INTERNATIONAL JOURNAL OF SOCIAL, POLICY AND LAW (IJOSPL)

Vol. 6 No. 3 (2025): October 2025 E-ISSN: 2774-2245

Application of Failure Mode and Effects Analysis (FMEA) Method in Financial Risk Analysis as ERM Implementation Case Study: PT Prima Hijau Lestari

Ndinta Herry Pramana S. E., M. H., Prof. Dr. Lis Sintha, S. E., M. M. and
Dr. Ir. Ktut Silvanita Mangani

Universitas Kristen Indonesia

ABSTRACT

This study examines financial risks in the implementation of Enterprise Risk Management (ERM) at PT Prima Hijau Lestari, an outsourcing company in Indonesia, using the Failure Mode and Effects Analysis (FMEA) approach in accordance with ISO 31000:2018. The research was motivated by unstable net profits, client dependency, and regulatory challenges. A descriptive qualitative method was applied through structured interviews and document analysis of financial statements and risk management reports.The findings reveal significant fluctuations in financial risks, particularly accounts receivable, during 2019–2024. To address these risks, management is advised to apply the Fishbone method for root cause analysis, use FMEA to prioritize risks through Risk Priority Numbers (RPN), and strengthen monitoring mechanisms.This study contributes to the academic literature by being among the first to apply ERM and FMEA in financial risk management within the outsourcing sector, an area rarely explored in prior research. Practically, it offers recommendations to improve human resource capacity, strengthen credit policies, and adopt digital risk management tools. The results provide valuable insights for both managerial decision-making and future research on risk governance and financial sustainability in emerging markets.

Keywords: **Enterprise Risk Management (ERM), Failure Mode and Effects Analysis (FMEA), Financial Risk, ISO 31000:2018, Outsourcing, Risk Governance**

Introduction

In Indonesia, outsourcing has become increasingly popular as companies seek to reduce operational costs by delegating specific functions to specialized third parties (Maulana, 2023). PT Prima Hijau Lestari (PHL) is one of the outsourcing companies operating in the country, offering services such as cleaning, office support, gardening, and building maintenance. The company aims to provide a qualified workforce with an emphasis on efficiency and compliance with labour regulations.

Although PHL has experienced business growth and expanded its client base, the company also faces significant challenges, particularly financial risks arising from unstable client contracts and economic fluctuations. Reports indicate fluctuations in PHL's profit ratio, with

Vol. 6 No. 3 (2025): October 2025 E-ISSN: 2774-2245

sharp declines in 2019 and 2020 due largely to macroeconomic conditions and the Covid-19 pandemic. The company managed to recover in 2021, before experiencing another downturn in 2022. In response, PHL implemented a client diversification strategy that yielded positive results in 2023 and 2024.

Another challenge relates to the company's accounts receivable, which increased between 2019 and 2024. In 2020, receivables rose sharply as many third parties were unable to meet their payment obligations due to the pandemic. Although receivables improved in 2021 with economic recovery, they increased again in 2023 and 2024, exacerbating the risk of late payments.

The outsourcing industry also faces regulatory challenges. Changes in labour laws, such as the Job Creation Law, affect both workers' rights and corporate obligations. Non-compliance with these regulations may result in legal risks that directly impact company finances. Therefore, effective risk management is essential to ensure business continuity (National Commission, 2011). Credit risk is a key issue, as debtors may fail to meet payment obligations on time (Fahmi, 2014). To mitigate such risks, companies must adopt more prudent credit policies and strengthen their risk management systems across all organizational levels.

Risk management is a structured process designed to align risk with organizational objectives. It involves identifying, assessing, and controlling risks that may affect business operations, while simultaneously enhancing efficiency and productivity (Djohanputro, 2008). In Indonesia, risk management practices have developed significantly, supported by regulatory frameworks beginning with Bank Indonesia Regulation (PBI) in 2003 and later transitioning to the Financial Services Authority (OJK) in 2013. Enterprise Risk Management (ERM) subsequently emerged as a comprehensive approach, integrating risk management into corporate strategy and operations (Grace, Leverty, Phillips, & Shimpi, 2015).

