

Post-war Risk Assessment and Management in Tigray: case study
on Small and Medium Manufacturing Enterprises at Mekelle



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Declaration

I hereby declare that the thesis entitled Postwar Risk Assessment and Management for Small and Medium Manufacturing Enterprises (SMMEs) in Tigray: case study Mekelle Small and Medium Manufacturing enterprise is my original work. This thesis has not been submitted previously, in whole or in part, to any other institution for any degree, diploma, or other qualification.

All sources and references used in the course of this research have been appropriately acknowledged, and due care has been taken to avoid plagiarism.

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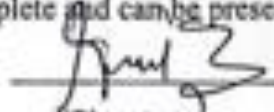

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To the best of our knowledge and as understood by the student this thesis adheres to the provisions of guidelines of the Ethiopian institute of technology Mekelle (EITM) school of mechanical and industrial engineering. Thesis is complete and can be presented.

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Abstract

Small and medium manufacturing enterprises are critical to economic backbone of countries, but their mission and objectives is highly affected by war and faced for various risks and challenges. Researchers were finds that the impact or damage assessment of war in small and medium manufacturing enterprises but those studies are insufficient to identify specific post war risks to be face in the sector during post war recovering and how manage the specific risks. This study aims to investigate the post-war risks affecting SMMEs in Tigray and proposes strategies for effective risk management and resiliency. This study employs mixed method approach combination of qualitative and quantitative research design. Data was collected from literatures, government reports and data's and primary data from survey interviews and questionnaires. The sample size of 90 number of enterprises were selected from the total of 1349 including textiles and garment, manufacturing material manufacturers, metals works and furniture's, agro processing and chemical packaging's sectors and 10 SMMEs industry experts and questionnaires was distributed. Qualitative and quantitative data analysis such as interviews, questionnaires' and relative important index was conducted in the study. A total of 32 post-war risks were identified and categorized into seven groups: financial, supply chain, market, human resource, operational, technological, and socio-political. Using statistical tool Relative Importance Index (RII) method, the study prioritized risks based on their likelihood, impact and their risk levels. Findings reveal that limited access to financial loans and supports, supply chain disruptions, increasing overall manufacturing cost and inflations are among the most critical risks to the survival of SMMEs in the region after the war. The study recommends management strategies such as strengthening government support, enhancing human resource development through educational partnerships, promoting market and supply chain diversification, and leveraging automation technologies. These strategies aim to enhance SMMEs' resilience, support sustainable economic recovery, and contribute to long-term regional development. The research concludes with strategic recommendations and future research studies in investigation interrelationships between identified post-war risk factors, which could provide a deeper insight into how these risks interact and compound each other.

.Key words: Risks, SMMEs, Risk assessment, Risk management, post war and relative important index

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List of Abbreviations and Acronyms

SMEs-small and medium enterprises
SMMEs -small and medium manufacturing enterprises
MSMEs -micro small and medium enterprises
GVCs-global value chain
LDCs- least developed countries
ISO-international standard organization
RA- risk assessment
RM- risk management
RR- risk response
ERM- enterprise risk management
RII- relative important index
SMEDA- small and medium enterprises development associations
FEMA- failure effect and mode analysis
FTA- failure tree analysis
HRM- human resources managements
RBQMS- risk based quality management system
HRD- human resources development

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Chapter one: Introduction

1.1 Background and justification of the study

Enterprises can be categorized as business groups aimed to create productions, services, employment opportunities and others for the communities(Boehlke & Tomanek, 2021)

