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NAVIGATING RISKS WITH ISO 31000 FOR A SUSTAINABLE FUTURE: A STRATEGIC APPROACH IN THE INDONESIA TEXTILE INDUSTRY

Agnes Zefanya Yonatan, Sani Susanto, Paulus Sukapto
Parahyangan Catholic University, Indonesia

Teuku Yuri M. Zagloel
Universitas Indonesia

Elkana Timotius
Universitas Kristen Krida Wacana

Abstract:
The dynamic changes across various industries are creating uncertainty, potentially leading to a state of risk. All industries are required to formulate mitigation actions for downside risks that have negative effects and leverage on upside risks, those with positive impacts. Despite various mitigation actions, only a few industries are capable of implementing risk management to address the dynamic changes. The refore, this qualitative research aimed to investigate the effectiveness of risk management guided by ISO 31000:2018 in navigating risks as a strategic approach for the industry to achieve a sustainable future. The investigation focused on the application of risk management in the textile manufacturing industry in Indonesia. The initial stages commenced with defining risk management scope, context, and criteria, followed by risk assessment consisting of identification, analysis, and evaluation, as well as formulating risk treatment. Heads of production, finance, and purchasing departments were selected as key informants through judgment sampling, where the results of semi-structured interviews served as primary data. Furthermore, operational, financial, strategic, technological, and informational risks were identified in the industry. The results showed that among the 109 downside and 20 upside risks, 10 were categorized as high-level and prioritized for handling. A total of 52 actions were determined as a treatment to navigate the high-level risks. The results showed that the ISO 31000:2018 guideline effectively addressed industry risk management needs, offering potential solutions to overcome the dynamic changes.

Key words: Downside Risks, ISO 31000, Risk Management, Uncertainty, Upside Risks

INTRODUCTION

Uncertainty is a certain thing in all aspects, particularly in the dynamic of businesses that are becoming increasingly complex. Tirayoh and Pangeran [1] stated that all industries face uncertainty, including technological advancements, market dynamics, and the presence of competitors. In this context, the business is increasingly challenged to predict future events, indicating the need for management efforts to address growing uncertainty [2]. Several industries are forced to alter strategic plans due to unforeseen changes, leading to the development of risks that threaten sustainability.

Kaluvala [3] defines risks as situations where the industry faces the possibility of financial loss and damage, thereby making goal achievement difficult or impossible [4]. Industry must minimize or prevent loss and negative impacts, requiring proactive management of inherent business risks to identify potential sources of loss at the early stage. Although this process does not guarantee complete avoidance of loss, effective risk management can reduce loss and negative impacts in industries.

In the manufacturing industry, there are several risks, such as production process failures due to resource unavailability, delays in raw materials, machinery breakdowns, production defects, high operational costs, etc. However, risks should not be considered as threats due to the potential opportunities when proper management is applied. This is supported by Saeidi et al. [5] which advocated for organizations to leverage risk management to gain advantages and withstand crises. Risk management strengthens

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organizations for better preparation in handling crises compared to competitors by anticipating unforeseen events.

Mwelu et al. [6] showed the importance of risk management in allowing organizations to achieve sustainable benefits in activities. This is in line with Kaluvala [3] who suggested that failure in risk management could lead to crises or disasters, while effective administration had the potential to create advantages, enabling goal achievement. Unfortunately, the implementation of risk management is often inconsistent and the effectiveness has not been measured.

Effective risk management should ideally identify all types of risks faced by organizations, rather than being confined to specific areas or divisions. This comprehensive approach is essential to prevent higher risks without proper identification. Based on the empirical situation found, this research aimed to model comprehensive and easily adaptable risk management according to ISO 31000:2018. Specifically, the investigation focused on the textile industry in Indonesia to formulate a strategic approach to all types of risks, including upside and downside risks. Through the results obtained, the proposed model is expected to address the difficulties faced by the industry in implementing ISO 31000:2018 during risk management. The framework of ISO 31000:2018 is anticipated to serve as evidence of a strategic approach to managing risks in various industries as needed.

LITERATURE REVIEW

Risk is defined in ISO 31000:2018 guideline as an uncertainty that has impacts on goal achievement [7]. This shows that risks should consider 3 main aspects, namely targets, uncertainty, and impacts [8]. Targets represent the goals to be achieved by organizations or individuals in terms of profit acquisition, sales growth, business development, and others. Regarding uncertainty, organizations or individuals lack the ability to predict variability and ambiguity of impacts, what and how conditions will happen. Meanwhile, impacts denote the consequences resulting from deviations of events from the desired goals.

In risk management, not all risks have negative impacts, as some can lead to benefits and profits for organizations. However, organizations often focus more on risks with negative impacts and neglect those positive impacts whereas both are important. Previous research suggested that organizations should not expend excessive resources to mitigate downside risks because handling upside risks is easier [9, 10]. Hillson [11] believed that upside risks occurred due to the absence of downside risks, emphasizing the importance of balancing attention.

