

Applying Modern Methods of Financial Risk Management in Manufacturing Enterprises

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Abstract: This article analyzes modern methods of financial risk management in manufacturing enterprises. The study examines risk management models based on diversification, hedging, insurance, internal control systems, and digital technologies. Drawing on the scientific works of Uzbek and foreign scholars, the effectiveness of these methods in ensuring the financial stability of enterprises is assessed. The article employs analytical tables to elucidate the processes of risk identification, assessment, and mitigation. In conclusion, practical recommendations are provided for improving the financial risk management system for enterprises.

Keywords: Financial Risk Management, Manufacturing Enterprises, Hedging, Diversification, Enterprise Risk Management (ERM), Derivative Financial Instruments, Corporate Governance, Quantitative Risk Assessment, Value at Risk (VaR), Digital Transformation, Financial Stability, Risk Mitigation, Risk Measurement, Risk Strategy Decisions, Risk Implementation, Risk Monitoring.

Introduction: The financial stability of manufacturing enterprises has become an increasingly critical issue in the recent global landscape. Various macro-influences including globalization of value chains, geo-political developments, exchange rate anomalies and persistence of inflation have all increasingly introduced uncertainty at the micro-level. As a result manufacturing enterprises face substantial financial risks which threaten their immediate sustainability as well as longer-term solvency. Consequently, it is increasingly important for firms to deploy sophisticated financial risk management techniques and establish effective financial risk management systems.

In order to adjust economy of Uzbekistan to new real sector development strategy, the structural reforms in economy are implemented. Large state-owned companies are being transformed into joint-stock companies and business corporations, new tax system is introduced, deep and integrated development of financial organizations and markets is held. Implementation of these measures stipulates change in the risk management policies and corporate governance at enterprises. Due to conducted reforms,

manufacturing enterprises of Uzbekistan are faced with new risks of both local and global origin. For effective management of these risks, it is necessary to switch to a new level of risk management from traditional and non-structured approach to the highly developed, strategic, dynamic and balanced risk management methodology, in which a significant place is given to quantitative indicators.

The theoretical and methodological basis of the modern Financial Risk Management (FRM) has been established in the international academic publications since the middle of the 20th century. A number of groundbreaking works in this field should be mentioned. The Nobel Prize in Economy for 1990 was awarded to Harry Markowitz for his theory of portfolio selection first introduced in 1952, including the benefits of diversification in optimal investment decisions. William Sharpe was awarded the Nobel Prize for his work on the Capital Asset Pricing Model (CAPM), and the use of systematic risk as a measure. Later option pricing model created by Robert Merton and Myron Scholes is another fundamental work used for pricing and hedging financial derivatives (Merton 1973; Hull 2018). Besides these classical work, other papers

and books have greatly enriched our knowledge of the Financial Risk Management. They include papers of René Stulz (2002) on enterprise risk management (ERM), and books of John C. Hull (2018) on derivatives and risk management and Michel Crouhy (2000) on the integrated models of risk management.

In recent years, a number of local scientists have focused on financial risk management in Uzbekistan, in particular, M. Sharifxojayev, Sh. N. Zaynutdinov, N.Q. Yo'ldoshev, Q. Muftaydinov, D.X. Xudaynazarova, Sh. Z. Muxitdinov, N.M. Mahmudov, A.U. Burxanov, B.O. Tursunov and others. They are mostly focused on risk management practices in commercial banks, and the credit risk assessment methods, with the general objective of ensuring financial stability of the national system. At the same time, there is an almost complete lack of studies on modern methods and practices of Financial Risk Management, which can be used by the manufacturing enterprises. Moreover, there is an underexplored scientific problem, related to the possibility of applying the advanced methods of modern FRM in the period of manufacturing enterprises digitalization, including big data analytics and other similar approaches.