Manufacturing enterprises can be defined as enterprise engaged in the manufacturing of products for better value by making changes to raw materials in shape, quantity or content using machinery, equipment or human resources(Kenton & Jackson, 2024) According to (COUNCIL OF MINISTERS. 526/2024) Manufacturing enterprises in Ethiopia are categorized into four groups of micros, small, medium and large sized enterprises based on their employee numbers and total asset. Micro manufacturing enterprises are those enterprise with 10 permanent employee and total asset worth up to birr 600,000 Small Manufacturing Enterprise are those enterprise with 11 (eleven) up to 50 (fifty) permanent employees and a total asset worth between Birr 600,001(six hundred thousand one) and 10,000,000 (ten million) .Medium Manufacturing Enterprise are those Enterprise with 51 (fifty-one) up to 100 (one hundred) permanent employees and a total asset worth between Birr 10,000,001 (ten million one) and 90,000,000 (ninety million) Large Manufacturing Enterprise” are those enterprise with more than 100 (one hundred) permanent employees and a total asset worth more than 90,000,000 (ninety million)

SMES in developing economies report higher participation in upstream sectors(WTO, 2021).They represent a seedbed of entrepreneurial skills and innovation, contribute to job creation, and are considered the backbone of the global economy But they encounter many funding barriers(Gherghina et al., 2020). Small and medium enterprises (SMEs) face many small and large internal and external risks. While they can better control much of the internal risks through risk management and treatment measures, they are more vulnerable to external risks because these risks are often beyond their control, influence, radar, and capacity to manage(Hanggraeni, Ślusarczyk, et al., 2019)

Risk effect of uncertainty on objectives. Risk management coordinated activities to direct and control an organization with regard to risk. Risk assessment is the overall process of risk identification, risk analysis and risk evaluation. Risk assessment should be conducted systematically, alliteratively and collaboratively, drawing on the knowledge and views of

stakeholders (ISO, ISO 3100, 2018), it attempts to answer the following fundamental questions: What can happen and why (by risk identification)?, What are the consequences?, What is the probability of their future occurrence?, Are there any factors that mitigate the consequence of the risk or that reduce the probability of the risk? (ISO, ISO31000, 2019)

Risk managements is the complete process of understanding risk, risk assessment, and decision making to ensure effective risk controls are in place and implemented, it begins with actively identifying possible hazards leading to the ongoing management of those risks deemed to be acceptable(Sinha, 2020)

Many countries experience conflicts and civil wars, the most war-affected regions suffered prolonged and permanent economic decline(Keseljovic et al., 2025), As a result, several researchers have studied the impact of war on firm revenues(Nkabane, 2022) (Klapper et al., 2015), with a particular focus on small and medium enterprises (SMEs) (Qaied & Basavaraj, 2020). Recent studies have explored the economic consequences of ongoing conflicts in Ukraine, Sudan, and Gaza (Nation, 2024)(Weligodapola, 2022).

In Ethiopia, research has examined the impact of civil war on small and medium manufacturing enterprises(Habibi, 2017)(Ayele et al., 2023), particularly in Tigray region severely affected by war. Notable works include studies on post-war recovery and the growth ecosystem for SMEs (Tesfay, 2024), the impact of the war in northern Ethiopia on micro, small and medium-Sized enterprises(Enterprise, 2022) and a pre- and post-war analysis of SMEs in Mekelle, Tigray(Haile, 2024).

However, despite these valuable contributions, existing research has not adequately addressed post-war risk identification and mitigation strategies specific to small and medium manufacturing enterprises in Tigray. Although assessments of war related damages have been conducted, they fall short of examining the risks and challenges currently facing active SMEs in the post-war environment and the strategies needed to effectively manage those risks.

The Tigray region in Ethiopia has recently emerged from a period of war. While reconstruction efforts are underway, small and medium manufacturing enterprises (SMMEs) face a unique set of challenges and risks in this postwar environment. This research study focused on currently serious issue aims to investigate the specific post war risks facing by Tigray's SMMEs and develop possible risk mitigation strategies and contribute to the region's economic recovery.

1.2 Statement of the problem

Small and Medium Manufacturing Enterprises (SMMEs) are widely recognized as engines of economic growth and employment creation, especially in developing countries. They play a pivotal role in promoting entrepreneurship, enhancing innovation, and boosting local economies. However, in post-conflict regions, these enterprises face severe risks that threaten their survival and potential.