Risks can essentially be managed through various approaches, including COSO (Committee of Sponsoring Organizations of the Treadway Commission), ERM (Enterprise Risk Management), NIST (National Institute of Standards and Technology), Cybersecurity Framework, COBIT (Control Objectives for Information and Associated Technology), OCTAVE Allegro, and others. However, the ISO 31000:2018 guideline in risk management is considered more efficient and easier to understand. It is flexible and adaptable, allowing the industry to focus on principles and processes to achieve specific needs [12]. Therefore, ISO 31000:2018 is widely accepted and applicable across various industries to assess different risks. The structured and systematic guidance provided in ISO 31000:2018 can be used to identify, analyze, and evaluate risks without undue complexity. Another advantage is the ability to promote risk management, prompting the industry to act before risks occur to minimize impacts.

ISO 31000 was initially introduced in 2009 by the International Organization for Standardization, serving as the reference for risk management. Subsequent refinements cumulated in 2018 made ISO 31000:2018 a versatile and effective tool for widespread application across various fields, functions, projects, and facilities of several industries [13]. In Indonesia, the National Standardization Board has adopted ISO 31000:2018 as the Indonesian National Standard, SNI 8615:2018. This standard consists of guidelines for risk management implementation, a conceptual framework, and best practices. The interrelation among the three clauses is shown in Figure 1.

An examination of the implementation of ISO 31000:2018 across several industries has been conducted in this research, as summarized in Table 1.

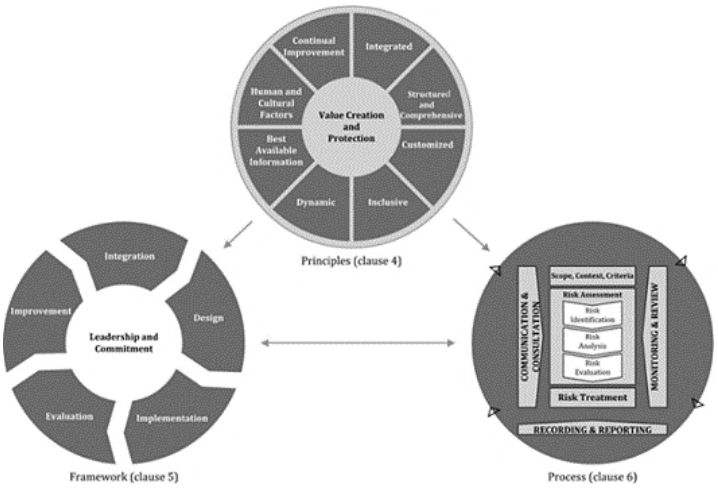


Fig. 1 Framework of ISO 31000:2018 in Risk Management

Table 1

Studies on the Application of ISO 31000:2018 in Risk Management

Author(s)	Country	Risk Area	Findings
Marhadhita & Pangeran [4]	Indonesia	Supply Chain Risk	Risks are categorized into internal and external. A total of 24 risks have been identified, with 5 categorized as severe, 7 high, 1 medium, and 10 low. Each risk passes through mitigation and is subsequently re-categorized.
Dewi & Kitri [14]	Indonesia	Manufacturing Risk	Out of the 17 identified risks in terms of impact and possibility, 9 are categorized as high, 7 as medium, and 1 as low. Mitigation measures are implemented for risks categorized as medium and high.
Mwelu, et al. [6]	Uganda	Manufacturing Risk	The manufacturing industry is gradually implementing risk management. This shows a strong correlation between the risk management process and industry profits.
Efua & Ewur [15]	Ghana	Operational Risk	Risks in the production process are grouped into 23 categories and addressed comprehensively.
duoza [16]	United Kingdom	Operational Risk	A total of 60 risks affect the achievement of goals, which is evaluated quantitatively based on possibility, impact, and the number of people affected.
Tirayoh & Pangeran [1]	Indonesia	Operational Risk	The 28 identified risks have different effects, some of them are 4 medium-level risks impacting finances and 4 medium-level risks affecting reputation. These 8 medium-level risks are further mitigated, while the remaining risks are acceptable.
Wicaksono [17]	Poland	Operational Risk	Out of the 20 identified risks, 5 have been designated as priorities due to severity, requiring actions to avoid, control, separate, transfer, and accept risks.
Evinia & Sitokdana [13]	Indonesia	Information Technology Risk	A total of 20 risks have been identified, with 2 categorized as critical, requiring special treatment, 5 as very severe, 11 as severe, and 2 as acceptable. Each risk requires treatment according to a respective category.
Hoa, et al. [18]	Vietnam	Information Technology Risk	Five tested hypotheses are accepted: knowledge management and organizational capacity have a positive effect on *Enterprise Risk Management* (ERM) implementation. Moreover, ERM implementation has a positive and significant impact on organizational performance and the information technology structure, and vice versa.
Ebenezer & Omar [19]	Malaysia	Financial Risk	A positive relationship has been found between risk management and financial performance. Although automatically increased profits are not guaranteed, institutions ranked in the Top 20% in risk management gain 3 times more profit compared to others.
Lyukevich, et al. [20]	Rusia	Financial Risk	The suitable approach for financial risk management is determined by the available conditions and information, including STAR (Strategic Technology Assessment Review), HAZOP (Hazard and Operability Study), FMEA (Failure Mode and Effect Analysis), SWIFT (Structured What If Technique), HACCP (Hazard Analysis and Critical Control Points), RCA (Root Cause Analysis), BOWTIE, and WCS (Worst Case Scenario).