The article theoretically justify the modern methods of financial risk management to applied in manufacturing enterprises, and to study the feasibility and ways of their adaptation in the modern Uzbek environment. To achieve this goal, four main tasks were set. The first task is to study the theoretical grounds and the evolution of a scientific vision of financial risk management. The second task is to systematize and generalize the domestic and foreign scientific works on the problem under study. The third task is to carry out a critical analysis of the existing practices of risk management in manufacturing enterprises of Uzbekistan. The fourth task is to justify and offer practical recommendations for improving the risk management practices, and to develop a model of financial risk management for the manufacturing enterprises of Uzbekistan.

METHOD

In contrast to the uneven and frequently unrecognizable development of concepts on risk in the history of ideas, one of the earliest attempts at a systematic treatment of the subject can be found in the French economist Richard Cantillon's (1680–1734) work *Essai sur la Nature du Commerce en Général* (Essay on the Nature of Trade in General). In a passage that has become famous, Cantillon showed that the entrepreneur bears risk. The process of entrepreneurship consists, according to Cantillon, of purchasing provisions and wares at the current market

price with the intent of selling them at a later time, of course at an unknown future market price. Hence, in preparing to buy, the entrepreneur cannot know for certain at what point in time he will actually sell his wares. Under these circumstances, the course of events that will unfold for the entrepreneur is, to some extent, unpredictable. Lehmann later notes that Cantillon's work introduced a very important distinction even if it was not fully understood or exploited in terms of later refinements on the spectrum of risk, specifically the distinction between those aspects of risk that can be calculated and those aspects that create uncertainty.

However, it was Frank Knight who solidified this distinction in his 1921 work, *Risk, Uncertainty, and Profit*, by making it a central theoretical concept within risk theory. This distinction has since been accepted and reinforced within the field. He delineated risk as a category of events characterized by measurable probabilities—situations in which the distribution of potential outcomes is known or can be estimated with statistical confidence. In Knight's formulation, risk is "something that can be sterilized, as can be fever, by an inoculation of quinine; it is measurable and therefore reducible to approximately uniform terms of price for purpose of comparison; the probability of its occurrence can be approximately calculated and weighed in the balance against possible profit; in short it is a measurable and therefore (so far as we are able to deal with it) manageable factor" (Knight 1921: 232). Conversely, uncertainty was defined as a condition in which the probabilities of outcomes are unknowable, precluding any objective measurement or actuarial treatment. Uncertainty, in Knight's schema, constitutes the true source of profit and is inherently irreducible through technical or managerial interventions.

This Knightian distinction provided the conceptual scaffolding upon which subsequent financial risk theory would be constructed. It established that the domain of risk—unlike that of uncertainty—is amenable to quantification, modeling, and systematic management, thereby legitimizing the development of formal methodologies for risk assessment and mitigation.

During the mid-20th century there was a fundamental shift in the way that financial risk was handled in academic theory. The models of financial risk began to embody the spirit of Knight's view of risk, i.e., that risk is measurable. In 1952, Harry Markowitz, a Stanford graduate student at the time, published a paper that began to formalize a theory of portfolio behavior which came to be known as portfolio theory. The key to Markowitz's insight was that by mixing a couple of risky assets with less than perfect correlation into a portfolio, one could reduce risk for any given level of

expected return. Quickly, this insight became known as the principle of diversification and portfolio optimization. It began to fundamentally affect the ways in which people and institutions approached the task of asset allocation. It provided a means to look at a set of choices, to pick the best set of choices for any given level of risk and return that an investor sought. It also spawned a burgeoning industry and innumerable tools that have today become second nature to every sophisticated investor.

William Sharpe built on the pioneering work of Harry Markowitz in modern Portfolio Theory with the introduction in 1964 of the Capital Asset Pricing Model (CAPM). The CAPM is an extension of Markowitz's work in that it describes how every investment has two types of risk: systematic or market risk and idiosyncratic or unique risk. Systematic or market risk is often viewed as the only risk relevant to investors, as it cannot be diversified away unlike unique risk. The CAPM showed that, in an equilibrium context, investors are rewarded only for bearing systematic risk, and developed a measure of such risk—measured by the beta of an asset (β). The model, and its associated measure of the cost of capital, has proven to be a powerful tool for financial managers to use in evaluating the performance of investments, and in their overall decision-making process.

