. 4, Sofia: UACEG, 2017, pp. 185-198.

compensating for the limitations of the previous formula. The notations in the modified formula are analogous to the original formula. The modified formula is as follows:

$$r_{ij}^{k} = \alpha_{ij}.(\beta_{ij})^2 \quad (2)$$

The author's modification to the formula consists of the following: β_{ij} is squared, i.e., $(\beta_{ij})^2$, which means that the impact level on the project objective is significantly increased compared to the original assessment of β_{ij}. his is crucial because it allows risks with lower probability but with substantial impact to carry greater weight in the final significance assessment. This prevents the neglect of risks that could potentially have a serious impact on the project, even if they are less likely to occur.

Determining the average level of each risk factor in terms of its impact on the project objective is calculated using the following formula:

$$R_i^k = \frac{1}{n}\sum_{j=1}^{n} \alpha_{ij}.(\beta_{ij})^2 \quad (3)$$

R_i^k is the Relative Impact Index for risk *i* on project objective *k*, and the remaining mathematical symbols are analogous.

To facilitate the understanding of the Relative Impact Index calculation process, an algorithm has been developed, visualized in Figure 5.

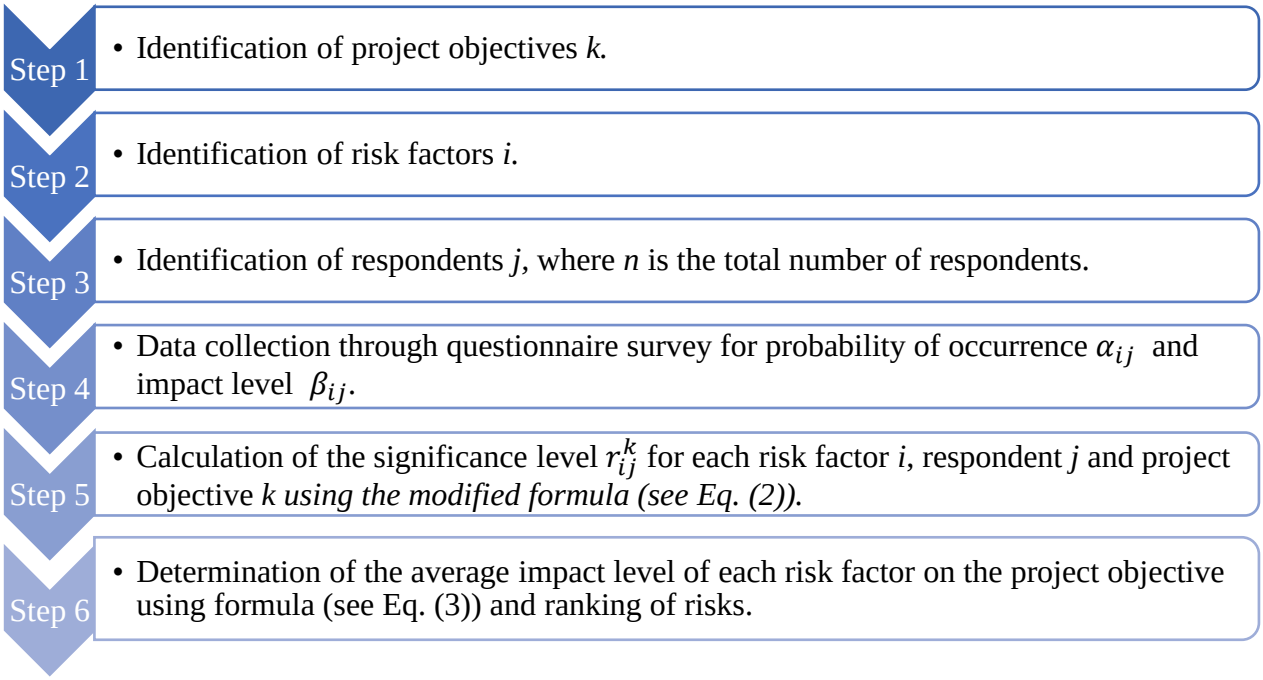

Figure 5. Algorithm for applying the modified formula in the study
Source: Compiled by the author based on reviewed specialized literature.

In paragraph 1.3., the following main conclusions are summarized:

1. The author adapts M. Saunders "Research Onion" method as the foundation for the research methodology, providing a structured framework for conducting the study.

2. A research concept focused on managing entrepreneurial risk in residential construction investment projects is formulated.

3. The author successfully conducts a survey, which serves as a targeted and effective tool for analyzing entrepreneurial risks. This process includes expert evaluations of 140 identified entrepreneurial risks, narrowed down to the 55 most significant ones, thus focusing clearly on key risks in the residential construction sector.

4. Data analysis has been performed, justifying the choice of the "Relative Impact Index" analysis method. A modification of the formula for this index is presented, integrating both the impact and the probability of occurrence of the risks.

CHAPTER TWO
ANALYSIS OF ENTREPRENEURIAL RISKS IN THE RESIDENTIAL CONSTRUCTION INVESTMENT PROJECTS

Chapter two of the dissertation identifies and analyzes entrepreneurial risks in residential construction investment projects in Bulgaria.

The first paragraph of Chapter two of the dissertation is dedicated to assessing the impact of entrepreneurial risks on the budget of residential construction investment projects in Bulgaria, according to the phases of the project life cycle. The main objective is to identify and define entrepreneurial risks that affect the budget of residential construction investment projects in Bulgaria across different project phases, presenting the results from the conducted survey. Based on the data collected from respondents and their statistical processing using the methodology described in section 1.3.2 of the dissertation, a comparative analysis is performed. This analysis is based on the values obtained for the standard RII (Relative Impact Index) and the modified RII, allowing for a better reflection of the real impact of risks on project objectives by considering both the probability of occurrence and the level of impact. Tables ranking entrepreneurial

risks in descending order based on their influence on the budget of residential construction investment projects in each phase of their life cycle are presented.

According to the results from the collected data and the computed values for the standard RII (Relative Impact Index) and modified RII for each risk across different phases of the life cycle of residential construction investment projects, detailed in the dissertation, the key 20 entrepreneurial risks have been identified based on their significance regarding their impact on the project budget (see Table 5). Higher values of the index indicate a greater impact on the project budget, underscoring the importance of focusing on these entrepreneurial risks.

Comparison between the standard and modified formulas for the Relative Impact Index (RII) of risks can be conducted through analysis of tabular data on specific entrepreneurial risks across various phases of the life cycle of residential construction investment projects.

Some of the conclusions that can be drawn from the presented table are:

1. Importance of risks: Entrepreneurial risks in different phases of residential construction investment projects unevenly impact the budget. Six risks manifest across all phases, five risks are associated with the “Market realization” phase, four with the “Financing” phase, three with the “Implementation” phase, two with the “Project preparation and development” phase, and one with the “Generating investment idea” phase. The phases “Warranty service” and “Monitoring and control” do not have key risks significantly affecting the budget.

2. Most significant risks: Risks associated with the “Financing” phase and market realization receive high ratings both under the standard and modified formulas, emphasizing the need for special attention in their management.

3. Rank differences: Some risks maintain similar positions in rankings, but others change their positions when using the modified formula. This is crucial for identifying and prioritizing the most significant risks. The modified formula considers the square of the impact factor, giving greater weight to risks with higher potential detrimental impact even if their likelihood of occurrence is lower.