The results of previous studies showed the management of several risks in the area of supply chain [4], manufacturing [6, 14], operational [1, 15, 16, 17], information technology [13, 18], and financial [19, 20]. However, comprehensive risk management applying ISO 31000:2018 guideline in the entire process, from scoping to implementation, has not been found whereas it provides a reference standard for industry to manage risks when facing uncertainty that threatens organizational goals.

METHODS

The identification and management of risks in this research are conducted in line with the framework of ISO 31000:2018. Specifically, this guideline states that risks are uncertainties affecting goals positively or negatively. The ability to identify both downside and upside risks can facilitate faster achievement of goals in the industry. However, there is limited information that focuses on identifying and managing upside risks.

Referring to ISO 31000:2018 guideline, the research and analysis process commences by establishing the scope, context, and criteria of risk management, followed by assessment and treatment [7]. When conducting risk assessment, ISO 31000:2018 recommends the implementation of identification, analysis, and evaluation, as shown in Figure 2.

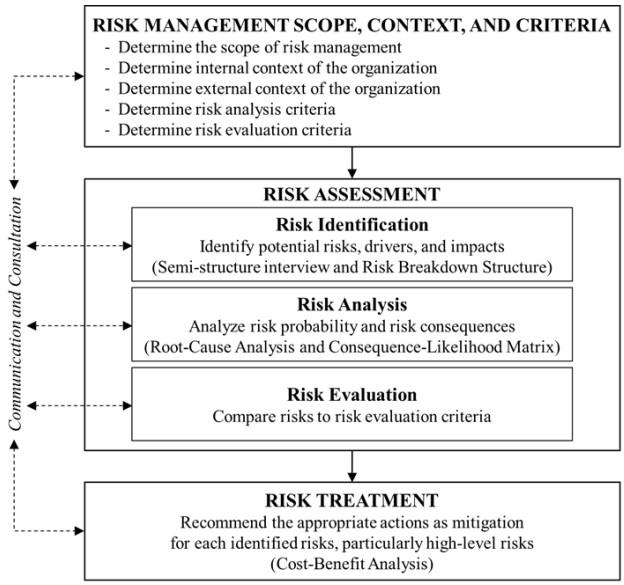


Fig. 2 Flow of Risk Management referring to ISO 31000:2018 Guideline

Research data are collected through semi-structured interviews with lower-level management and discussions with top management to conduct risk assessment. It is one among the 31 recommended tools in ISO 31010:2019.

Additionally, cost-benefit analysis is also used for risk treatment.

According to ISO 31010:2019 guidelines, Risk Assessment Tools and Techniques presented in Table 2 are recommended for use during risk management, including identification, analysis, and evaluation. Subsequently, the use of each technique is fully described in their respective annexes [21]. Although ISO 31010 does not require the implementation of all techniques, organizations can use other optimal methods based on their characteristics and conditions.

Research participants consisted of 10 individuals each from 3 main departments (production, finance, and purchasing), who were selected through judgment sampling in a textile industry in Indonesia. They were interviewed semi-structurally and the managers also engaged in discussions as representatives of top management. The interview questions are structured to identify potential risks related to events hindering (downside risks/threat) and facilitating (upside risks/opportunity) the industry in achieving goals, the processes of events, control mechanism, impacts on the goals, and the responsible parties.