The post-war survey in Lebanon, Cote d'Ivoire, Yemen, Somali, Sudan, Libya, Srilanka and Ukraine highlights the negative impact of the war on all SME enterprises, all enterprises these countries were adversely affected by the conflict, The conflict impacted the enterprise employment badly their turnover declined, cash receivables deteriorated, domestic and export orders reduced and input costs increased(Goheer, 2017), Destruction of infrastructure and supply disruptions of intermediate inputs such as materials, electricity and other utilities can drive up the operating costs(Klapper et al., 2019). SMEs have suffered material damage to productive assets and infrastructure, loss of life and bodily injury, a significant decrease in their customer base, loss of skilled personnel, limited access to financing, power outages, and other basic services(Qaied & Basavaraj, 2020), Supply chains have been affected, and business owners have had to make difficult decisions regarding their businesses continuing(ILO, 2018). Revenues decrease because of the conflict-induced lower availability of production inputs. Higher conflict exposure reduces firms' economic performance. Relationship between conflict and firms' economic performance becomes convex(Prete et al., 2021), to the global economic risks and geopolitical risks are of major concern for SMEs, Failure of regional or global governance, failure of national governance, and interstate conflict with regional consequences were found to be among the top geopolitical risks for the SMEs(Asgary et al., 2020). Many SMEs were destroyed by the arm conflicts, it was highly risky to establish new businesses, and obtaining loan facilities from the bank was difficult. Many problems related to inputs arose, such as lack of electricity, no skilled workers due to the migration, extremely high costs of raw materials, inferior infrastructure facilities such as roads and communication, lack of marketing facilities such as shrunk the market access; the demand for goods was very low due to the displacement of people and the loss of income sources for the general public(Gamage et al., 2020).

The war in northern Ethiopia has significantly impacted economy especially micro, small and medium enterprises (MSMEs). Infrastructure has been damaged, disrupting production and displacement over 4.2 million peoples, GDP growth declined from 6.3% to 6.1% ,MSMEs have reduced operations by 60-80% or closed due to access to capital, market, resources and high inflations(Enterprise, 2022), those findings were focused on the impact of the war on SMEs but they are not sufficient evidence to answer what are the specific post war risks faced in SMMES and what are their specific management strategies.

In Tigray, SMMES face similar consequences, the number of operating enterprises has significantly declined, skilled labor has been lost, and access to finance, electricity, supply chains and markets has been severely disrupted. According to 2024 Tigray biro of SMMES 9 month report the target human power for the SMMES office employee and experts are about 960 but now they are only 615(64%) workers and experts are on their work actually, the number of SMMES dropped from 6415 before the conflict to 3779(66%) post-conflict. In Mekelle before the war there were 1890 SMMES but currently 1349(77%) SMMES are in operating. Following a period of conflict, the Tigray region faces a complex situation for its small and medium manufacturing enterprises (SMMES). The war in Tigray has significantly impacted the region's economy and SMMES face a multiple of challenges and risks in the postwar period. Most of the business are totally out of function or reduced their productivity and efficiency that leads to question SMMES survivals.

Moreover the war introducing various post-conflict risks for SMMES such as financial risks, Supply chain risks, Market risks, Human resource risks, Operational risks, Technological risks, and sociopolitical risks.

An enterprise's effort in detecting and managing risk has a substantial effect on the performance of SMEs (Ntare et al., 2022)(Ujagare, 2023).This study, therefore, aims investigate post-war risks specific to SMMES in Tigray, assessing their likelihood and impact, and propose evidence based strategies for effective risk management. It will contribute to building resilience in local enterprises and support sustainable economic recovery in the region.

1.3 Research Questions

The major research questions to be raised in the process of this research preparation could be:

- ✓ What are post war risks facing in small and medium manufacturing enterprises in Tigray?