The SNI ISO 31000:2018 standard provides guidelines for risk management and has been widely adopted across sectors in Indonesia, with an implementation rate of 67.5% (Grace et al., 2015). Risks are commonly grouped into three categories: internal, industry-related and external. Identification and assessment should be carried out at the business unit level, with continuous monitoring to ensure that risks are effectively managed. At the micro level, ERM is crucial for evaluating significant risks and their impact on organizational outcomes.

To strengthen this process, management must communicate the importance of risk management to all stakeholders. Both qualitative and quantitative approaches can be applied in risk assessment. In the outsourcing industry, financial risks particularly those related to accounts receivable are a major concern, requiring systematic audits and robust risk management methods.

The Failure Mode and Effects Analysis (FMEA) method provides a structured approach to analyzing risks through the identification of failure modes and corresponding corrective

Vol. 6 No. 3 (2025): October 2025 E-ISSN: 2774-2245

actions. Originally developed for safety and reliability assessments, FMEA has since been applied in diverse industries. Its adoption in financial risk auditing has been shown to reduce vulnerabilities (Yanjun, 2014). Prior studies have integrated ERM and FMEA in risk assessment. For instance, Katikar, Pawar, and Ramkrishna (2014) applied FMEA to evaluate and prioritize vendor-related risks, while Pranatham, Moeljadi, and Hernawati (2018) identified 18 organizational risks and demonstrated how ERM enhances risk sensitivity and decision-making.

Further, Mascia et al. (2020) developed an FMEA-based framework for laboratory research processes, successfully identifying more than 100 potential errors. Mu'adzah and Firmansyah (2020) identified ten high-priority risks requiring immediate mitigation at PT XYZ. Pangestuti, Nastiti, and Husniaty (2022) compared internal and external risks at PT Unilever Tbk, while Santosa and Palupi (2024) highlighted operational risks in ERP implementation at PT XYZ.

From this review, it is evident that studies combining ERM and FMEA have been conducted across multiple sectors. However, little research has specifically addressed financial risk, particularly those associated with receivables in outsourcing companies. Therefore, this study seeks to identify financial risks that may hinder ERM implementation and to propose mitigation strategies by integrating FMEA with the ISO 31000:2018 standard. The focus is on evaluating the impact of receivable-related financial risks within PHL's finance division and offering practical solutions to manage these challenges.

LITERATURE REVIEW

Lemon Theory

Lemon theory, introduced by George Akerlof, explains the consequences of information asymmetry between buyers and sellers, which leads to market inefficiency. In the financial context, investors often face difficulties distinguishing between high-quality and low-quality assets, resulting in prices that do not reflect their true value. The theory also emphasizes the risk of uncollectible receivables due to such asymmetries. In the case of PHL, this theory provides a foundation to understand the risks associated with trade receivables and to design more effective mitigation policies.

Risk Management

According to ISO 31000:2018, risk is defined as the effect of uncertainty on organizational objectives, which can result in both positive and negative deviations. Risk is closely tied to organizational goals and can be described in terms of its sources, potential events, consequences, and likelihood. In practice, risks may create opportunities (positive impact) or losses (negative impact) (Syahputri & Kitri, 2020). Risk is also seen as an uncertain condition that may contain hazards and consequences resulting from specific events (Husaini, 2023). A commonly used formula to measure risk is:

Vol. 6 No. 3 (2025): October 2025 E-ISSN: 2774-2245

$$\text{Risk Score} = P \times D$$

where P represents probability and D denotes impact.
Financial risk is one of the most critical areas, often influenced by inflation, interest rates, macroeconomic conditions, and exchange rates. It can arise from the use of financial leverage, which increases both potential returns and potential losses. Risk management, therefore, becomes essential in reducing uncertainty and ensuring that risks are managed in line with organizational objectives.