Table 5

Key 20 entrepreneurial risks according to their significance for the budget of residential construction investment projects

Phases	Risks	RII	Rank by RII	Modified RII	Rank by Modified RII
Risks that may manifest during each phase	1. Risk of pandemic	12.60	1	54.24	1
Phase 3 Financing	2. Risk of project cost escalation	11.56	2	45.16	2
Risks that may manifest during each phase	3. Risk of unstable investment environment	10.46	3	39.30	4
Phase 5 Market Realization of the Product	4. Risk of changes in supply and demand in the real estate market	10.06	4	40.18	3
Phase 4 Project Implementation	5. Risk of additional construction and assembly works outside the project documentation	10.02	5	38.06	7
Phase 3 Financing	6. Risk of inability to attract external financing (bank loans, potential investors, etc.)	9.96	6	39.04	5
Risks that may manifest during each phase	7. Risk of bribery and corrupt schemes	9.94	7	38.10	6
Phase 4 Project Implementation	8. Risk of delaying the commissioning of the construction site	9.64	8	34.76	14
Phase 3 Financing	9. Risk of poorly planned project budget	9.52	9	36.48	11
Phase 2 Project Preparation and Development	10. Risk of errors and omissions in project design	9.48	10	36.76	9
Phase 5 Market Realization of the Product	11. Risk of decline in market price of construction products	9.48	11	36.72	10
Phase 2 Project Preparation and Development	12. Risk of complicating and increasing the cost of the project by the designers-architects	9.38	12	35.34	13
Phase 5 Market Realization of the Product	13. Risk of incorrect pricing of construction product	9.34	13	35.62	12
Risks that may manifest during each phase	14. Risk of natural disasters	9.34	14	37.70	8
Risks that may manifest during each phase	15 Risk of labor shortages (difficulties in hiring and retaining suitable employees)	9.32	15	33.84	15
Phase 4 Project Implementation	16. Risk of non-compliance by the contractor with the agreed prices, terms and quality for the construction and installation works	9.12	16	33.80	16
Phase 3 Financing	17. Risk of choosing between attracted and own funding	8.76	17	32.40	18
Phase 3 Financing	18. Risk of lack of cash receipts from pre-sales	8.76	18	32.76	17
Phase 5 Market Realization of the Product	19. Risk of unsustained urban infrastructure around the project location	8.70	19	30.90	21
Phase 1 Generating Investment Idea	20. Risk of incompetent consulting	8.60	20	31.52	19
Risks that may manifest during each phase	21. Risk of excessive pursuit of maximum profitability of the entrepreneur	8.56	21	31.52	20

Source: Author`s survey

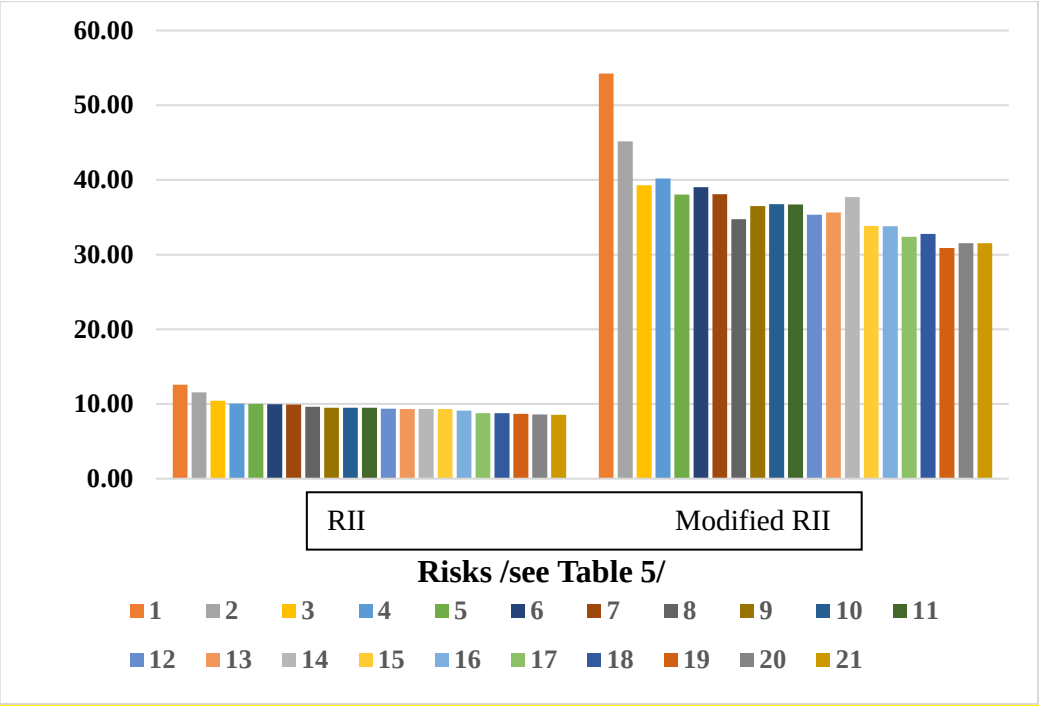

Fig.6. Key 20 entrepreneurial risks according to their significance for the budget of residential construction investment projects

Source: Author`s survey

The diagram visually compares the values of the standard and modified RII for the 20 key entrepreneurial risks impacting the budget of residential construction investment projects. Each of the 20 columns (in different colours) represents one risk, with their height reflecting the values of the standard and modified RII. The diagram also shows the difference in rankings between the risks according to the two indices, helping to understand the key risks and their impact on the budget. These data systematize the main risks in the different phases of investment projects that most strongly influence the budget and could lead to project failure. Therefore, entrepreneurs need to pay special attention to these risks to minimize their negative impact and complete the projects within the approved budget.

Based on the information presented in paragraph 2.1., the following key conclusions can be drawn regarding the impact assessment of entrepreneurial risks on the budget of residential construction investment projects in Bulgaria:

1. Entrepreneurial risks have a significant impact on the budget of residential construction investment projects in Bulgaria, with this impact varying across different phases of the project life cycle. The main risks were identified through a survey, and the collected data were statistically processed using both the standard and modified RII.

This approach allows for a more accurate reflection of the probability and impact level of the risks. Ranking the risks in tables according to their impact on the budget in each project phase supports effective risk management and minimizes their negative consequences.

2. The key 20 entrepreneurial risks that have the most significant impact on the budget of residential construction investment projects have been identified. These risks were analyzed using both the standard and modified RII, and the visualization through a diagram provides a clear comparison between the values of the two indices. The height of the columns in the diagram reflects the significance of each risk, which facilitates the understanding and management of key risks. This methodology supports the optimization of the budget for residential construction investment projects in Bulgaria.

In the second paragraph of Chapter Two, the results of the survey on entrepreneurial risks affecting the quality of residential construction investment projects and their analysis using the methodology described in section 1.3.2. of the dissertation are presented. The tables track the obtained values for the standard and modified RII for the entrepreneurial risks from the phases of the life cycle of residential construction investment projects.

Extracting the key entrepreneurial risks that have a significant impact on the quality of residential construction investment projects requires a detailed analysis and evaluation of the data collected at different phases of the project. Using the calculated standard and modified RII indices, the key 20 entrepreneurial risks with the greatest influence on the quality of residential construction investment projects have been identified and summarized.