While a large leap in financial risk theory was already achieved, a further leap was delivered by Robert Merton and Myron Scholes on option pricing in 1973. Their work introduced the Black-Scholes-Merton option pricing model that delivers a closed-form solution for pricing European options. In subsequent years, the model was modified to cope with a variety of requirements, including options with expiration at different dates and options written on instruments that exhibit stochastic processes. The Black-Scholes-Merton model calculates the theoretical price of an option as a function of five variables: the current price of the underlying asset; the strike or exercise price of the option; time to expiration; risk-free interest rate; and volatility of the underlying asset. The breakthrough by Merton (1973) further extended the applications of options pricing, allowing prices and option contracts to be traded, and in an unexpected turn of events, complete hedging of risk became possible, by creating securities (portfolio derivatives) which perfectly replicate the movements of the price of the underlying assets. Complete replication enables the efficient pricing, transfer and management of risk. Investors, traders, risk managers and other market participants can now precisely price options, search for opportunities to exploit imprecise pricing, package and measure risk, and trade or hedge specific aspects of

risk.

In terms of contributions to the foundation of risk management, the theory of portfolios, the CAPM, and the option pricing models laid the ground work for the modern practice of quantitative risk management. They set the precedent that risk can be treated as an issue that managers deal with on a day-to-day basis that is amenable to a mathematical framework.

The quantitative revolution of the late 1950s and 1960s introduced specialized techniques and tools to analyze and manage specific risk dimensions and to develop corresponding hedging strategies. However, the problem of how these techniques and tools were to be incorporated into an overall risk management system at the level of the firm or corporation presented a theoretically distinct problem. In his 2002 book *Risk Management & Derivatives*, René Stulz addressed this problem in a practice-oriented fashion.

Stulz has defined a new way of looking at risk management. Risk management is no longer simply seen as a defensive activity. Rather than preventing losses, risk management involves creating value by reducing the probability of financial distress, allowing better investment decisions, and exploiting differences in the cost of bearing risk. "Risk management is about reducing the possibility of loss and creating opportunities for the firm" (Stulz 2002). As such, the field of risk management can have a positive net present value (NPV) and is a source of value creation.

In his presentation on Organisational Change, Andy Stulz spoke about the process to organisational change. He stated that there are 5 Steps involved in the process which are Interconnected and Repetitive.

This is the stage where all material risks that the organisation faces are identified and categorised. The risks may affect the organization through a variety of means including market risk (including price, interest rates or foreign currency risks), credit risk (the risk that a party to a contract fails to meet its obligations), liquidity risk (the inability to access or generate sufficient funds or resources to meet obligations), operational risk (failure of people, systems and processes, or a combination of these) and strategic risk (unforeseen change or future developments in the business environment).

Risk Measurement: Identification of risks and measurement using a range of metrics and models, utilising quantitative statistics such as Value-at-Risk (VaR) and Conditional Value-at-Risk (CVaR). In addition, analysis of risk sensitivities including duration, convexity and beta, and stress testing to measure potential loss under adverse circumstances.

Risk Strategy Decisions: For each identified risk, a decision as to which of the several options (avoidance, reduction, transfer, retention) will be used to address the risk to the organization.

Risk Implementation: The translation of selected risk strategies into practice via the implementation of tools, policies and organisational structures necessary to embed the management and measurement of risk into day to day activities, ensuring that consideration of risk impacts investment and lending decisions and is a key aspect of performance management.

Risk Monitoring – The Ongoing Process Risk Monitoring involves the on-going identification, assessment and monitoring of risks, the review of risk responses and the identification of any emerging issues or changes. Monitoring provides feedback into the risk management process, allowing and ensuring that management of risk remains aligned with current objectives and circumstances.

Within Enterprise Risk Management (ERM) the framework provided by Stulz for identifying and assessing unique risks helps broaden the view of Enterprise Risk Management from being viewed solely as a collection of specialized silos to an integrative organization wide perspective on risk. ERM is a holistic approach to managing risk that takes into account the many different types of risk, how those risks interact, and ensures that the risk-taking of the organization is aligned with its overall strategy. Culturally and governance-wise, managing risk must be integrated and incorporated into every aspect of the organization.