- ✓ What is the likelihood, impacts and risk levels of the post war risks in small and medium manufacturing enterprises?
- ✓ What are the post war possible risk mitigation and management strategies in small and medium manufacturing enterprises?

1.4 Objective

1.4.1 General objective

To investigate postwar risks facing by SMMEs in Tigray and propose possible risk management strategies and contribute to the region's economic recovery.

1.4.2 Specific objective

- ✓ To identify and categorizes postwar risks affecting in small and medium manufacturing enterprises in Mekelle
- ✓ To analyze the likelihood, impacts and risk level of the risks and prioritize the risks based on their severity
- ✓ To recommend evidence-based risk mitigation and management strategies

1.5 Scope of the study

The study was focused on the assessing and analyzing impacts and risks following the recent war in Tigray on Small and Medium manufacturing Enterprises (SMMEs) in Mekelle city (textile and garment, metal work and furniture, construction material manufacturer, chemical packaging and Agro processing) and recommend literature based managements strategies for the most severity risks.

1.6 Significant of the study

The significance of this study lies in its potential to identify and address the critical the post-war risks in small and medium manufacturing enterprises (SMMEs) in context of the Tigray region. The study explores how risk assessments and management practices, tailored to the unique post-war risks and challenges, can enhance the resilience and performance of SMMEs in Tigray.

This lies in its potential to guide and input for SMMEs Tigray biro, policy makers and researchers through the post-war recovery process by identifying key risks and providing practical risk management strategies. By doing so, the study will contribute to the rehabilitation of the local economy, improved firm performance, and long-term sustainable development in the region.

1.7 limitation of the study

The limitations of the study are:

- ✓ The limitations of the study include the restricted range of risk factors assessed.
- ✓ Restricted number of sample size due to financial issues and challenges

Chapter Two: Literature review

2.1 Small and Medium enterprises

SME stands for Small and medium-sized enterprises (SMEs) or small and medium-sized businesses (SMBs) are business whose personnel numbers fall below certain limits. Actually the SME sector plays an extremely important part in modern economy, proving to be the most attractive and tremendous innovative system (Al-Herwi, 2019), make a substantial contribution to economic activity, job creation and economic growth in all countries. In developing economies, they account for approximately 50–60 percent of gross domestic product (GDP) and 60 percent of jobs (Lycra, 2019)

Factors in determining SME are number of employees, sales or revenues, assets or capital investment and a total of debt (Sidek et al., 2020). SMEs, to be competitive on the market, should follow the guidelines in the country where they operate, and then they consider the quality of products or services, to distinguish one from the other, always taking into account the legal provisions of the competition (Prenaj & Ismajli, 2018). Developing countries tend to have a larger share of small and medium-sized enterprises. SMEs are also said (by whom?) to be responsible for driving invention and competition in numerous (which?) profitable sectors. Although they produce further new jobs than large enterprises, SMEs also suffer the maturity of job destruction/compression (Pedraza, 2021)

2.1.1 Small and Medium Manufacturing Enterprises

Manufacturing means a mechanical, physical, or chemical conversion of a raw material, substance, or component by using machine, equipment or labor into products that worth better value Regulation No. 373/2024). Typical examples of manufacturing enterprises are furniture's and metal works, agro processing, chemical packaging, construction materials manufacture and textiles and garment. Manufacturing Firm productivity measures the efficiency of how a firm transfers inputs into outputs. Therefore the productivity of a firm is a reflection of both labor ability and technology. The main determinants of productivity include access to materials, quality and size of workforce, the capabilities of management, the organizational structure, and the use of technology and the level of capital sufficiency.

According to Ethiopian enterprise classification the enterprises can be classified according to total assets and total employees.

Table 1 enterprises classification

	Capital	Employee
Micro enterprises	<=600,000	<=10
Small enterprises	600001-10000000	11-50
Medium enterprises	10000001-90000000	51-100
Large enterprises	>90,000000	>100

Source (Ethiopian Regulation No. 373/2024".)