Table 6 provides summarized information on these key 20 entrepreneurial risks from all phases of the life cycle of residential construction investment projects. This data offers valuable insights into the management of entrepreneurial risks and opportunities for improving project quality. The analysis of these risks represents a key step in the strategy to ensure the successful completion of projects with high quality standards and compliance with the goals and requirements of investors and stakeholders.

Table 6

Key 20 entrepreneurial risks according to their significance for the quality of residential construction investment projects

Phases	Risks	RII	Rank by RII	Modified RII	Rank by Modified RII
Risks that may manifest during each phase	1. Risk of pandemic	10.90	1	43.34	1
Risks that may manifest during each phase	2. Risk of labor shortages (difficulties in hiring and retaining suitable employees)	9.82	2	37.22	2
Phase 3 Financing	3. Risk of project cost escalation	9.80	3	33.96	5
Risks that may manifest during each phase	4. Risk of unstable investment environment	9.56	4	34.28	3
Risks that may manifest during each phase	5. Risk of natural disasters	8.84	5	34.08	4
Phase 4 Project Implementation	6. Risk of additional construction and assembly works outside the project documentation	8.82	6	30.70	8
Phase 2 Project Preparation and Development	7. Risk of errors and omissions in project design	8.60	7	31.20	6
Phase 3 Financing	8. Risk of inability to attract external financing	8.58	8	30.66	9
Phase 4 Project Implementation	9. Risk of delaying the commissioning of the construction site	8.56	9	28.92	14
Phase 2 Project Preparation and Development	10. Risk of complicating and increasing the cost of the project by the designers-architects	8.36	10	28.92	13
Phase 4 Project Implementation	11. Risk of non-compliance by the contractor with the agreed prices, terms and quality for the construction and installation works	8.34	11	29.34	12
Risks that may manifest during each phase	12. Risk of excessive pursuit of maximum profitability of the entrepreneur	8.32	12	29.92	10
Phase 1 Generating Investment Idea	13. Risk of incompetent consulting	8.28	13	29.80	11
Phase 6 Warranty Service	14. Risks of unforeseen hidden defects (curved walls, cracking of plaster, etc.)	8.22	14	30.94	7
Phase 3 Financing	15. Risk of poorly planned project budget	8.12	15	27.76	16
Risks that may manifest during each phase	16. Risk from the functioning of the public administration	8.06	16	26.82	20
Phase 1 Generating Investment Idea	17. Risk of incomplete preliminary research and analysis	7.88	17	27.60	17
Phase 6 Warranty Service	18. Risk of irreparable defect	7.84	18	28.40	15
Phase 3 Financing	19. Risk of choosing between attracted and own funding	7.72	19	25.88	25
Risks that may manifest during each phase	20. Risk of bribery and corrupt schemes	7.72	20	23.72	34
Risks that may manifest during each phase	21. Risk of not good reputation of the entrepreneur	7.70	21	27.38	18
Phase 2 Project Preparation and Development	22. Risk of errors and unspecified situations in the design assignment	7.58	23	26.82	19

Source: Author`s survey

From the information presented in Table 6, the following conclusions can be drawn:

– Importance of Risks: Entrepreneurial risks associated with different project phases do not have the same effect on project quality. The analysis shows that certain phases concentrate a higher number of significant risks compared to others. For example, phases such as financing, implementation and project preparation and development are critical points with significant concentrations of risks. This highlights the need for specialized management in these phases.

– Comparison between Standard and Modified RII Formulas: The modified formula for risk impact assessment offers more realistic evaluations compared to the standard one. The standard formula may underestimate risks with lower probability but higher potential for serious consequences. The modified formula, by taking into account the square of the impact factor, better balances the importance of such risks.

– Change in Risk Ranking: Some entrepreneurial risks change their position in the ranking when using the modified formula for risk assessment. This is due to the fact that the modified approach considers the greater potential impact of risks with strong influence on project quality, regardless of their probability of occurrence. Risks that occupy higher positions in the ranking when using the modified formula are those with significantly high potential for negative impact on quality.

– Difference in the Scope of Key 20 Entrepreneurial Risks: The calculations show significant differences in the scope of key entrepreneurial risks when using the standard and modified formulas. This underscores the importance of choosing the right assessment method that accounts for both the probability and potential impact of risks on the successful completion of the project.

Figure 7 visualizes the key 20 entrepreneurial risks affecting the quality of residential construction investment projects, measured using the standard and modified RII. The diagram is in a bar chart format, where each bar represents an individual risk from Table 6, differentiated by colour for visual distinction. This visualization allows for a visual comparison of the risk rankings according to both assessment methods, reflecting their impacts on project quality. It aids entrepreneurs in making informed decisions regarding risk management by directing attention to the most significant risks

and establishing a basis for appropriate control measures and mitigation of their negative impacts.

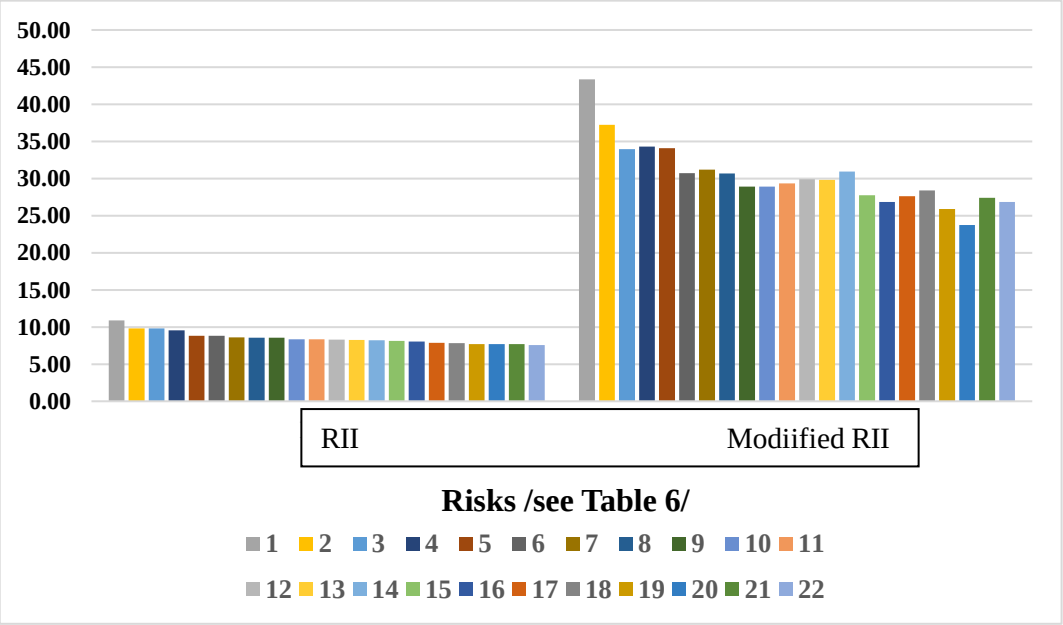

Fig.7. Key 20 entrepreneurial risks according to their significance for the quality of residential construction investment projects
Source: Author`s survey

Based on the analysis of the survey on entrepreneurial risks in paragraph 2.2., we can draw the following main conclusions:

The study highlights the importance of analyzing entrepreneurial risks on the quality of residential construction investment projects. By using the standard and modified RII, the author successfully identifies the impact of risks in various project phases, aiding in the effective management of their influence on quality.

Identifying the key 20 entrepreneurial risks that significantly affect the quality of residential construction investment projects is crucial. Ranking and visualizing these risks allow for a better understanding of their importance and impact, providing a foundation for appropriate management strategies and mitigation of their negative effects on project quality.