Table 2

Risk Assessment Tools and Techniques referring to ISO 1010:2019 Guideline

Tools and Techniques	**Risk Assessment Process*)**					**See Annex**
	Risk Identification	**Risk Analysis**			**Risk Evaluation**	
		Consequence	**Probability**	**Level of Risk**		
Brainstorming	SA	NA	NA	NA	NA	B 01
Structured or semi-structured interviews	SA	NA	NA	NA	NA	B 02
Delphi	SA	NA	NA	NA	NA	B 03
Checklists	SA	NA	NA	NA	NA	B 04
Primary Hazard Analysis	SA	NA	NA	NA	NA	B 05
Hazard and Operability Studies (HAZOP)	SA	SA	A	A	A	B 06
Hazard Analysis and Critical Control Points (HACCP)	SA	SA	NA	NA	SA	B 07
Environmental Risk Assessment	SA	SA	SA	SA	SA	B 08
Structure “What if?” (SWIFT)	SA	SA	SA	SA	SA	B 09
Scenario Analysis	SA	SA	A	A	A	B 10
Business Impact Analysis	A	SA	A	A	A	B 11
Root Cause Analysis	NA	SA	SA	SA	SA	B 12
Failure Mode Effect Analysis	SA	SA	SA	SA	SA	B 13
Fault Tree Analysis	A	NA	SA	A	A	B 14
Event Tree Analysis	A	SA	A	A	NA	B 15
Cause and Consequence Analysis	A	SA	SA	A	A	B 16
Cause-and-Effect Analysis	SA	SA	NA	NA	NA	B 17
Layer Protection Analysis (LOPA)	A	SA	A	A	NA	B 18
Decision Tree	NA	SA	SA	A	A	B 19
Human Reliability Analysis	SA	SA	SA	SA	A	B 20
Bow Tie Analysis	NA	A	SA	SA	A	B 21
Reliability Centered Maintenance	SA	SA	SA	SA	SA	B 22
Sneak Circuit Analysis	A	NA	NA	NA	NA	B 23
Markov Analysis	A	SA	NA	NA	NA	B 24
Monte Carlo Simulation	NA	NA	NA	NA	SA	B 25
Bayesian Statistics and Bayes Nets	NA	SA	NA	NA	SA	B 26
FN Curves	A	SA	SA	A	SA	B 27
Risk Indices	A	SA	SA	A	SA	B 28
Consequence-Probability Matrix	SA	SA	SA	SA	A	B 29
Cost-Benefit Analysis	A	SA	A	A	A	B 30
Multi-criteria Decision Analysis (MCDA)	A	SA	A	SA	A	B 31

*) SA = Strongly Applicable
A = Applicable
NA = Not Applicable

Source: [21].

By asking 8 open-ended questions to informants (Table 3), the empirical data will be revealed as primary data.

Table 3
Interview Guideline

Question	Objective
What are the events that hinder and threaten goal achievement in the company?	To identify existing negative risks that have the potential to reoccur.
What are the events that accelerate goal achievement in the company?	To identify existing positive risks that have the potential to reoccur.
What conditions have not occurred but can hinder goal achievement?	To identify negative risks that have not occurred but can hinder the achievement of future goals.
What conditions have not occurred but can accelerate goal achievement?	To identify positive risks that have not occurred but can accelerate the achievement of future goals.
How have efforts been made to control each event that occurred?	To identify risk navigation actions that have been taken.
Why did the event occur?	To identify risk sources that trigger the occurrence of events.
What impact did each event have on goal achievement?	To identify the risk impact of each event that occurs.
Who is responsible for managing each event that occurs?	To identify the risk owner of each event that occurs.

The first stage of risk assessment is identification, with interview results serving as the basis for this process. Risk Breakdown Structure (RBS) is applied to identify risks as suggested by Susilo and Kaho [22]. After analyzing the root causes, risks are categorized based on hierarchical composition, clarifying ownership, and documented in Risk Register 1.

The second stage is analysis by creating a Consequence-Likelihood Matrix to show the level of risk concentration. The measurement scale of impacts and possibilities should be established to compile the matrix, followed by results documentation in Risk Register 2.

The final stage is evaluation, carried out to determine whether risks are considered hazardous, beneficial, or possibly ignored due to insignificant impact on organizational goals. During evaluation, risk preferences and tolerance are crucial, influencing the determination of acceptance levels [11]. Subsequently, the resulting risk priority levels are reported in Risk Register 3.

In this research, all risk registers are developed to facilitate management analysis, sharing the same function and differences in storing data as well as information. Specifically, Risk Register 1 is used to store data and information obtained from the identification process, Risk Register 2 is applied for analysis results, and Risk Register 3 is for the evaluation process. In conclusion, all risk registers are comprehensively presented in the management implementation report, serving as the basis for decision-making.

As shown in Figure 2, the subsequent stage after completing the risk assessment is treatment. Hillson [23] warned of the importance of focusing on specific issues rather than using a strategy that spreads across all identified risks. It is more important to strategically address certain problems that have a large impact or are easier to handle. Furthermore, the capacity of organizations to manage risks should be considered to ensure adequate management. In this research, the risk treatment process applies cost-benefit analysis, which compares the total costs incurred with the total benefits obtained to select the most advantageous prevention measures. The outcome is used as a strategic approach to navigate risks, specifically in the textile industry in Indonesia. Based on the ISO 31000:2018 guideline, risk management for organizational sustainability can be examined for effectiveness.