One of the important texts on options and derivatives is John C. Hull's *Options, Futures, and Other Derivatives*. The first edition was published in 1989. Hull is to the derivatives market in much the same way that Fisher Black was to options pricing. Hull also has made very significant contributions to the area of quantitative risk management. He recommends that companies use hedging, diversification, and insurance as major risk management strategies. He has also contributed much to the development of many quantitative techniques and models for quantifying risk including VaR models and stress testing.

Behavioral finance marked a profound shift away from the metric based models. Work by Andrei Shleifer and Robert Vishny is notable in this regard. Their "limits of arbitrage" theory elucidates the impact of market inefficiencies and investor irrationality on risk (Shleifer, 2000). This theory contradicts the neoclassical risk taking formulation where risk is an outcome of a purely economic decision making process and points to the considerable role of mental components.

Risk management and corporate governance have

become important topics in both the scientific and business communities. Christian Laux, University of Frankfurt, finds that appropriate corporate governance mechanisms such as independent Boards of Directors, risk committees and appropriate risk-based incentive structures are closely linked to good risk management practices.

In a recent paper published in the *European Business Organisation Law Review (EBOR)*, Klaus J. Hopt, Professor of Civil Law, German Business Law and Comparative Private Law at the Max Planck Institute for Comparative Law and Intellectual Property, in particular compares the European and US risk governance approaches and concludes that a proper risk management system should be a fundamental element of corporate governance, and should therefore be supervised by the Board of Directors and be based on principles of accountability and disclosure. In a paper published in 2010, Paul L. Davies (Senior Fellow of the British Academy and Gunning/Negus Professor of Financial Law at the University of Cambridge) considers the board's role in relation to strategy, arguing that this is a fundamental risk management function and setting out criteria for assessing risk management systems.

Together with a governance-oriented perspective, risk management has also inspired the use of strategic management tools with a focus on risk. The Balanced Scorecard (BSC) (Kaplan & Norton 1992) is a strategic management tool developed by Robert S. Kaplan and David P. Norton to link measures and benchmarks used in a company's performance measurement system to the company's strategy. Through four different perspectives — financial, customer, internal processes, and learning and growth — the BSC shows a global approach to managing an organization. Kaplan and Norton (2004) show on strategy maps linked to the BSC how an organization can manage the financial risk of its current activities and the strategic risk of its future goals.

In the conditions of modern development of the economy of our country, research into the issues of financial risk management in the scientific literature has been increasing since the early 2000s, which, according to our opinion, is directly linked to the gradual transition of domestic science to a new stage of development – the introduction of foreign experience and methods in the relevant scientific discipline. Thus, M. Sharifxojayev (2023) considers a risk management system as a strategy for enterprise activity, correlating the state regulation with market mechanisms. Sh. N. Zaynutdinov (2024) pays particular attention to investment project risks and refers to domestic and foreign scientific literature for quantifying these risks

using methods of calculating the discount rate, carrying out the sensitivity analysis of the main coefficients and constructing scenarios.

At the same time, the author highlights the relevance of applying foreign experience to the realities of our country. N.Q. Yo'ldoshev (2023) links risk management with ensuring the financial stability of an enterprise, emphasizing the importance of creation of efficient preventive and reaction mechanisms within domestic and foreign scientific and practical experience, while ensuring the continuity of the enterprise through the development of its internal audit and control system. Q. Muftaydinov (2024) notes that using the services of the banking sector for manufacturing enterprises is highly advisable in order to further reduce the risks. Moreover, expanding insurance services will also contribute to the protection of manufacturing enterprises against high risks. According to the research carried out by D.X. Xudaynazarova (2023) and Sh. Z. Muxitdinov (2024), domestic and foreign researches and scientific publications carry out a detailed analysis of the application of artificial intelligence in increasing the effectiveness of risk management and its correlation with the use of big data in making operational forecasts for a timely assessment and reduction of risks in market activities. N.M. Mahmudov (2024) and A.U. Burxanov (2023) and B.O. Tursunov (2024) further carried out their research on the practical application of diversification, hedging and insurance tools and products in Uzbek enterprises. As a result of the research, it was concluded that risk management systems are not fully developed in the manufacturing enterprises of our country and require radical reform.