The third paragraph of Chapter Two is dedicated to examining the impact of entrepreneurial risks on the time for implementing residential construction investment projects. The main objective is to identify and define potential entrepreneurial risks in various phases of the project lifecycle that affect the project's completion time.

Through the data collected from the survey on entrepreneurial risks affecting the time of residential construction investment projects and their analysis using the methodology described in section 1.3.2, it is possible to compare the obtained values of standard and modified RII for the examined entrepreneurial risks from the phases of the investment projects lifecycle.

An analysis of the data from various phases of residential construction investment projects has been conducted, identifying the key 20 entrepreneurial risks that impact project completion time. Table 7 summarizes these risks, emphasizing their impact on project execution time and their potential to cause delays or interruptions. The analysis underscores the importance of managing entrepreneurial risks across different phases of residential construction investment projects and reveals the imbalance in the influence these risks exert on project completion time:

– Risk Distribution: The most serious risks that could lead to delays are distributed across different phases. From the first phase “Generating Investment Idea”, there are 2 risks; from the second phase “Project Preparation and Development”, there are 3 risks; from the third phase “Financing”, there are 5 risks; from the fourth phase “Implementation”, there are 3 risks; and from the fifth phase “Market Realization of Construction Product”, there is 1 risk. There are no risks among the key 20 in the sixth and seventh phases, while 7 of them fall under the category “Risks that may manifest during each phase”.

– Comparative Analysis of Risk Rankings using standard and modified RII reveals important information about the impact of risks in different project phases. The positions of risks change depending on the assessment methodology, reflecting changes in the risk landscape. For example, the risk of legal disputes is ranked 9th in the modified RII but 17th in the standard RII. This highlights the need to update risk assessments and track changes in the project's risk profile. Identifying risks that change their position in the rankings is crucial for risk management, as they may reflect significant changes in the external environment, project conditions, or other factors affecting project time.

Table 7

Key 20 entrepreneurial risks according to their significance for the time of residential construction investment projects

Phases	Risks	RII	Rank by RII	Modified RII	Rank by Modified RII
Risks that may manifest during each phase	1. Risk of pandemic	13.30	1	58.98	1
Phase 3 Financing	2. Risk of project cost escalation	11.30	2	43.78	4
Risks that may manifest during each phase	3. Risk of unstable investment environment	11.24	3	45.04	2
Phase 4 Project Implementation	4. Risk of delaying the commissioning of the construction site	10.94	4	43.66	5
Risks that may manifest during each phase	5. Risk of labor shortages (difficulties in hiring and retaining suitable employees)	10.76	5	44.28	3
Phase 4 Project Implementation	5. Risk of additional construction and assembly works outside the project documentation	10.52	6	40.60	7
Phase 3 Financing	7. Risk of inability to attract external financing	10.12	7	39.80	8
Risks that may manifest during each phase	8. Risk of natural disasters	10.04	8	41.80	6
Phase 4 Project Implementation	9. Risk of non-compliance by the contractor with the agreed prices, terms and quality for the construction and installation works	9.46	9	36.06	10
Risks that may manifest during each phase	10. Risk from the functioning of the public administration	9.38	10	35.26	11
Risks that may manifest during each phase	11. Risk of bribery and corrupt schemes	9.38	11	34.98	13
Phase 2 Project Preparation and Development	12. Risk of complicating and increasing the cost of the project by the designers-architects	9.30	12	35.18	12
Phase 2 Project Preparation and Development	13. Risk of errors and omissions in project design	9.22	13	34.78	14
Phase 3 Financing	14. Risk of choosing between attracted and own funding	9.20	14	34.60	15
Phase 3 Financing	15. Risk of poorly planned project budget	9.14	15	33.90	16
Phase 3 Financing	16. Risk of lack of cash receipts from pre-sales	8.94	16	33.50	18
Risks that may manifest during each phase	17. Risk of legal disputes between participants in the investment process	8.94	17	36.98	9
Phase 1 Generating Investment Idea	18. Risk of incompetent consulting	8.90	18	33.78	17
Phase 1 Generating Investment Idea	19. Risk of an incorrectly formulated concept of the entrepreneur	8.74	19	32.06	20
Phase 5 Market Realization of the Product	20. Risk of incorrect pricing of construction product	8.72	20	21.72	21
Phase 2 Project Preparation and Development	21. Risk of design delays	8.62	21	32.98	19

Source: Author`s survey

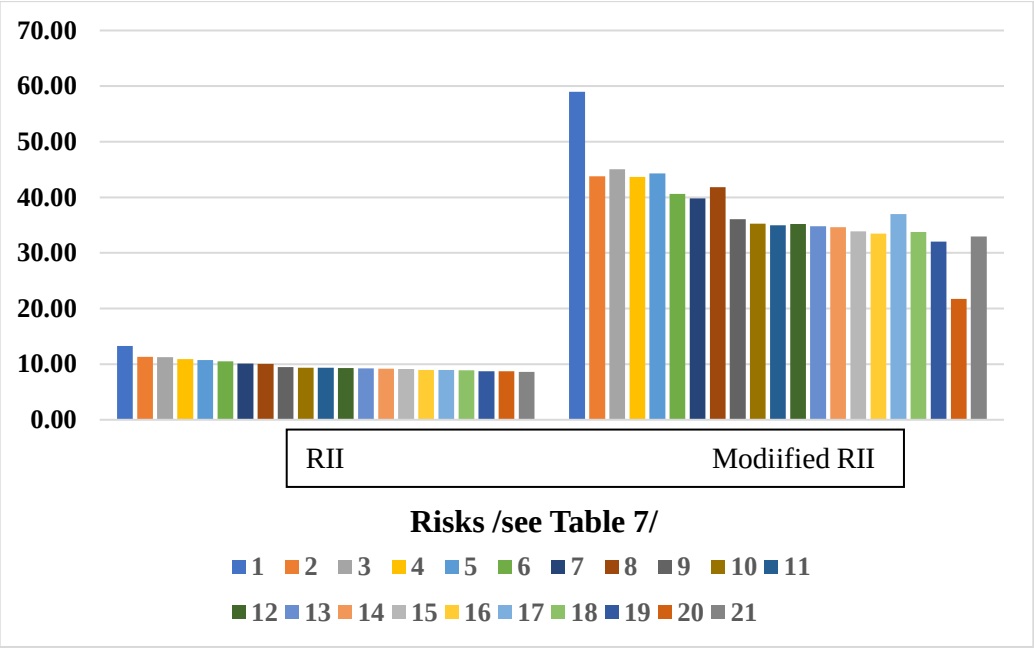

Fig.8. Key 20 entrepreneurial risks according to their significance for the time of residential construction investment projects

Source: Author`s survey

Figure 8 visualizes the key 20 entrepreneurial risks that significantly impact the time of residential construction investment projects, measured through standard and modified RII. The bar chart displays the significance of each risk in different colours for easy identification. This visualization allows comparison of risk rankings between the two methods, showcasing their influences on project time. It contributes to a better understanding of the importance of each risk and its impact. This analytical tool is valuable for construction entrepreneurs, providing information on key risks that can affect project completion time. It helps entrepreneurs make informed decisions regarding appropriate risk management strategies.