Risk management has been defined by Brigham and Houston as a process to manage risks effectively at both individual and organizational levels (Handayani, Wibowo, Nursyachbani, & Prihapsari, 2018). The process involves identification, analysis, assessment, and control of risks, with the aim of minimizing potential losses and optimizing opportunities. Globally, more than 80 frameworks exist, each requiring adaptation to specific organizational contexts. In Indonesia, the development of risk management has been driven by regulatory reforms, starting from Bank Indonesia Regulation (PBI) in 2003 and later transitioning to the supervision of the Financial Services Authority (OJK) in 2013 (Djohanputro, 2008).

Enterprise Risk Management (ERM)
Traditional risk management approaches often focus on specific risks in isolation and overlook interconnections between risks. Enterprise Risk Management (ERM) emerged as a more comprehensive framework that views risks holistically, treating them as part of a single portfolio. ERM emphasizes the alignment of risk management with strategy and operations, including harder-to-measure risks such as reputational and compliance risks (Zhao, Hwang, & Low, 2013).
ERM is defined as a discipline for identifying, evaluating, and managing risks from various sources to enhance organizational value (Casualty Actuarial Society, 2003). It allows firms to remain resilient under uncertainty, while fostering a risk-aware culture across all levels of the organization. Effective adoption of ERM requires leadership commitment, integration into decision-making processes, and embedding risk awareness into incentive structures.
ISO 31000 provides international guidelines for implementing ERM, with principles that emphasize value creation and protection, integration into business processes, and continuous monitoring of risks. In Indonesia, the ISO 31000:2018 standard has been widely adopted across sectors and incorporated into national regulations. Its framework highlights three key elements: risk evaluation, risk control, and monitoring.

Failure Mode and Effects Analysis (FMEA)
Failure Mode and Effects Analysis (FMEA) was first introduced by the United States Army in 1949 to address safety and reliability concerns. Since then, it has been widely applied in industries such as aerospace, energy, automotive, pharmaceuticals, and electronics. FMEA provides a systematic approach for identifying potential failure modes, assessing their effects, and prioritizing corrective actions.

Vol. 6 No. 3 (2025): October 2025 E-ISSN: 2774-2245

In financial risk management, FMEA can be applied to evaluate vulnerabilities in credit processes, particularly related to receivables. The Risk Priority Number (RPN) is the key measurement tool, calculated as:

$$RPN = S \times O \times D$$

where *S* represents severity, *O* occurrence, and *D* detection. Higher RPN values indicate higher levels of risk that require urgent mitigation (Li, Kang, Ma, & Li, 2011).

Research Gap

Although ERM and FMEA have been applied in various industries, few studies have focused specifically on financial risks in outsourcing companies, particularly those related to accounts receivable. This study therefore seeks to address that gap by applying the FMEA method as part of ERM implementation, in accordance with ISO 31000:2018. The aim is to identify financial risks at PT Prima Hijau Lestari, evaluate their impact on receivables management, and propose practical mitigation strategies.

- Severity is the severity of the effects of a failure mode, such as default on receivables.

Table 1. Severity Rating Scale (S)

Severity	**Description**	**Level**
Extremely Fatal	Resulting in major losses, massive defaults, a severe liquidity crisis, and significant disruptions to company operations.	10
High	Causing substantial losses, widespread defaults, liquidity pressure, and disruption of company operations.	8
Medium	Non-performing loans involving several large borrowers, leading to profit decline and restrictions on new lending.	6
Low	Minor delays (less than 30 days), which can be managed through routine procedures.	4
Very Low	Financial impact is small and does not significantly affect operations.	2
Negligible	No significant impact on the company's financial performance.	1

Source: A. Mascia, et al,. (2020)

Vol. 6 No. 3 (2025): October 2025 E-ISSN: 2774-2245

- Occurrence shows how often credit risk arises in receivables

Table 2. Occurrence Rating Scale (O)

Occurrence	**Likelihood of Occurrence**	**Tingkatan**
Very high	Occurs every month; bad debts increase by more than 10% in consecutive months.	10
Frequently	Occurs 5–10 times per year; non-performing loans remain in the 6–10% range.	8
Moderately Frequently	Occurs 1–5 times per year, or delays consistently appear in one semester.	6
Rarely	Occurs once per year, typically due to seasonal or situational factors.	4
Almost Never	Occurs only once in five years, usually due to exceptional circumstances.	2
Very Rarely	Occurs once in 5–30 years, or has never been recorded before.	1

Source: A. Mascia, et al,. (2020)

- Detection helps control credit risk before it becomes a serious problem.