Risk-reduction methods are numerous and, many times, complementary to each other. Starting from Harry Markowitz's portfolio theory (1952) by diversifying investments (i.e., distributing them in less-correlated fields) in order to generally lower the overall risk:

In manufacturing, we have product diversification (to counterbalance possible peaks and troughs in demand), market diversification (to distribute risk of sales in specific geographic areas) and investment diversification (to counterbalance market fluctuations) as well as supply diversification (to safeguard operations).

Hedging is another very important method. By using forward, futures, options and swap derivatives, it allows one to manage the risks of possible volatility in the prices of exchange rates, interest rates and commodities. The purpose of hedging activities, according to Hull (2018), is essentially that of managing

the risk of possible variations in exchange rates, interest rates or commodity prices.

The management and evaluation of risks have been also theoretically perfected by Dan Galai and Robert Merton (1995), who developed the models for the management and evaluation of the risks starting from the option pricing model.

Insurance is another mechanism of transferring risks. Crouhy (2000) holds that, nowadays, there are great numbers of various kinds of insurances which can be chosen by the enterprises for example, property insurances, liability insurances and business interruption insurances. For our purposes in the context of manufacturing sector of Uzbekistan the property insurances for the fixed assets and stocks, the liability insurances for any eventual third party harm, the credit insurances for the protection of accounts receivable and the transit insurances for the transported goods are of great importance.

The internal control system (ICS) is a basic organization structure for a number of risk management measures. Laux and Leuz (2009) confirmed with their researches the efficiency of the ICS. The main elements of an ICS are control environment, risk identification process, control activities, information and communication and activities for monitoring.

The use of modern digital technologies is one of the key risks of our time. The use of big data, artificial intelligence and machine learning makes it possible to control processes in real-time, to predict and prevent risks. According to Chorshanbiyeva (2024), the use of AI-based monitoring systems in Uzbekistan's banking sector for managing securities market risks is a good practice that can be applied in the manufacturing sector in Uzbekistan.

The current regulatory activities for financial risk in Uzbekistan are carried out based on the national legislation, in particular the Law "On Banks and Banking Activity" (Law of the Republic of Uzbekistan, 2019) the risk limitation and management mechanisms for the banking system are provided.

Synthesizing the theoretical and practical aspects, a risk management system in a manufacturing company can be described as a cycle consisting of four stages (Iriskulov, 2025): Risk Identification is the first stage of financial risk management involving a structured risk mapping process that identifies potential risks and their underlying causes. Risk Assessment and Analysis Risks are quantified in terms of potential loss and ranked on the basis of a combination of potential impact and probability of occurrence. In this stage, the enterprise must decide upon an appropriate strategy for managing that risk.

Possible strategies include: Risk intervention
Depending on the nature and priority of the risk factor, it may be necessary to determine an appropriate intervention method from the following:

Avoidance – the risk is not taken;

Transference – the risk is transferred to another party, for example by taking out insurance;

Mitigation – the risk is reduced in either its likelihood or its impact;

Acceptance – the risk is acknowledged and included in

the business plan.

Implementation and monitoring Once the intervention strategies for the identified risk factors have been determined, it is time for implementation, continuous monitoring of the risk factors and evaluation of their impact, as well as the control measures that have been put in place, via an audit.

The following table analyses the degree of application of financial risk management methods in manufacturing enterprises of Uzbekistan (Chorshanbiyeva 2024, 4; Iriskulov 2025, 89).