Based on the information presented in paragraph 2.3. regarding the study of the impact of entrepreneurial risks on the implementation time of residential construction investment projects, the following can be summarized:

1. The assessment of the impact of entrepreneurial risks on time across different phases of the investment projects' lifecycle emphasizes the need to study their influence on project implementation time. Using gathered data and analyzing it, the author demonstrates a methodology for comparing standard and modified RII, providing a tool for managing entrepreneurial risks and optimizing project implementation time.

2. Identifying and ranking key entrepreneurial risks based on their significance for the time of residential construction investment projects provides important visualization of their impacts. The author uses a bar chart that clearly presents the significance of each risk and its impact, offering a tool for making informed decisions regarding appropriate strategies for managing entrepreneurial risks in investment projects for residential construction.

3. These analytical tools are crucial for construction entrepreneurs, providing them with information and analysis on key entrepreneurial risks that can affect project execution and lead to deviations. Through these tools, the author offers an opportunity for a more detailed understanding of the role of each risk and for making informed decisions regarding the management of entrepreneurial risks in residential construction investment projects.

CHAPTER THREE
INNOVATIVE STRATEGIES FOR ENTREPRENEURIAL RISKS MANAGEMENT IN RESIDENTIAL CONSTRUCTION INVESTMENT PROJECTS

In the third chapter of the dissertation, some of the existing opportunities for managing entrepreneurial risks in residential construction investment projects are presented.

In the first paragraph of Chapter Three, an optimization of entrepreneurial risk management in residential construction investment projects is presented. To propose measures for reducing entrepreneurial risks in residential construction investment projects in Bulgaria, a survey was conducted among construction entrepreneurs and companies. The methodology for the survey includes the following elements:

1. Research objective: Study of existing measures for managing entrepreneurial risks in residential construction investment projects and identification of opportunities for their improvement.

2. Research sample: 50 construction entrepreneurs from Sofia, Plovdiv, Varna, and Burgas, including 33 representatives from construction firms, 3 from investor firms, and 14 from firms with mixed activities.

3. Survey model: Direct standardized workplace interviews with a questionnaire programmed on tablets.

4. Analysis methods: Qualitative and quantitative analysis using statistical methods.

The first part of the survey is focused on building the current profile of the surveyed construction entrepreneurs.

Regarding gender distribution, men dominate among the participants with 78%, while women are represented with 22%.

The age structure shows that the majority fall within the middle age group (35 - 54 years), while younger (25 - 34 years) and older entrepreneurs over 65 years are less represented.

Regarding experience in realized residential construction investment projects: 40% of participants have completed between 16 and 30 projects. There are also groups with fewer projects (26% with between 6 and 15 projects) and more projects (18% with between 31 and 50 projects), while only 6% have realized between 51 and 100 residential projects.

In terms of company size based on the number of employees: 64% of participants are small and medium-sized enterprises with 1 to 49 employees. A significant number of companies (36%) have 50 or more employees, with only 4% having over 250 employees.

The assessment of knowledge in the field of entrepreneurial risk management shows diversity: 34% have an average level of knowledge, 28% have basic knowledge, 20% have a high level, and 14% have a very high level of knowledge. Only 4% of participants have noted a lack of knowledge in this area.

These data provide a detailed profile of construction entrepreneurs and their approach to risk management in the residential construction sector.

The second part of the survey aims to establish the current state and, based on this, outline measures to reduce entrepreneurial risks in residential construction investment projects in Bulgaria. The results show that a significant portion of participants implement risk management standards. For instance, 60% use ISO 31000:2018, 16% rely on the FERMA framework document, and 6% follow other

standards. However, 36% of companies do not apply any standard, which may pose challenges to their ability to manage risks in construction.

The responses indicate that coordination of activities for managing entrepreneurial risks in various phases of residential construction investment projects is high. The most significant coordination is observed in the second, third, fourth, sixth, and seventh phases of the projects, where percentages range between 58% and 78%. It is important to pay attention to these data and analyze the reasons for the varying levels of coordination across phases to enhance risk management and minimize potential negative consequences for the projects.

Companies involved in residential construction investment projects employ various methods for managing entrepreneurial risks. For example, a significant percentage of them always plan the risk management process (56%) and conduct ongoing monitoring and review of all aspects (58%). Additionally, a large portion of the companies regularly define the scope and criteria for risk management (from 24% to 44%) and perform risk analysis (from 18% to 58%). These data underscore the importance of diversity in companies' approaches to risk management, which can influence the success of their projects.

According to survey responses, the methods used by companies to identify entrepreneurial risks in residential construction investment projects include document review (74%), individual subjective assessments (64%), checklist analysis (40%), evaluation by external experts (40%), SWOT analysis (20%), specialized risk management software (14%), expert assessment methods (10%), and questionnaires (6%). Only 4% of companies do not use any methods for risk analysis.

There is a variety of methods that companies use for analyzing entrepreneurial risks in residential construction investment projects, including individual subjective assessments (66%), cost-benefit analysis (56%), scenario/sensitivity analysis (40%), consultations with external experts (36%), use of specialized risk management software (12%), and the fact that 4% of companies do not apply any methods for risk analysis, which may reflect a lack of awareness or appropriate resources for these activities.

As a result of the conducted survey and analysis of the gathered data, the following measures for mitigating entrepreneurial risks have been systematized in Table 8.

Table 8

Systematized measures for reducing entrepreneurial risks in residential construction investment projects

№	Measure	Description
1.	Creating a risk culture	– Ensuring awareness and engagement with risk management throughout the organization. – Promoting open dialogue and the importance of risk at all management levels.
2.	Training and development of staff in the field of entrepreneurial risk management	– Providing education and training on risk management methods and tools. – Creation of internal programs for the development of staff skills in the field of risk management.
3.	Building a clear structure with roles and responsibilities for managing entrepreneurial risks	– Defining the risk management roles and responsibilities of each team member. – Establishing a clear communication network and accountability for risk issues.
4.	Selection of an appropriate standard for managing entrepreneurial risks in residential construction investment projects	– Review the different risk management standards and methodologies and choose the right one for the projects.
5.	Diversification of methods for identification and analysis of entrepreneurial risks	– Using a variety of methods and tools to detect, assess and manage risk. – Adapting the methods to the specific needs of residential construction investment projects.
6.	Determination of acceptable levels of entrepreneurial risks	– Establish criteria and limits for acceptable levels of risk for projects.
7.	Integrating risk management in all phases of the life cycle of residential construction investment projects	– Incorporating risk management from the initial planning phase to the implementation and monitoring phase of the project.
8.	Use of external consultants and experts	– Use of external specialists and consultants for additional expert support in the field of entrepreneurial risk management.
9.	Improved communication and collaboration	– Creating an open and effective communication environment for information sharing and collaboration between the various project stakeholders.
10.	Review and update enterprise risk management plans	– Regular review and update of risk management plans in line with changing conditions and requirements.
11.	Using innovative technologies to manage entrepreneurial risks	– Implementation of innovative technologies and software solutions for more effective risk management and process facilitation.
12.	Recording and reporting of information	– Systematic recording and analysis of entrepreneurial risks information for future use and project analysis.

Source: Developed by author based on author's survey

Based on the presented optimization of entrepreneurial risk management in residential construction investment projects in paragraph 3.1, the author draws the following main conclusions and recommendations:

1. Analysis of the profile of construction entrepreneurs: A survey was conducted among 50 construction entrepreneurs in Bulgaria, providing valuable data on risk management in residential construction investment projects.