RESULTS AND DISCUSSION

This research focused on a textile industry that has been operating since 1963, applying ISO 31000:2018 in risk management. Industry was selected due to the challenges, including a significant profit decrease of 40% in 2020, caused by the pandemic. Moreover, the industry experienced a fire accident with a loss exceeding USD 60,000, leading to the temporary closure of operations, negatively affecting more than 100 employees.

n response to address the challenges, management strives to sustain the operations by achieving a minimum profit of 3% in 2 years post-pandemic. Unfortunately, the profit has continued to decline, posing long-term challenges to the industry's sustainability due to uncovered operational costs. Considering this situation, as suggested by Crawford and Jabbour [24], the industry should implement risk management procedures to receive early warnings affecting goals in an industrial environment characterized by high uncertainty levels. By implementing risk management in the purchasing, production, and finance departments, the industry is expected to forecast uncertainty and gain a competitive advantage during potential crises.

Risk Management Scope, Context, and Criteria

Adhering to the standard procedures of ISO 31000:2018 shown in Figure 2, the initial process of implementing risk management commences with defining the scope. Initial interviews with several department heads show that the ingrained risk behavior in the industry is risk-averse, indicating a tendency to avoid and resist taking risks. This phenomenon occurs along with a dislike for uncertainty and a reluctance to tolerate ambiguous factors in decision-making including multiple parties.

The initial results, contrasting ISO 31000:2018 guidelines, prompt the decision that the scope of risk management should include all departments in the industry. This is carried out to facilitate a risk-aware culture that consistently identifies, analyzes, and provides appropriate handling plans for existing risks. The responsibility of the process spans across several levels, ranging from business owners, directors, managers, and department heads, to all

employees. Knowledge about risks is a resource used in risk management, serving as the foundation and framework for implementation, with outcomes being documented in the Risk Register.

The external context of industry in risk management needs to be identified as the basis for conducting assessment and treatment for subsequent stages. Through PESTLE analysis from a political perspective, the industry is required to be vigilant about changes in laws governing taxes, import and export procedures, as well as labor standards. Economically, inflation rates, currency exchange rate fluctuations, and changes in interest rates are other factors that should be considered. Socio-culturally, the availability of quality labor needs to be recognized, while advancements in production approaches have the potential to increase profits regarding the technology aspect. Based on a legal perspective, industry must consider labor, business, and consumer protection laws. In terms of the environment, waste generated by the production process should be properly managed to prevent environmental pollution. These 6 external contexts include stakeholders categorized into alert (consumers, creditors, and government), support (suppliers, consultants, and employees), marginal (community), as well as threat (competitors) types.

The internal context in risk management is carried out by examining the business activities such as inputs, processes, and outputs, that occur. Through SWOT analysis, the identified strengths include over 50 years of industry experience, loyal suppliers, and negotiable selling prices. However, the weaknesses of the industry include the limitations and capabilities of the workforce, the absence of a marketing department, lack of knowledge about the latest manufacturing technology, limited machine capacity, inconsistent product quality, and low focus on human resource development. Industry also has the opportunity to expand into digital business, increase export value, and enhance consumer loyalty. Meanwhile, the threats faced include the inability to identify potential consumers, unstable currency exchange rates, sudden damage to production machinery, unavailability of quality raw materials, and similar issues.

In this research, not all identified risks with potential occurrences can be avoided, as the industry is often limited to accepting certain risks. However, some risks should be avoided absolutely or overcome to prevent widespread impact. This phenomenon is influenced by attitude toward risk as risk appetite, but the industry can also tolerate future occurrences of secondary risks.

Semi-structured interviews are conducted with the heads of the purchasing, production, and finance departments as risk owners, distinguished by types and levels. Based on type, some risks have positive benefits and others are detrimental. Meanwhile, according to levels, there are low, medium, and high-level risks depending on impacts. Risks with low levels can still be accepted due to insignificant effects on industry goals, but require adequate monitoring to prevent dangerous events. Low-impact risks or even high-impact risks can be categorized as risks with moderate level if risks are still acceptable, industries only need to mitigate them if their benefits greater than the costs incurred. Risks that have a high impact must be rejected or eliminated because they endanger the achievement of business goals. A summary of actions for risks based on types and levels is presented in Table 4.

Table 4
Risk Classification

Risk Type	Risk Level	Risk Appetite	Risk Tolerance	Risk Treatment
Downside Risk	High	Risk cannot be accepted	Risk cannot be tolerated	Risk must be mitigated or avoided at all costs
	Moderate	Risk must be mitigated	Risk must be mitigated	Risk must be mitigated to reduce either the likelihood or consequences only if the benefits outweigh the costs
	Low	Risk is accepted	Risk can be tolerated	Risk is accepted and monitored
Upside Risk	High	Risk must be exploited	Risk must be exploited	Risk must be exploited; the company needs to make sure the risk will happen
	Moderate	The likelihood and impact of risk must be increased	The likelihood and impact of risk must be increased	The likelihood of risk occurrence and its consequences have to be increased only if the benefits outweigh the costs
	Low	Risk is accepted	Risk can be tolerated	Risk is accepted and monitored

Risk Assessment

After establishing the scope, context, and criteria, ISO 31000:2018 directs the industry to comprehensively identify risks. According to ISO 31000:2018, risk identification is the process of recording uncertainties that can hinder (as downside risks) or facilitate (as upside risks) the achievement of goals [7]. The identification refers to the search for root causes.