Table 3. Rating Scale Detectable (D)

Detectable	**Description**	**Level**
Very difficult	No available detection or inspection method.	10
Difficult	Detection or inspection relies solely on prior experience.	7
Fairly easy	Detection or inspection uses general financial management analysis tools.	4
Very easy	Detection or inspection is conducted by the finance team and experts through structured brainstorming methods.	1

Source: A. Mascia, et al,. (2020)

In the table, it can be seen that the Detectable rating scale starts from the almost impossible level to affirmation. Each level has a value of 10 for a very difficult level to 1 for a very easy level. Then the criticality category value of the RPN value obtained is as follows:

Table 4. Categories of criticality

RPN	Action	Criticality Category
1 – 100	Low	Acceptable, requires only regular monitoring
101 - 200	Medium	Requires further analysis and possibly minor corrective actions
201 - 1000	High	Immediate corrective actions required

Source: AIAG (2008)

Vol. 6 No. 3 (2025): October 2025 E-ISSN: 2774-2245

Ishikawa (Fishbone) Diagram

The Ishikawa Diagram, also known as the Fishbone Diagram, was developed by Dr. Kaoru Ishikawa in the 1960s. Its structure resembles a fishbone skeleton and is widely used as a visual tool to systematically identify the root causes of a problem. The most commonly applied categories of causes are raw materials, machinery and equipment, human resources, methods, environment, and measurement collectively referred to as the 5M1E framework. The brainstorming method is typically employed in conjunction with this diagram to generate potential causes.

The steps in constructing a Fishbone Diagram begin with defining the main problem and then identifying contributing causes under each category. The 5 Whys technique can also be applied to trace root causes by repeatedly asking "Why?" until the fundamental issue is revealed. For example, an analysis may show that the root cause of financial risk lies not only in the lack of third-party financial assessment but also in weaknesses in resource allocation policies. By combining the Fishbone Diagram with the 5 Whys method, the validity of root cause identification can be strengthened. This integrated approach has proven valuable in improving processes and mitigating risks across various industries.

METHODOLOGY

This study is categorized as applied research, aiming to analyze financial risks at PT Prima Hijau Lestari, Indonesia, by employing the Enterprise Risk Management (ERM) framework in combination with the Failure Mode and Effects Analysis (FMEA) method. The main objective of this research is to formulate practical solutions to specific problems in financial risk management.

Data were collected through two primary techniques: interviews and document analysis. Structured interviews were conducted with the company's management to gain insights into the implementation of ERM practices. Document analysis involved a review of credit agreements, financial statements, and risk management reports, which provided supporting evidence for the qualitative findings. The FMEA method was applied to systematically identify potential failure modes in financial processes, evaluate their severity, occurrence, and detection, and calculate the Risk Priority Number (RPN).

To strengthen the analysis, a Fishbone (Ishikawa) Diagram was utilized to identify and categorize the root causes of credit risk. In addition, the 5 Whys technique was applied to further explore underlying issues contributing to financial risk. By integrating these tools, the study seeks to produce a comprehensive mapping of credit risk and to provide effective recommendations for enhancing financial risk management at PT Prima Hijau Lestari.