2. Evaluation of current risk management measures: The current state of implemented measures was examined, evaluating their effectiveness and challenges, providing a basis for better project management in residential construction.

3. Recommendations for improvement: Scientifically grounded recommendations have been formulated to enhance risk management, based on data analysis and contemporary theories and practices. These recommendations are valuable for the development of the construction sector in Bulgaria.

In the second paragraph of Chapter Three, a new framework for managing entrepreneurial risks in residential construction investment projects is proposed through the design of a web-based platform. In Bulgaria, increasing competition in the construction sector demands better analysis of entrepreneurial risks for successful project execution. Dynamic economic conditions and digitalization also play crucial roles. Creating a web-based risk assessment platform is a logical step towards modernizing and enhancing the efficiency of the investment process. The platform aims to integrate modern technologies and expert analysis to identify and evaluate entrepreneurial risks in projects. The platform assists construction entrepreneurs in developing strategies to optimize and reduce entrepreneurial risks by providing information and analysis tools that facilitate decision-making. The platform arises from the need for a centralized hub for information and risk management tools, supporting construction entrepreneurs, companies, consultants, and other stakeholders in the construction sector to make more informed decisions and optimize entrepreneurial risk management.

The development of the core components of the web-based platform involves several stages designed to create a functional and efficient online tool for managing entrepreneurial risks in residential construction investment projects:

Stage 1. Conducted online survey: The survey results highlight the absence of web-based platforms for assessing entrepreneurial risks in Bulgaria. This underscores the need for developing innovative solutions accessible to the general public to support successful risk management and implementation of residential construction investment projects.

Stage 2. User profile research:

1. Identifying different user categories for the platform – construction entrepreneurs, employees of construction companies, consultants and experts in construction and real estate, as well as other stakeholders. Understanding their goals and challenges is crucial for the successful development of the platform.

2. Students and educators are part of the user profile, as they can utilize the platform for learning and enriching their educational materials in the field of risk management in construction.

3. Analysis of user needs clearly indicates the necessity to develop a web-based platform that is not only intuitively understandable and easy to use but also provides free access to its functionalities.

Stage 3. System architecture includes the following components:

1. WordPress is used as the primary web development platform because of its popularity and flexibility, facilitating the creation of websites and platforms. MySQL database is preferred for data storage and management due to its reliability and efficiency, ensuring fast access to information and smooth platform operation. A plugin (additional software component) was used to create the risk assessment survey form, enabling the creation of various types of surveys directly within WordPress, thereby facilitating user form completion.

2. Risk Assessment Method: The web-based platform has developed a method for assessing entrepreneurial risks, which includes the following aspects:

2.1. Calculation of a summarized modified relative impact index: For the purposes of the web-based platform, the adopted method of analyzing the collected data from the second chapter of the present dissertation was applied, which is based on combining factors of impact on the project objective and the probability of occurrence of the risk factor. However, the method has found application with some modifications

that contribute to greater precision and adaptation to the specifics of the web-based platform. Formula (4) of the summarized modified RII is as follows:

$$R_i = \alpha_i.\{\left(\beta_{i_b}\right)^2 + (\beta_{i_q})^2 + (\beta_{i_t})^2\} \quad (4)$$

R_i – is the summarized modified index of relative risk impact.

α_i – *i*s the probability of occurrence of risk factor *i*.

β_{i_b} – is the level of impact of risk factor *i* n the project objective budget (b) of the project.

β_{i_q}– level of impact of risk factor *i* on project objective quality (q) of the project.

β_{i_t} – level of impact of risk factor *i* on project objective time (t) of the project.

2.2. Determining the risk level: The web-based platform uses the results from calculating the summary modified index of relative impact to determine the risk level:

– Low risk (in green color): Risk index values from 3 to 125.

– Medium risk (in yellow color): Risk index values from 126 to 250.

– High risk (in red color): Risk index values from 251 to 375.

2.3. Security and data protection: In the platform, data is integrated into the system, and access is provided through the web interface. Users can access necessary information and functionalities without the need to create an account or input personal data. This method of data processing allows users to use the platform with greater convenience and anonymity, while ensuring the security and protection of their data.

3. The user interface design includes the following aspects: The design encompasses various elements aimed at providing convenience and usability. The homepage offers basic information, instructions, and easy navigation. The homepage slider dynamically presents an engaging start for users, while the colour palette, font selection, and footer enhance the visual experience and provide easy access to platform functionalities.

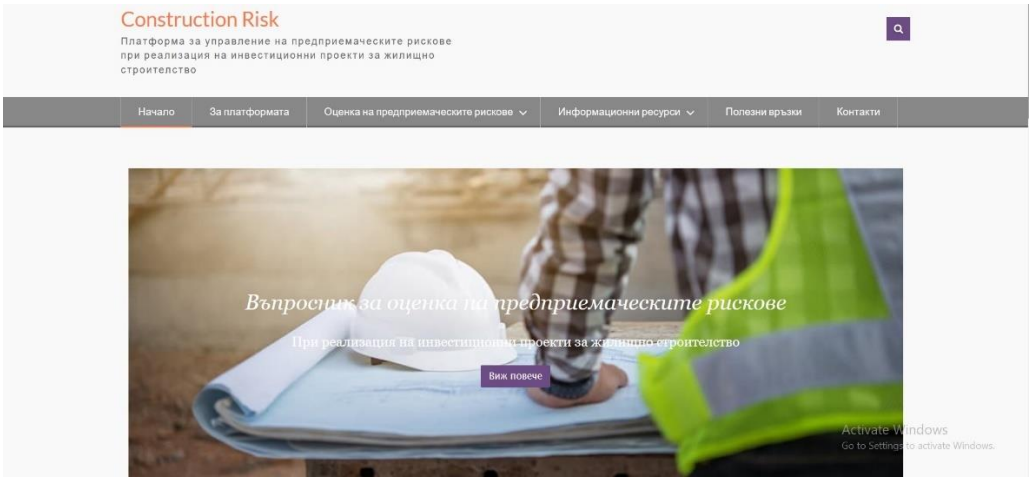

Fig. 9. Screen capture of the homepage of the web-based platform
Source: Web-based platform Construction Risk developed by the author [8]

The functionalities of the web-based platform are designed to ensure easy, accessible, and comprehensible use (see Fig. 9). These functionalities include the following elements:

At the top of the homepage of the web-based platform is the main navigation menu, which includes the following buttons:

1.1. “Home”: Returns users to the homepage of the platform, where they can begin exploring the various features and services.

1.2. “About the Platform”: Provides information about the platform, including its purpose and capabilities for users.

1.3. “Entrepreneurial Risk Assessment”: Links to the risk assessment form, where users can utilize the platform's functionality for analyzing entrepreneurial risks.

1.4. “Information Resources”: Here, users can find useful materials related to the topic of evaluating and managing entrepreneurial risks in the implementation of residential construction investment projects.

1.5. “Useful Links”: Includes links to external resources that provide additional support or services related to the field of investment or construction.

1.6. The platform features a search bar, offering users a convenient way to find specific information or resources they are looking for.

[8] Available online at http://constructionriskbg.com/. The platform was developed entirely in Bulgarian. There is no English version, as it is designed specifically for Bulgaria.

1.7. The “About Me” section is a place where users can find a brief biography of the author of the platform.

1.8. The contact form is an important functional element of the platform, providing a means of communication between users and the author of the platform.