Small and medium enterprises in Tigray are operated in a problematic situation suffering from financial constraints and work premises are found out as a general challenge to all SMEs. The critical problem of peace and security among the Ethiopian Regional Governments and neighboring countries hinders the market linkage among them(Gebreselassie, 2022)

2.2 Impact of war on small and medium enterprises (SMES)

The post-war survey highlights the negative impact of the war on all enterprises, and provides evidence of a decline in household incomes and an increased dependence on local markets, worsened the pre-war constraints, decrease the level of earnings and household incomes, increased instability, damage to infrastructure and lack of access to skills and support services (Goheer, 2017).). The post war damage assessment in Yemen showed destroyed around 65 percent of the SMEs in the country. SMEs have suffered various types of damage/loss, including material damage to productive assets and infrastructure, loss of life and bodily injury, a significant decrease in their customer base, loss of skilled personnel, limited access to financing, power outages, and other basic services(Qaied & Basavaraj, 2020), in Somali also finds that 5 per cent of SMEs were totally destroyed, 22 per cent suffered major damage to human, physical and economic assets, and 58 per cent experienced minor damage. Moreover, 40 per cent of SMEs reported direct human losses. While 35 per cent experienced direct physical damage or loss to buildings, infrastructure, equipment, furniture, raw materials, final products, 97 per cent suffered economic losses such as losses cause by business loss of earnings for workers during suspension, loss of sales revenue, and a decline in customers. Some 30 per cent of businesses lost more than half of their fixed assets, and 60 per cent of SME employees were laid off(Maow, 2021).

Revenues decrease because of the conflict-induced lower availability of production inputs. Firms exposed to higher conflict intensity use fewer workers and intermediate inputs, resulting in a negative effect on the firm's output level. On the other, the conflict changes the level of market competition faced by firms (Prete et al., 2022). SMEs in Ukraine are suffering badly from the consequences of Russia's war of aggression. Production facilities have been destroyed, sales are falling, and skilled workers have fled or are fighting at the front (Developments, 2024), conflicts led to drop in firm total factor productivity and increases in operating costs is a possible channel driving this impact (Hugues, 2015).

2.3 Risk assessment and management process in SMEs

Many SMEs fail to adopt adequate risk management, resulting in project failures such as cost overruns, schedule delays, and poor quality (Mthiyane et al., 2022), success and sustainability of small and medium-sized enterprises (SMEs) significantly influences by their ability to identify, assess, and mitigate risks effectively (abdurkadr ayden, 2023). Risk management has been a key issue in recent years, contributing to the demise of countless SMEs (Abbas et al., 2021), adoption of ERM frameworks can offer significant benefits, including improved risk identification and mitigation, enhanced decision-making capabilities, better resource allocation, and increased stakeholder confidence (Ahmad & Teo, 2024).

The relationship between internal environments (IE), monitoring (MT), event identification (EI), risk Response (RR), and risk Assessment (RA) all significantly influenced ERM. An enterprise's effort in detecting and managing risk has a substantial effect on the performance of SMEs (Ntare et al., 2022) (Adeoye et al., 2024).

2.3.1 Risk assessment

Risk assessment identifies, prioritizes, and estimates risk to organizational operations (mission, functions, image, and reputation), organizational assets, individuals, other organizations, and the Nation, resulting from the operation and use of information systems (Țircovnicu & Hategan, 2023). A risk assessment methodology for a Virtual Enterprise (VE) was developed to facilitate analysis of the key factors of risks and assessment of the level of risks a VE faces during its complete functioning period (Mahmood et al., 2018), uses the results of threat and vulnerability assessments to identify and evaluate risk in terms of likelihood of occurrence and potential adverse impact (

magnitude of harm) to organizations, assets, and individuals identify the most important risks and their resources(Grondys et al., 2021).