Vol. 6 No. 3 (2025): October 2025 E-ISSN: 2774-2245

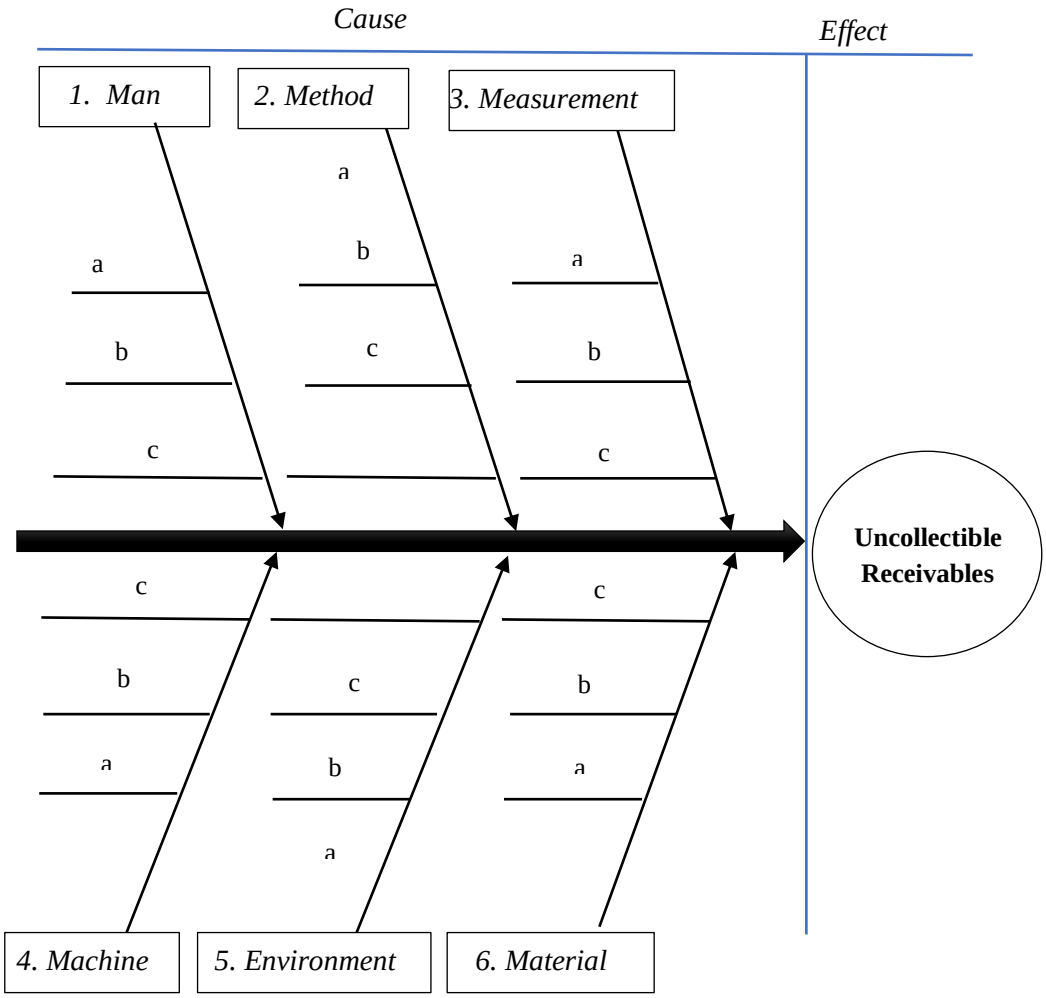

Figure 1 Fishbone diagram of PHL

Description:

1. **Man**
   a. Limited number of financial analysts
   b. Uneven competencies of human resources in risk management
   c. Absence of specialized training in FMEA or ERM for employees
2. **Method**
   a. Lack of a formal third-party credit policy
   b. Irregular monitoring process of receivables
   c. Absence of routine analysis regarding the financial viability of third parties
   d. Risk mitigation standard operating procedures (SOPs) not yet integrated with FMEA
3. **Measurement**
   a. Lack of regularly developed Key Risk Indicators (KRIs)
   b. Absence of comprehensive risk calculations based on probability and impact matrices
   c. Risk Priority Number (RPN) values not integrated into decision-making processes