2. The main feature of the platform is the entrepreneurial risk assessment form, which is prominently displayed on the homepage. Users can easily complete the form by following the instructions and entering the required information. This provides a convenient and user-friendly way to analyze risks:

2.1. Risk identification is essential for managing investment projects in residential construction. Users of the platform can assess entrepreneurial risks that may arise during various phases of their project life cycle. A total of 55 different risks have been identified and classified through expert assessments, evaluated based on their likelihood and impact on the budget, quality, and project completion time. The risks are distributed across 7 main project phases, with an additional category for risks that may occur at any time during project execution. Thus, users can work with a total of 8 risk categories, which are crucial for their construction activities.

2.2. The platform uses a 5-point scale for risk assessment, aimed at a detailed and systematic evaluation of the likelihood of risk occurrence and its impact on the three project objectives – budget, quality, and time. This scale provides a gradation of risk, allowing users to determine the likelihood of a given risk and the extent of its impact on a specific project objective. This helps users prepare for potential threats and take the necessary measures for risk management. Through this scale, users receive a clear representation of the entrepreneurial risks that may affect the success of their projects, enabling them to focus on specific aspects of the project that require special attention and management.

2.3. After completing the entrepreneurial risk assessment form, users automatically receive their results, with the screen displaying the obtained risk index value and the corresponding risk level, including colour coding for easier understanding (green for low risk, yellow for medium risk, and red for high risk). Users also have the option to download and save the questionnaire and results in PDF format for easy sharing or archiving. This functionality provides users with valuable information about

the risks associated with their projects, helping them make informed and thoughtful decisions about their future actions and encouraging them to continue assessing subsequent risks through clear instructions and references to the next entrepreneurial risk assessment forms.

The web-based platform is a collection of tools and capabilities that significantly enhance the process of assessing entrepreneurial risks in the implementation of investment projects for residential construction. These functionalities not only facilitate and optimize user operations but also offer numerous advantages: easy access and navigation, data visualization for a clear understanding of risks, a feedback system for continuous improvement, free access without the need for registration, the ability to save assessment results, provision of free informational resources, and a professional, modern design. These aspects combine convenience, functionality, and value, improving the user experience and helping users make informed decisions.

To confirm the applicability and effectiveness of the platform, a testing algorithm has been developed, including sequential steps such as identifying the need for testing, determining objectives, selecting a company for testing, executing the process, analyzing the results, and publishing the final outcomes. The testing was conducted by the construction company “Planex” EOOD. The review and testing provide valuable insights into the potential applications and effectiveness of the system, proving that it can support the management of entrepreneurial risks in residential construction investment projects.

The summarized conclusions in paragraph 3.2., made by the author, are as follows:

1.The author creates a conceptual model of a web-based platform that integrates modern technologies and expert analysis to assist in the identification and assessment of entrepreneurial risks in residential construction in Bulgaria, aiming to support construction entrepreneurs in optimizing the investment process.

2.The main components of the platform are designed for ease of use and flexibility to adapt to different needs, with an architectural scheme that ensures stability and efficiency, while the user interface makes the risk assessment process accessible to a wide range of users.

3.The web-based platform for entrepreneurial risk assessment represents an innovative tool that facilitates the evaluation and management of risks, offering a variety of functionalities to optimize the process, and promoting the development of knowledge and skills in risk management.

4. The author develops a testing algorithm for a real-world environment, conducted by the construction company "Planex" EOOD, which evaluates key aspects such as functionality, effectiveness, and quality of the platform, proving its applicability in managing entrepreneurial risks in investment projects for residential construction.

In the third paragraph of the third chapter, integration of artificial intelligence in managing entrepreneurial risks in residential construction investment projects is presented.

In an era where technological innovations are transforming the way we work and interact, the use of artificial intelligence is becoming increasingly prevalent across all aspects of life and business. In construction, where managing entrepreneurial risks is critical to project success, there is a crucial need for innovative approaches to effective management. The use of artificial intelligence represents a key tool for optimizing risk management and enhancing project success.

The introduction of technological innovations such as artificial intelligence provides new opportunities for analysis, prediction, and management of risks in construction. Artificial intelligence capabilities include processing large volumes of data, analyzing complex interrelationships, and predicting potential threats and opportunities, which promote more informed decisions and reduce the risk of failure in residential construction investment projects. Artificial intelligence uses machine learning algorithms, neural networks, and natural language processing to analyze data, recognize patterns and speech, and make decisions without explicit programming. This technology can optimize risk management in residential construction investment projects by enhancing understanding and facilitating more informed decision-making.

ChatGPT 3.5[9] is the latest version, as of the development of the dissertation, of an artificial intelligence-based text generation system developed by OpenAI. It aims to generate text that mimics human speech styles and tones and understands the context of

[9] Available at https://chatgpt.com/.

a given question or task. The technology behind ChatGPT 3.5 is based on transformer models, which use large neural networks to generate responses and analyze information. This version has been trained on a large volume of internet data, allowing it to possess a rich knowledge base. ChatGPT 3.5 provides capabilities for personalized and contextual responses that can be integrated into various applications and systems, including for managing entrepreneurial risks in residential construction investment projects in Bulgaria, by processing large volumes of real estate data and providing forecasts for potential risks and scenarios for different situations.

Although there are other AI models that can be used for managing entrepreneurial risks, ChatGPT provides a broad range of capabilities for effectively managing risks and improving business processes in residential construction investment projects in Bulgaria.

The SWOT analysis for the application of ChatGPT 3.5 entrepreneurial risks management in investment projects for housing construction in Bulgaria enables a detailed examination of the strengths and weaknesses, as well as the opportunities and threats associated with the use of this technology.

Table 9

SWOT analysis for the ChatGPT 3.5 application for entrepreneurial risks management in residential construction investment projects in Bulgaria

Strenghts	Weaknesses
➢ **High accuracy and reliability:** ChatGPT 3.5 is a highly accurate artificial intelligence model capable of providing quality and reliable analysis of entrepreneurial risks in residential construction. ➢ **Wide range of analysis:** The application can analyze various aspects of risk, including financial, technical, legal, and others, making it a powerful risk management tool. ➢ **Extensive database and training:** ChatGPT 3.5 is trained on a vast amount of data from various sources, enabling it to handle diverse challenges. ➢ **Speed and efficiency**: ChatGPT 3.5 provides quick and efficient responses, allowing	➢ **Context understanding limitations**: Despite its high accuracy, the model may have limitations in understanding complex contextual situations or specific language nuances related to residential construction. ➢ **Potential data scope limitations**: Despite its extensive training, ChatGPT 3.5 may have limitations in processing specific data unique to residential construction in Bulgaria. ➢ **Need to keep up-to-date**: The system requires constant updates with new data and information to maintain its relevance and provide accurate risk management analyses. ➢ **Training requirement**: To fully leverage the application, it is important for entrepreneurs to be trained and familiar with

entrepreneurs to make swift and informed decisions regarding risk management. ➢ **Natural language understanding:** ChatGPT 3.5 can understand and interpret users' natural language, providing intuitive and easily understandable responses and analyses.	how to use ChatGPT 3.5 for risk management.
Opportunities	**Threats**
➢ **Integration with other project management tools:** There is an opportunity for the application to integrate with other project management software tools, which would facilitate effective risk management in residential construction investment projects. ➢ **Development of additional functionalities:** With advancements in artificial intelligence technologies, there is an opportunity to expand the application's functionalities, enhancing its utility and effectiveness.	➢ **Competition from other AI models**: With the emergence of new AI models and technologies, the application may face competition, potentially reducing its popularity and applicability. ➢ **Regulatory constraints:** Various regulatory and legal constraints could limit the application and development of ChatGPT, particularly in areas concerning data privacy protection and ethical use of artificial intelligence.