In addition to observations and semi-structured interviews with risk owners, identification engages industrial benchmarking to compare risks in similar manufacturing industries. Subsequently, the identified risks are assessed and discussions with top management are conducted to result in triangulation. Identification is carried out structurally and depicted in the Risk Breakdown Structure, serving as a result of developing a Work Breakdown

Structure. These results, as shown in Figure 3, should refer to the division of work structure based on the organizational framework [8].

ORGANIZATION		
Production Department	**Financial Department**	**Purchasing Department**
▪ Preparation Risks ▪ Big Printing Rotary Risks ▪ Small Printing Rotary Risks ▪ Dyeing Risks ▪ Finishing Risks ▪ Packing Risks ▪ Grey Fabric Warehouse Risk ▪ PPC Risk ▪ Expedition Risk ▪ Garage Risk	▪ Human Resources Risks ▪ Monetary Risks	▪ Coal Purchasing Risks ▪ Other Purchasing Risks

Fig. 3 Risk Breakdown Structure Results of Risk Identification

Operational, financial, strategic, technological, and informational risks have been identified in the industry. A total of 109 downside risks are identified, consisting of 17 from the purchasing department, 78 from the production, 9 from the directors, and 5 from the finance department. Additionally, 20 upside risks have been identified, including 7 from the purchasing department, 4 from the production department, 5 from the directors, and 4 from the finance department. The causes of each risk are identified using a 5-whys analysis to ensure accuracy and address the root cause of the problem directly rather than symptoms.

After the identification process, analysis is carried out according to ISO 31000:2018 guidelines to understand and evaluate the previously identified risks. The analysis is conducted by assessing each risk to determine the priority level, enabling the industry to formulate appropriate actions. According to Costa et al. [25], risks are a function of the probability of an event and the potential consequences. Therefore, the score of risks is calculated by multiplying two main factors, risk consequence and risk likelihood, with the following formula:

$$Risk\ Score = Risk\ Consequence\ x\ Risk\ Likelihood \quad (1)$$

Based on Risk Consequence Value, a higher negative or positive impact of risks, results in greater value. A high consequence value shows that risks have a significant impact and need to be addressed immediately. The scale of this value can be different for each department, as determined based on the impact of risks on specific.

In Risk Likelihood Value, a higher probability of occurrence corresponds to a greater value. Generally, value is assigned based on chance of occurrence, where very low (probability of less than 5%) is given a value of 0.1, a moderate (probability of 5-10%) has 0.3, medium (probability of 11-30%) has 0.5, high (31-50%) at 0.7, and a very high (probability of more than 50%) is given a value of 0.9.

After calculating the values for all identified risks, 109 downside and 20 upside risks are classified based on levels. According to Hillson [11], there are 3 zones in the Consequence-Likelihood matrix (Figure 4), namely the red, yellow, and green for high, moderate, and low-level risks, respectively. In the red zone, risks require immediate attention, while those in the yellow and green zones need further analysis.

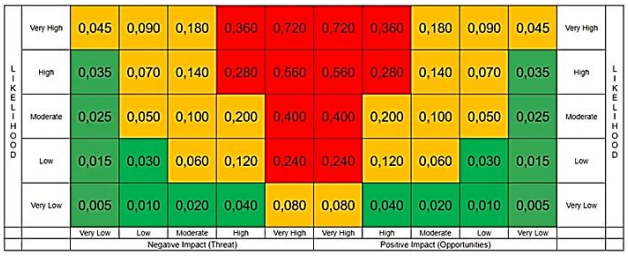


Fig. 4 Consequence-likelihood Matrix for Levelling Risks
Source: [22].

Among the 109 downside and 20 upside risks identified, the analysis found that there are 83 low, 36 medium, and 10 high risks, making simultaneous resolution difficult. Therefore, the ISO 31000:2018 guideline is proven to help the industry recommend risks that require prioritization and simultaneous actions for resolution. The navigation carried out becomes a reference for industry to formulate mitigation actions, for high-level risks which are a priority to be handled by the textile industry.

Although not all risks have a negative impact, there are also high-level risks with a positive impact and should be exploited. The industry is promoted to focus on resolving 10 high-level risks, with 8 having a negative impact and 2 positive impacts. Based on the analysis results using the ISO 31000:2018 guideline, recommendations for risk management are shown in Table 5.