Table I. Analysis of the Application of Financial Risk Management Methods in Manufacturing Enterprises

Risk Type	Identification Methods	Assessment Methods	Mitigation Methods	Monitoring Methods
Market Risk	Market analysis, expert evaluation	VaR model, stress testing	Hedging, diversification	Real-time monitoring
Credit Risk	Scoring systems, credit history	EAD, PD, LGD models	Credit insurance, provisioning	Monitoring of accounts receivable
Liquidity Risk	Cash flow analysis	Liquidity ratios	Reserves, credit lines	Daily cash flow monitoring
Operational Risk	Process audit	Expert evaluation	Internal control, insurance	Internal audit
Currency Risk	Currency position analysis	VaR, sensitivity analysis	Hedging, currency clause	Exchange rate monitoring

Source: Compiled by the author

As the table illustrates, risk management methods are applied variably across Uzbek manufacturing enterprises. Hedging and diversification methods are relatively less used for managing market and currency risks, which is explained by the insufficient development of the derivative financial instruments market.

The following main problems exist in the financial risk management system of Uzbek manufacturing enterprises:

1. Underdeveloped derivative financial instruments market – limits hedging opportunities.
2. Insufficient methodological basis for risk assessment – reduces the accuracy of quantitative assessment.
3. Lack of qualified personnel – shortage of skilled specialists in risk management.
4. Lack of integrated information systems – limits the ability to obtain real-time information on risks.
5. Weak corporate governance system – insufficient independence and authority of risk committees.

The following proposals have been developed to address these problems:

1. Develop the derivative market – establish markets for forwards, futures, options, and swaps.
2. Improve risk assessment methodology – align with international standards (Basel III, IFRS 9).
3. Establish a personnel training system – implement specialized programs in risk management at higher education institutions.
4. Modernize information systems – implement ERP systems and integrate risk management modules.
5. Improve corporate governance – establish independent risk committees within supervisory boards.

Digital transformation is a crucial factor in improving the quality of risk management in manufacturing enterprises. Using big data technologies, data collected from all areas of enterprise activity can be processed in real-time, enabling early risk detection.

The basic model for quantitative risk assessment is expressed through the following equation:

$$\text{VaR} = \sigma \times \sqrt{\Delta t} \times z_{\alpha} \quad (1)$$

where:

- VaR – Value-at-Risk
- σ – standard deviation (volatility)
- Δt – time horizon
- z_{α} – z-coefficient corresponding to the confidence level

This model is one of the primary tools for quantitative risk assessment, enabling enterprises to estimate potential losses probabilistically (Hull 2018, 245-268).

An Enterprise Risk Management (ERM) system allows

for managing all types of risks within a single framework. As René Stulz (2002) noted, the ERM system provides the following advantages in risk management:

1. Optimizing the risk portfolio – considering correlations between different risks.
2. Efficient capital allocation – directing capital based on risk levels.
3. Improving strategic decision quality – incorporating risk factors into strategic planning.
4. Enhancing control effectiveness – centralizing risk management processes.

Table II. Comparative Analysis of Traditional and Integrated (ERM) Risk Management Systems

Indicator	Traditional Risk Management	Integrated Risk Management (ERM)
Management Approach	Silo-based approach	Holistic (portfolio) approach
Risk Consideration	Isolated	Comprehensive, considering correlations
Responsibility	Individual departments	The entire organization
Objective	Minimize losses	Create value and minimize losses
Information Systems	Dispersed, non-integrated	Centralized, integrated
Reporting Frequency	Periodic (monthly, quarterly)	Real-time

Source: Compiled by the author based on Stulz (2002)

Integrating corporate governance and risk management is a crucial direction for enhancing risk management effectiveness. Research by Christian Laux and Christian Leuz (2009) proved that the following elements of the corporate governance system positively impact risk management effectiveness:

1. Supervisory board independence – ensures impartiality in risk management decisions.
2. Existence of a risk committee – ensures a specialized approach to risk management issues.
3. Executive compensation system – links risk management outcomes with personal interests.
4. Transparency and accountability – ensures openness of information regarding risks.

As Klaus J. Hopt (2013) noted, a comparative analysis of European and US models shows that the risk management system should be an integral part of corporate governance and must be supervised at the

board level (Hopt 2013, 301-328).

CONCLUSION

The article provides theoretical and methodical generalization of modern methods of financial risk management (FRM) and their application in manufacturing companies, with reference to modern Uzbek economy. The study's findings are theoretically and practically significant, and may find use in the current development of domestic enterprises.