Source: Developed by the author based on research

The guide for effective use of artificial intelligence in managing entrepreneurial risks in residential construction investment projects aims to provide construction entrepreneurs with the necessary knowledge and guidance for successfully implementing the technology within their organizations. The goal is for construction entrepreneurs to fully leverage the potential of artificial intelligence in managing entrepreneurial risks in their residential construction investment projects. They need to learn how to ask the right questions, provide the necessary information, and extract valuable insights from the system to enhance decision-making processes and mitigate risks in their projects.

In summary for successful implementation of ChatGPT 3.5, an algorithm has been developed for maximizing the effective use of this tool in managing entrepreneurial risks management in residential construction investment projects, depicted graphically in Figure 10:

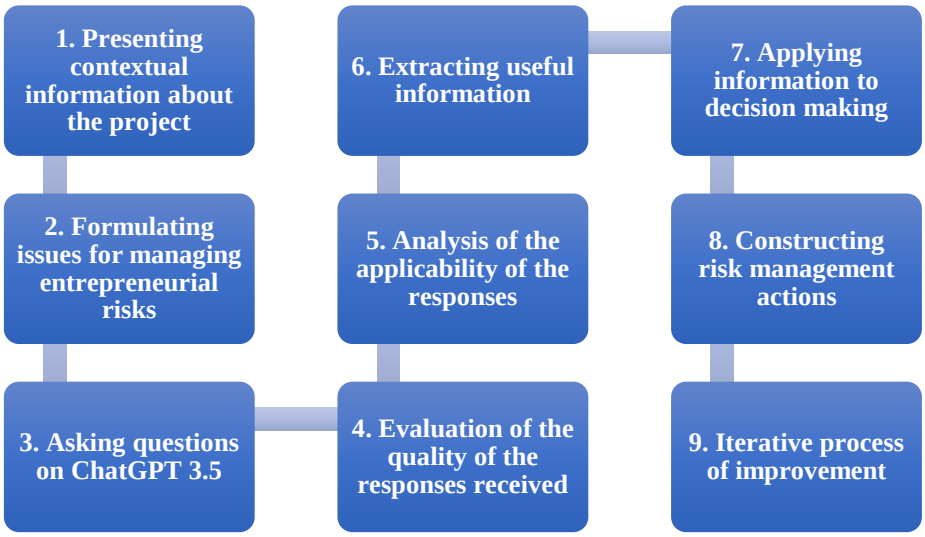

Fig. 10. Algorithm for effective use of ChatGPT 3.5 in entrepreneurial risks management in residential construction investment projects
Source: Developed by the author based on research

The statements in paragraph 3.3 provide the author with the following key conclusions:

1. Introducing artificial intelligence into the management of entrepreneurial risks in residential construction investment projects is crucial for modern business practices.

2. The conducted SWOT analysis of the ChatGPT 3.5 application identifies strengths, weaknesses, opportunities, and threats. ChatGPT 3.5 has significant potential to enhance risk management and contribute to more effective and innovative decision-making in the construction sector.

3. The author provides a guide for effectively using artificial intelligence in entrepreneurial risks management in residential construction investment projects. This aims to equip construction entrepreneurs with the necessary knowledge and guidance for successfully implementing the technology, thereby improving decision-making processes and reducing risks in projects.

4. An algorithm has been developed for maximizing the effective use of ChatGPT 3.5 in entrepreneurial risks management in residential construction investment projects. This innovative approach provides clear instructions for integrating intelligent data analysis into project management, enhancing risk management, and achieving project goals.

CONCLUSION

The results obtained from the research done in the dissertation allow us to make the general conclusion that the intended aim has been achieved and the tasks related to it have been fulfilled.

The main results of the research can be presented:

1. The research found that residential construction investment projects are exposed to various entrepreneurial risks that significantly influence their successful implementation.

2. The research demonstrated that detailed analysis of entrepreneurial risks is crucial for understanding and managing these risks across various phases of the project lifecycle.

3. The results of the research indicate that identifying and ranking key entrepreneurial risks is a necessary step towards developing strategies for prevention and management.

4. Implementing innovative strategies to reduce entrepreneurial risks, including using a web-based platform for management and integrating artificial intelligence, opens up opportunities to enhance management practices in the field of residential construction.

5. The innovations proposed in this study represent specific steps towards achieving greater efficiency and success in implementing residential construction investment projects.

The dissertation provides a comprehensive analysis of entrepreneurial risks in residential construction investment projects and offers specific solutions for their management.

The results and recommendations obtained reveal opportunities for future research and application of best practices in the sector, aimed at supporting the development and success of residential construction.

III. REFERENCE TO THE CONTRIBUTIONS IN THE DISSERTATION

In the dissertation, the following theoretical and practical contributions can be outlined:

1. Based on conducted theoretical research and critical analysis of literature sources, the dissertation has clarified and specified the interrelationships among the concepts of “investments”, “real estate investments”, “residential construction investment projects”, “financing of investment projects” and “entrepreneurial risk”. These formulations imply their broader research and practical applicability.

2. Based on in-depth analysis and synthesis of specialized literature, two comprehensive classifications of investment types and risks based on leading criteria have been proposed. These classifications provide a significant foundation for presenting and disaggregating entrepreneurial risks across the lifecycle phases of residential construction investment projects and by types. This is crucial for subsequent effective risk management and achieving success in projects when they are included in specific studies and models.

3. Adapted from M. Saunders “Research Onion” process used in academic research, a methodology has been developed for studying entrepreneurial risks in residential construction investment projects. A data analysis method called the “Relative Impact Index” has been justified, with a modified formula implemented specifically tailored for the research objectives.

4. As a result of a comparative analysis of the data collected from the conducted survey on entrepreneurial risks in residential construction investment projects in Bulgaria, key entrepreneurial risks have been identified across the lifecycle phases of investment projects that have the greatest impact on the three main project goals – budget, quality, and time. This allows for making informed specific assessments and implementing measures to mitigate the impact of these risks.

5. Outlined are innovative strategies for managing entrepreneurial risks in residential construction investment projects in Bulgaria, including the development of a web-based platform for risk assessment and integration of artificial intelligence into their management. Scientifically justified opportunities for optimizing risk management

have been formulated based on data analysis from a survey on the current state of applied measures in the sector.

IV. PUBLICATIONS RELATED TO THE DISSERTATION

Articles

1. Staneva-Todorova, M. Economic Essence of Entrepreneurial Risk. Real Estate and Business: Peer-Reviewed Academic Journal. Sofia: UNWE Publishing Complex, 3(1), 2019, p. 52-61.

Conference reports

1. Staneva-Todorova, M. Risk Management through a Series of International Standards ISO 31000. Construction Entrepreneurship and Real Estate: Proceedings of the 33rd International Scientific Conference – November 2018, Varna: Science and Economics, 2018, p. 286-294.

2. Staneva-Todorova, M. Entrepreneurial Risks in the Market Implementation of Construction Investment Projects. Construction Entrepreneurship and Real Estate: Proceedings of the 32nd International Scientific Conference – November 2017, Varna: Science and Economics, 2017, p. 415-426.