2.3.1.1 Risk identification

The risk identification process is identify unwanted events, undesirable outcomes, emerging threats, as well as existing and emerging opportunities. The output of risk identification is list of risks that may positively or negatively impact the organization(Chapman, 2022). Identification of factors threatening the functioning of enterprises increases the effectiveness of risk management that accompanies the conducted activity(Kokot-Stępień, 2023).

Risk identifications tools and techniques are hazard analysis; brainstorming; hazard analysis and critical control points (Khodadadyan et al., 2018), SWOT analysis (evaluating strengths, weaknesses, opportunities, and threats), PEST analysis (examining political, economic, social, and technological factors), industry benchmarks, and scenario analysis are commonly employed(Dohm & Ji, 2021).

2.3.1.2 Risk analysis

After the risk identification process, a scoring system individually prioritizes the identified risks with regard to their impact and probability rates(Khodadadyan et al., 2018).The goal of risk analysis and assessment is to prioritize risks based on their significance, enabling the organization to focus its resources on the most critical threats(Ferreira de Araújo Lima et al., 2021).

qualitative and quantitative risk analysis, the expert judgement, risk probability and impact assessment, sensitivity analysis and data gathering and representation as the most practiced techniques(Khodadadyan et al., 2018),A quantitative risk analysis method is a probabilistic estimation of risk where risk is calculated as a continuous series from high to low. A qualitative risk analysis method is a basic estimation where risks are typically ranked from high to low. Quantitative methods, such as probabilistic risk assessment, Monte Carlo simulations, and sensitivity analysis, are often used to provide a numerical estimation of risk levels. Qualitative methods, including expert judgment, Delphi technique, and risk matrices, complement quantitative approaches by incorporating subjective insights and experiences.(Dohm & Ji, 2021), other Techniques for analysis risk include Structured interview with experts in the area of interest Use of multi-disciplinary group of experts Individual evaluation using questionnaires (Wiengarten et al., 2016).

2.3.1.3 Risk register

The document in which the risks are recorded is known as the risk register and it is the main output of a risk identification exercise(Avanasi et al., 2023), This systematic approach ensures that all potential threats are captured and documented, providing a solid foundation for subsequent analysis and assessment(Dohm & Ji, 2021).

As a minimum, the risks register records the risk, risk category, how and why the risk can happen cause of risk, how will the risk impact the Institution, the likelihood and consequences of the risk to the Institution, the existing internal controls that may minimize the likelihood of the risk occurring, a risk level rating based on pre-established criteria, framework, including an assessment of whether the risk is acceptable or whether it needs to be treated, a clear prioritization of risks (risk profile); accountability for risk treatment (may be part of the risk treatment plan); and time frame for risk treatment. Once the risks have been identified and existing control have been assessed and it is has been established that controls are inadequate, an assessment of whether the risk is acceptable or whether it needs to be treated needs to be performed(O’Har et al., 2017).

2.3.2 Risk managements

2.3.2.1 Risk mitigation

Mitigation deals with the aftermath of a disaster and the actions that can be taken before the event occurs to decrease negative and, potentially, long-term repercussions, as opposed to planning to avoid a risk(Hurtado et al., 2021), it is crucial for minimizing the adverse effects of potential threats to an organization's stability and growth. These mitigation strategies encompass a range of proactive measures, each tailored to address specific types of risks(Hurtado et al., 2021).Reducing the probability of occurrence, and the severity of the consequences of an unwanted product failure is a natural outcome of risk mitigations(Stewart & Cioni, 2018).

The primary strategies for risk mitigation include risk avoidance, risk reduction, risk sharing or transfer, and risk retention(Hurtado et al., 2021),SMEs risk mitigation techniques include streamline their business processes, ensure that planning takes place in the form of budgets and to leverage information technology and Performance measurement.(Mthiyane et al., 2022).