First, the modern FRM is rooted in mid 20th century financial economics. The theory of portfolio selection by Harry Markowitz (1952) laid the groundwork for measuring risk, which was further developed by the Capital Asset Pricing Model (Sharpe, 1964) and the option pricing theory (Merton and Scholes, 1973). Option pricing has provided methodologies for valifying assets, measuring and managing risk and hedging. Building on the financial economics of the three founders of modern finance (MM, CAPM and option

pricing) financial economists like Nobel laureates (Economics) René Stulz and John C. Hull and noted researcher Andrei Shleifer have extended the risk management paradigm to the more recent area of enterprise risk management (ERM) as well as the behavioral finance and managing risk under imperfect markets. This body of financial economic theory provides the knowledge base underpinning modern risk management practices.

Second, the research produced by Uzbek scientists (M. Sharifxojayev, Sh. N. Zaynutdinov, N.Q. Yo'ldoshev, Q. Muftaydinov and others) contains a number of original scientific generalizations on the issues of FRM in the domestic economy. Their works systematize the best practices, institutional and legal environment features, and practical activities of risk management at enterprises of real sector of economy. These findings will be used as a scientific basis for development and organization of risk management system, taking into account the real sector's economy of Uzbekistan environment, current reforms and strategic priorities of the country.

Third, the research finds that current FRM practices have evolved to incorporate a sophisticated array of tools that enable manufacturing enterprises to deal with risks more effectively in today's global market environment. Strategic diversification and vertical integration strategies are used to manage idiosyncratic and systematic risks. Derivative financial instruments (forwards, futures, options, and swaps) are commonly used to manage market risks, and insurance is used to transfer insurable risks. Other tools include appropriate internal controls to manage operational and compliance risks. In addition, manufacturing enterprises are leveraging a host of digital tools and technologies to support a variety of functions and processes. Within the broader ERM toolkit, derivative instruments and comprehensive ERM systems that enable a holistic, enterprise-wide approach to risk identification, assessment, and mitigation assume a particularly strategic role.

For effective functioning of a modern manufacturing enterprise, the issue of risk management assumes increasing importance. The article analyses the opportunities and barriers encountered by Uzbek manufacturing enterprises in this field. In summary, five major aspects are examined, including the specific risks facing the sector, general principles for managing such risks, international practices in implementing the FRM system, comparative characteristics of the level of FRM implementation within the enterprises of Uzbekistan and of foreign countries, and the level of development of the FRM system within enterprises of Uzbekistan. Fourthly, the empirical research identified

that the FRM system is at an early stage of development. A number of problems exist related to the underdeveloped domestic derivatives market, lack of qualified professionals in relevant specialities, scarcity of available methodological materials and best practice examples, and the failure of enterprise information systems to be integrated appropriately.

The study, based on structured interviews with practitioners and experts in relevant sectors, identifies five key strategic directions for boosting the effectiveness of the FRM in manufacturing organizations. These include: development of the derivatives market to expand the range of hedging tools; improvement of methods for assessing financial risk using probable approaches, stress tests, and scenario planning; creation of a personnel training system with relevant financial risk expertise; information systems innovation to create a unified data environment and develop predictive models of financial risk; and strengthened corporate governance to encourage risk responsibility at the highest levels of the organization.

This empirical analysis sets the basis for an integrated framework for strengthening the FRM system in domestic manufacturing enterprises. A coherent development strategy for enhancing the capacity of manufacturing enterprises to cope with Foreign Risk can be built by systematically integrating key International Best Practices and institutions relevant to the local environment along a number of critical dimensions including infrastructure, human, technology and governance systems.

Further potential for research could be realized in using modern digital technologies to develop predictive models for measuring risk. Given the rapid pace of digitalization, incorporating artificial intelligence (AI) methods like machine learning, in order to identify patterns and anomalies, as well as big data analytics for processing the large amounts of financial and operational data on a high-frequency basis, could significantly improve the quality and timeliness of predicting future risks for manufacturing companies. Future research could analyze the potential of FRM using digital technologies and test integrations with ERM in order to better assess the positive effects on company resilience over the long-term and its contribution to sustainable financial performance.

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