Vol. 6 No. 3 (2025): October 2025 E-ISSN: 2774-2245

4. **Machine**
    a. Non-utilization of digital ERM and FMEA software
    b. Reliance on conventional financial control and audit support tools
    c. Absence of a risk dashboard to facilitate early detection
5. **Environment**
    a. Changes in labour regulations (e.g., Job Creation Law) affecting contract structures
    b. High dependency on key clients, increasing vulnerability to client efficiency measures
    c. Rising operational material costs due to inflation
    d. Adverse impacts of the Covid-19 pandemic
6. **Material**
    a. Incomplete or difficult-to-access financial information from third parties
    b. Heavy reliance on historical data without incorporating recent trend analysis
    c. Absence of a technology-based risk recording system (manual recording still applied)

After the fishbone diagram was employed to identify risks, the results were further analyzed using the FMEA method to examine failure modes and their causes. In this process, risk is measured through three main dimensions: Severity, Occurrence and Detection. Each identified risk was scored according to these criteria, and the Risk Priority Number (RPN) was subsequently calculated to determine the level of priority for corrective action.

RESULTS AND DISCUSSION

After the Fishbone Diagram was applied to identify potential risks, the findings were further analyzed using the Failure Mode and Effects Analysis (FMEA) method to evaluate failure modes and their underlying causes. In this stage, risks were assessed across three key dimensions: Severity, Occurrence, and Detection. Each identified risk was systematically scored based on these criteria, and the corresponding Risk Priority Number (RPN) was calculated. The RPN values were then used to prioritize risks and determine the appropriate level of corrective action required.

Risk Assessment

Table 5. Severity Rating

Year	*Cause of Failure*	Uncollectible Receivables (receivables period x - receivables period x-1	Total Receivables (receivables period x)	Uncollectible receivables ratio	Description	Level
2019	Accounts Receivable Status	321,654,630	1,163,588,729	28%	Very Low	2
2020		3,640,320,245	4,803,908,974	76%	Moderate	6
2021		-3,055,927,201	1,747,981,773	-175%	Negligible	1
2022		-286,605,606	1,461,376,167	-20%	Negligible	1
2023		1,505,805,343	2,967,181,510	51%	Low	4
2024		1,251,296,705	4,218,478.215	30%	Very Low	2

Vol. 6 No. 3 (2025): October 2025 E-ISSN: 2774-2245

Table 6. Occurrence Rating

Year	There are uncollectible receivables (monthly)					Total	Level
	Third party 1	Third party 2	Third party 3	Third party 4	Third party 5		
2019	11	9	10	11	9	**10**	**8**
2020	10	13	11	10	11	**11**	**10**
2021	8	9	5	4	0	**5**	**4**
2022	8	9	5	4	0	**5**	**4**
2023	9	9	6	5	9	**8**	**6**
2024	8	9	5	4	0	**5**	**4**

Table 7. Detection Rating

Respondents	2019	2020	2021	2022	2023	2024
Person 1	4	10	4	4	7	4
Person 2	7	10	7	4	7	4
Person 3	10	10	7	4	7	4
Person 4	7	10	4	4	10	4
Person 5	7	10	7	4	7	7
Person 6	7	10	1	4	10	4
Person 7	7	7	1	7	4	4
Person 8	7	10	1	4	7	4
Person 9	10	10	4	4	7	4
Person 10	7	10	7	4	4	4
Total	**73**	**97**	**43**	**43**	**70**	**43**
Average	**7.3**	**9.7**	**4.3**	**4.3**	**7**	**4.3**
Detection	**7**	**10**	**4**	**4**	**7**	**4**

Based on the results of data analysis, the severity of bad debts shows fluctuations from year to year. In 2019, the severity level was rated 7, which falls into the High category. In 2020, the severity increased significantly to 10, classified as Very High. In 2021 and 2022, the severity level dropped to 4, which corresponds to the Low category. In 2023, the severity rose again to 7 (High), before declining to 4 (Low) in 2024. These results indicate that the severity of bad debts in outsourcing companies is highly volatile and requires continuous monitoring.