Specifically, results of risk analysis as shown in Table 5, changes in market share could be considered as a downside and an upside risk simultaneously. It has a negative effect in case of a decrease, but can positively cause a significant increase. This is in line with ISO 31000:2018, where risks are the effect of uncertainty on goals and they will trigger subsequent uncertainties [7]. Industry is encouraged to consider uncertainties and adopt a strategic approach to overcome associated risks.

Having identified and analyzed, risk evaluation is the final stage in risk assessment. Based on ISO 31000:2018 guideline, the evaluation compares analysis results with previously established standard risk criteria, followed by decision-making regarding necessary actions. Although the 36 moderate-level risks are not a priority to be addressed, evaluation should be carried out and recommended based on cost-benefit considerations. Specifically, the acceptance of 83 low-level risks required careful consideration and continual monitoring of effect development. When these risks commence to affect goal achievement, the industry should start preparing mitigation actions.

Table 5

Recommendations for High-level Risk Management Results of Risk Analysis

Risk Type	Risk Category	Empirical Problems	Potential Impacts	Recommended Action
Downside Risks	Operational	The error of the fabric pattern printed on the big rotary printer	The production process is hampered due to defects in the fabric produced	The inspection system on the big rotary printer should be changed based on fabric patterns. Previously, only the production department (proofing) inspected the fabric patterns received from the purchasing department and matched them with suitable colors. The production department (ink) only received the color recipe and printed pattern from the proofing department. To avoid risks, the ink department should receive fabric patterns from the purchasing department. This allows for cross-checking and immediate identification of any errors made by the proofing department.
	Operational	The error of the fabric pattern printed on the small rotary printer	The production process is hampered due to defects in the fabric produced	The inspection system on the small rotary printer should be changed based on fabric motifs. Previously, only the production (proofing) department checked the fabric motifs received from the purchasing department and then searched for suitable colors, while the production (ink) department only received color recipes and printed motifs from the proofing department. To avoid risks, the ink department should receive fabric motifs from the purchasing department. This allows for cross-checking and immediate identification of errors made by the proofing department.
	Operational	Operators do not check the fabric in detail and thoroughly during the production process	The increase in defective products that pass inspection and are accepted by consumers reduces trust and satisfaction	Replacing the quality inspection process at the final stage of production with specific machines to reduce human error and adding operators in the production (packing) section to improve the quality inspection process.
	Operational	Many employees were exposed to COVID-19 during the pandemic	Industry cannot operate as planned due to labor shortages.	Although the pandemic has concluded and COVID-19 is no longer extremely dangerous, health protocols must still be implemented in a disciplined manner to reduce risks of declining employee health which has an impact on productivity.
	Strategic	Imported fabric products flood the local market	There has been a decline in demand because consumers have switched to buying imported fabric products, thereby potentially reducing production efficiency	Re-exploring export sales include mapping global markets, and developing more effective marketing strategies using digital media such as SEO-based websites.
	Strategic	Decreasing market share	The emergence of many industries operating in the same field is causing market share to decrease	Market assessments and analysis should be conducted to formulate industry core values that are essential to winning the competition. Industry competitive advantages should be continuously enhanced and publicized.
	Financial	Increasing inability to pay debts on time	Industry finds it difficult to sustain long-term due to the risk of losing the trust of its suppliers and business partners	Revitalizing industry cash flow includes restructuring expenses and cutting unnecessary costs. However, savings should not hinder innovation and business development, investments can still be considered to enhance industry competitiveness.
	Technological	Decrease in skilled workforce capable of operating new technologies	Advancements in production process technology are not matched with human resource capabilities, posing a threat to the industry's business growth	Employee training and development programs should be carried out continuously through talent management. The industry should carefully follow technological developments to improve competitiveness, conduct a Training Need Analysis to determine needs and develop programs optimally.
Upside Risks	Strategic	Increasing customer loyalty	Technological advancements and intense competition have made consumers aware not only of low prices but also of trustworthy and committed producers	The industry needs to conduct consumer analysis by comparing existing and new customers to maintain the right composition, as repeaters are required for business sustainability. Meanwhile, new customers are needed to develop business. The industry is recommended to provide special services specifically to existing customers, thereby facilitating repeat purchases.

	Strategic	Market share is increasing	The industry's ability to maintain quality and production consistency will enhance consumers' trust, specifically with the recognition, therefore increasing market share.	The industry needs to maintain good relationships with customers through harmonious communication. Feedback from customers can provide valuable input for the industry to improve service quality. This allows the provision of products/services expected by customers, as communication channels play a significant role in customers' relationship management.

Risk Treatment

The establishment of risk treatment as a strategic approach for a sustainable future is essential to navigating the 10 high-level risks. ISO 31000:2018 defines risk treatment as the process of taking action to address risks identified as priorities [7]. Susilo [8] suggested that the industry should conduct a cost-benefit analysis of the risk treatment process.