2.3.2.2 Risk control and monitoring

Organizations employ risk monitoring tools, techniques, and procedures to increase risk awareness, helping senior leaders/executives develop a better understanding of the ongoing risk to

organizational operations and assets (Alcántara & Melgar, 2016). Monitoring the part of risk management that is most often given inadequate focus and as consequence of that programs of many agencies become ineffective over time. This part of Risk management ensures that the important information generated by the previous processes is captured, used, and maintained (Berger et al., 2023)

2.4 SMEs Risk Assessment and Managements

Enterprise Risk Management (ERM) is management practiced at the enterprise level, It puts the core strategic mission of the enterprise at the center of the discussion, driving all possible responses to potential risks in a holistic approach (Nocco & Stulz, 2022), aims to analyze the risks by identifying the risk sources, analyze the probabilities and risk effects and design alternative strategies to prevent and control business risk that might be faced by MSMEs (Sukiyono et al., 2023).

Any SMEs exposed to risk such as market risks, operational risk, supply chain risk, growth risk, risks related to management and employees, environmental and health risks, financial risks, which include credit and default, liquidity and interest rate risk, Information system (ERP) risk, cyber and IT risks (e-business), combined with fraud risk and Governance risks including generational risks (Muriithi, 2017) (Islam et al., 2018) (Andrei, 2021), and they try to manage uncertainty and the challenge to determine how much uncertainty to accept as they strive to satisfy stakeholders' needs. In most SMEs the risk management process is fully embedded when owners and managers make a decision, as they set the business objectives and check that they are correctly achieved (Crovini, 2019).

The risk impacts are reduction in revenues, increase in cost of business operation, and inability to expand the business and decrease income (Heyneke, November, 2010). If these challenges can be tackled with the relevant needs to meet them, surely the economy will get better (Hanggraeni, Ślusarczyk, et al., 2019).

Enterprise's effort in detecting and managing risk has a substantial effect on the performance of SMEs (Ntare et al., 2022), and gain competitive advantage which is essential for survival and progress in the present hyper-competitive and highly dynamic business scenario and thus for adding value for its shareholders (Srivastava, 2017) (Hanggraeni, Ślusarczyk, et al., 2019).

2.5 SMMEs risk factors

Small- and Medium-Sized Enterprises (SMEs) engaged in manufacturing continuously encounter daily internal and external disturbances to their operations that detract from their business performance (Islam et al., 2018). SMEs face financial factors, marketing, management and HRM factors and environmental factors (Haroon & e Haq, 2017), lack of finance, and low levels of human resources and technological capabilities, insufficient management competencies, the lack of a skilled workforce, deficiencies in marketing strategies, low efforts in R&D, and a lack of innovative technology are significant risk factors responsible for the unstable growth of SMEs (Epede & Wang, 2022), other factors like power shortage, lack of capital, poor management skills and competencies, and inadequate information and corruption (Muriithi, 2017) (Kassegn, 2022), Terrorism, religious conflicts (Naradda Gamage et al., 2020), insufficient access to finance, complex and sometimes nontransparent domestic and foreign regulations, rising and unpredictable transportation costs, the, tariff and nontariff barriers, time-consuming foreign customs procedures, language and cultural differences, and lack of knowledge of foreign markets (Deanna Tanner Okun, 2020, disruption of raw material supply, the reduction of the demand side, increased operating costs, capital and logistics chain exercise (Nkwabi & Mboya, 2019).

SME businesses failed due to the lack of availability and optimal combinations of resources and opportunities, limited access to finance, size, age, poor market conditions, unbeatable competition, isolation, inadequate skilled labor, wrong pricing, and lack of institutional support, innovation and necessary skills of entrepreneurs (Naradda Gamage et al., 2020), low education, lack of training and poor managerial skills; business-related glitches such as poor market access, stiff competition, and the entrepreneur's inability to understand market expectations; and economic environmental issues such as inflation, recessionary trend (Agrawal, 2016).