In terms of frequency, bad debt risk events peaked in 2020 with an average occurrence of 11 months, falling into the Very High category with a rating of 10. In 2019, the frequency was also high at 10 months (rating 8, High). In 2021 and 2022, the frequency declined to 5

Vol. 6 No. 3 (2025): October 2025 E-ISSN: 2774-2245

months each (rating 4, Low). In 2023, the frequency rose again to 8 months (rating 6, Moderate), before decreasing back to 5 months in 2024 (Low). This trend demonstrates that although the frequency has fluctuated, the peak risk occurred in 2020 and has shown a downward adjustment in subsequent years.

With respect to risk detection, in 2019 and 2023 risks were identified during the invoice collection process, which is categorized as difficult with a rating of 7 (High). The year 2020 represented the most severe condition, as risks were detected only after clients defaulted, resulting in a rating of 10 (Very Difficult). By contrast, in 2021, 2022, and 2024, risks were identified earlier, namely prior to the payment scheme agreement, corresponding to a rating of 4 (Low). This suggests that the company has gradually improved its ability to detect risks at an earlier stage, thereby providing opportunities for more effective preventive measures.

Corrective actions must be implemented by management to effectively address financial risks. The contributing factors to these risks include the limited number of financial analysts, the implementation of strict credit policies, and frequent regulatory changes. In addition, the asymmetry of information between the company and its clients has further exacerbated the occurrence of such risks. Therefore, PHL is strongly advised to adopt the recommended actions to minimize financial risks and enhance the management of bad debts. The rating levels presented in this study were obtained from ten research respondents and have been summarized as follows:

Table 8. PHL Financial Risk Control

No.	Recommended Action	Severity	Occurrence	Detection	RPN
1	Adjustment of contract structure according to labour regulations (Job Creation Law)	9.8	9	8.8	793.4
2	Using ERM & FMEA software digitally	10	8	9.4	752.0
3	Automated and practical financial control and audit support tools	9.6	8	9.1	698.9
4	Providing technology-based risk recording system	9.2	9	7.6	643.3
5	Analyzing the completeness and availability of third-party financial information at the beginning of the agreement	9.2	7	9.4	640.0
6	Routine third party financial feasibility analysis	8.2	8	8.8	577.3
7	Not too dependent on major clients	10	9	6.4	563.2
8	Regularly develop KRI (Key Risk Indicator) indicators	9.4	7	7.9	505.0
9	Conducting recent trend analysis	8.6	8	7.3	502.2
10	Providing risk dashboard to assist early detection	7.4	8	8.2	485.4
11	Preparing operational material stocks	7.2	7	9.1	484.8

Vol. 6 No. 3 (2025): October 2025 E-ISSN: 2774-2245

No.	Recommended Action	Severity	Occurrence	Detection	RPN
	just in case Preparing operational material stocks just in case Preparing operational material stock just in case				
12	Increase the number of financial analysts	7.8	8	7.9	480.6
13	Specialized FMEA or ERM training for employees	8.6	7	7.6	470.6
14	Regular monitoring of receivables	6.8	9	7.6	465.1
15	Improve HR competence in risk management	6	8	8.8	443.5
16	Perform risk calculations based on a thorough probability and impact matrix probability and impact matrix	7.4	8	7.6	438.7
17	RPN value of risks integrated into decision making	7.8	8	6.7	418.1
18	Risk mitigation SOPs integrated with FMEA	7.8	8	7	415,0
19	Strict third-party credit policy	8	6	8.2	367.4
	Average	**7.2**	**8**	**8.8**	**532.2**
	Increase the number of financial analysts				**561.9**

Following the implementation of risk control mitigation, the RPN value decreased to 561.9. Referring to Table 4 on the criticality categories, this value falls within the High category, which requires immediate corrective action.

CONCLUSION

Research on financial risks in outsourcing companies using the FMEA method is still limited, making it difficult to identify common financial risks. There is also little data available because it relates to confidential client information. The focus of the research is only on the financial risk of uncollectible trade receivables.