The cost-benefit analysis is initiated by estimating the impacts that would occur when risks are not addressed as basic costs. This is followed by estimating the potential impacts when risks are managed as residual cost, the cost of handling as total implementation cost, and the benefits by subtracting the basic cost from the residual cost. Subsequently, the benefit-to-cost ratio is evaluated through the division of benefits by the total implementation cost. After analyzing the cost-benefit, the industry is required to establish 52 actions as risk treatments, consisting of 41 actions for downside risks and 11 actions for upside risks. These actions are established to mitigate negative impacts on target achievement and enhance the positive impacts that can strengthen sustainability.

Actions to mitigate operational risks, such as errors in fabric patterns printed by rotary printers, should be minimized through changes in business processes, followed by machine replacement. This is because the use of outdated technology machines hinders the production process and compromises product quality as well as productivity levels. Similarly, Büchi et al. [26] persuaded for industry to enhance production performance through technology to remain competitive and avoid the risk of losing consumers' trust. Other operational risks, such as color errors due to inaccurate recipes, should ideally be anticipated by implementing information systems to prevent information errors [27].

Strategic risks, such as market share loss and declining demand can spill over into financial risks of inability to pay debts on time. These risks prompt the industry to reassess marketing strategies, including developing the B2B (Business-to-Business) concept more effectively. The ability to retain existing customers and acquire new ones becomes a main focus for business sustainability, as convinced by Esterhammer [28] and Nilsson [29]. Furthermore, Kaur et al. [30] recommend the industry prioritize and focus on customer engagement to enhance business performance despite numerous competitors. These risk mitigation actions lead to the development of business models for industries [31].

The weakness in the capacity and competence of human resources has the potential to increase the technological risks faced by industry. Currently, human resource development aims to meet the workforce's needs and become a strategic business partner [32, 33]. It is needed to balance technological advancements, market dynamics, and unanticipated labor competition. Otherwise, they will hinder the innovation produced whereas, according to Timotius [34], innovation serves as a source of strength for an industry facing competition and expanding market share. Moreover, the industry should enhance employee achievement motivation to assist in facing unpredictable business risks [35].

In short, effective risk treatment should consider risks at a macro level and assess impacts holistically. Cost-benefit considerations are also found as essential determinants in risk treatment, emphasizing the need for the industry to avoid subjectivity in decision-making. Although risk treatment can occur incrementally, the industry should remain committed to implementing all designated solutions, particularly in mitigating the root causes.

CONCLUSION

Based on the results, this research showed that risks faced by the industry were inevitable but could be effectively managed. Effective management could strengthen industrial activities in facing uncertainty, requiring a strategic approach to mitigate risks. The process stages recommended by ISO 31000:2018 offered industry-effective guidance for risk management.

The research focused on the textile industry in Indonesia, reveals the benefits and roles of ISO 31000:2018 in risk management according to their needs. It showed that difficulties and challenges faced by industry could be overcome using the comprehensive guidelines of ISO 31000:2018, to identify, analyze, and evaluate risks, including preparation of mitigation actions. Risk management extended beyond specific areas to include the entire business process. Consequently, the framework of ISO 31000:2018 in risk management leads to a strategic approach for ensuring business sustainability across all industries.

As defined by ISO 31000:2018, risks have uncertainties that could impact goal achievement, either negatively or positively. Both impacts required effective management as downside risks could harm, while upside risks contributed benefits to the industry. Another important aspect required during the implementation of risk management was found to be commitment and support to enhance sustainability, not formally implemented by pretending and unserious actions.

Although various possibilities were not examined, ISO 31000:2018 guidelines played an effective role in risk management. Risks could remain unidentified when key informants become dishonest, indifferent, or insensitive to empirical situations. Therefore, further research could

be developed to fully investigate the implementation of ISO 31000:2018 across various industries and explore potential opportunities regarding various risks.

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Agnes Zefanya Yonatan
Department of Industrial Engineering
Parahyangan Catholic University, Indonesia
e-mail: agneszefanyayonatan@gmail.com

Sani Susanto (corresponding author)
ORCID ID: 0000-0002-0208-8865
Department of Industrial Engineering
Parahyangan Catholic University, Indonesia
e-mail: ssusanto@unpar.ac.id

Paulus Sukapto
ORCID ID: 0000-0001-7568-1697
Department of Industrial Engineering
Parahyangan Catholic University, Indonesia
e-mail: paulus@unpar.ac.id

Teuku Yuri M. Zagloel
ORCID ID: 0000-0002-0261-4837
Department of Industrial Engineering
Universitas Indonesia, Indonesia
e-mail: yuri@ie.ui.ac.id

Elkana Timotius
ORCID ID: 000-0002-8480-0966
Department of Industrial Engineering
Universitas Kristen Krida Wacana, Indonesia
e-mail: elkana.timotius@ukrida.ac.id