It is recommended that future research include a broader financial risk analysis, not only trade receivables. The resulting managerial implications include: improving human resources through training, improving credit methods and policies, developing risk indicators, using digital software for risk management such as billing systems and improving BPR payroll, making contract adjustments according to regulations, and analyzing third party financial information before the agreement.

REFERENCES

Books

Djohanputro, B. (2008). Manajemen Keuangan Korporat. *PPM. Jakarta*.

Irham Fahmi .2014. Manajemen Risiko, Alfabeta, Bandung

Vol. 6 No. 3 (2025): October 2025 E-ISSN: 2774-2245

Journal

Grace, Martin F., J. Tyler Leverty, Richard d. Phillips, dan Prakash Shimpi. The Value of Investing in Enterprise Risk Managemet. The Journal of Risk and Insurance. 82, No, 2, 289-316. DOI: 10.1111/jori.12022. 2015

Husaini, H., Nurazi, R., & Saiful, S. (2023). Moderating role of risk management effectiveness on corporate social responsibility-corporate performance relationship. *Cogent Business & Management*, *10*(1), 2194465.

RS, K., & Dikkatwar, R. (2014). Analysis of Risk by FMEA in Manufacturing Outsourcing for Batch Type Industries.

Mascia, A., Cirafici, A. M., Bongiovanni, A., Colotti, G., Lacerra, G., Di Carlo, M., ... & Kisslinger, A. (2020). A failure mode and effect analysis (FMEA)-based approach for risk assessment of scientific processes in non-regulated research laboratories. *Accreditation and Quality Assurance*, *25*, 311-321.

Mu'adzah & Firmansyah, N. A. (2020). Analisis Enterprise Risk Management Menggunakan FMEA pada PT XYZ. *Teknoin*, *26*(2), 154-164.

Santosa, D. S. R. P., & Palupi, G. S. (2024). Analysis of Risk Management in the Implementation of Enterprise Resource Planning (ERP) using the FMEA Method at PT XYZ. *Journal of Emerging Information System and Business Intelligence (JEISBI)*, *5*(2), 83-95.

Pangestuti, D. C., Nastiti, H., & Husniaty, R. (2022). Analisis Risiko Operasional Dengan Metode FMEA. *Jurnal Akuntansi, Ekonomi dan Manajemen Bisnis*, *10*(2), 177-186.

Syahputri, H. Y., & Kitri, M. L. (2020). Enterprise risk management analysis of group XYZ based on ISO 31000: 2018 framework. *Asian Journal of Accounting and Finance*, *2*(3), 1-12.

Yanjun, T. (2014). Study on audit of corporate financial risk based on FMEA method. *J. Chem. Pharm. Res*, *6*(3), 616-621.

Zhao, X., Hwang, B., G., and Low, S., P. (2013), "Developing Fuzzy Enterprise Risk Management Maturity Model for Construction Firms", Journal of Construction Engineering and Management, 139 (9), 1179-1189.

Internet Source

Casualty Actuarial Society - Enterprise Risk Management Committee. 2003. Overview of Enterprise Risk Management. Accessed from www.casact.org/area/erm/overview.pdf. diakses 7 Maret 2025 accessed on March 10, 2025

Li, Y., Kang, R., Ma, L., & Li, L. (2011). Application and improvement study on FMEA in the process of military equipment maintenance. The Proceedings of 2011 9th …. Accessed from https://ieeexplore.ieee.org/abstract/document/597 9402/ accessed on March 13, 2025

Roby Irzal Maulana. (2023, Juni 7). Perkembangan Perusahaan Outsourcing di Indonesia. *Kompasiana*. Accessed from https://www.kompasiana.com/roby56522/64802d4782219969ce5c45c2/perkembangan-perusahaan-outsourching-di-indonesia accessed on March 6, 2025

Vol. 6 No. 3 (2025): October 2025 E-ISSN: 2774-2245

.

Others

Handayani, Wibowo, Nursyachbani, & Prihapsari. (2018). Analisis Risiko pada Proyek Pembangunan Flyover Jatingaleh dengan Kerangka Procirm dan Metode FMEA. Seminar Nasional IENACO, 397–406