There are global and local challenges of SMEs, the global risks are global competition, global financial crisis, technological challenges and cheap imports and the local challenges are high cost of infrastructure, lack of finance, low productivity, lack of managerial capabilities, access to managements and technology and heavy regularity (Naradda Gamage et al., 2020) (Mulugeta, 2022).

Crucial risks factors that may hinder the sustainable development and smooth operation of SMEs are: Disruption in the transportation network, Price fluctuation of raw materials, demand uncertainty, lead time and schedule delay, lack of knowledge about modern disruptive

technologies, fluctuation in the interest rate due to global economic instability, difficulty in maintaining sustainable relationship with the suppliers, Poor working environment and safety issues, Lack of potential market opportunities, Labor strikes and political instabilities, Emergence of disruptive situations, wars, unavailability of financial aid from the government and non-government sectors, inadequate quality testing facilities ,lack of skilled and properly trained manpower, lack of expertise in using advanced machineries and measuring devices, difficulties in accurate capacity and facility planning(Mulugeta, 2022)(Muriithi, 2017).

These risks are grouped under categories of operational; marketing; technical and financial risks, on risk management. All identified risk factors are interrelated(Karmaker et al., 2023).

2.5.1 SMEs Financial risk factors

Small and medium enterprises financial risks include limited access to commercial finance due to an increase in loan defaults(Karmaker et al., 2023), high interest rate payments for procured loans amongst many others(Hagos, 2022), unfavorable interest rates, insufficient loan size, maturity, and grace period, and lack of transparency(Wajebo, 2022), inadequate collateral to secure loans; information opaqueness; low level technical and management skills; lack of professionalism; competition; inability to afford long term financing among others(Nyirenda & Qutieshat, 2023).

Access to formal finance is fundamental and still remains a challenge for the growth and survival of SME's. Especially for those developing countries in Sub-Saharan African countries including Ethiopia(JIBREL, 2023).

2.5.2 Supply chain SMEs risk factors

The factors of disruption affect its supply chain activities are shortage of supply equipment failure and lack of buying power(Malik et al., 2022), demand fluctuations, security regulation and cyber risks(SCRM(Foli et al., 2022), political unrest in a sourcing country or rumors about financial problems of an important supplier can trigger the need to investigate specific supply chains (Ngoc et al., 2022), Other the supply chain risks factors are supplier reliability, transportation disruption, inventory in accuracy, counterfeit products, demand volatility and political and trade uncertainty(Turgay & Aydin, 2023), raw material supplier failure, transportation carrier failure, finished goods manufacturing failure product quality failure, economic recession or market collapse, failure of major software system, spike in raw materials cost, extended loss of electricity, inventory write due to new design change, cash crisis due to customer delayed payment(Sunjka et

al., 2020), Access to Markets and Disruptions in the Supply Chain, high cost of transportation, and Foreign exchange shortages(Morvey et al., 2024).

2.5.3 Market risk factors

The most important market risks factors are: losing the customers; strong competition in the line of business; stagnation of the market; unreliability of the suppliers(Hudakova & Dvorský, 2019), lack of knowledge about marketing channels and a failure to develop marketing networks, lack of expertise about marketing tactics, branding, and client loyalty, as well as a lack of good relationships with other domestic and foreign firms(Manas & Setapa, 2021) Most serious source of market risk is losing customers (Dvorský et al., 2018).

2.4.4 Human resource risk factors

Human Resource refers to the individuals or workforce working within an organization responsible for performing the tasks given to them for achieving goals and objectives of the organization. The Human Resource Management (HRM) is the management of Human Resource (HR) that emphasizes employee performance to the maximum. Employee skills and training, employee potential and involvement, employee benefits are the most important factors to improve SMEs performance(Holátová & Brezinova, 2019). Problem of Human resources management is very sensitive issue in SMEs(Knezović et al., 2020).

The risk factors related to human resources are Operator's knowledge, skills, personal problems (financial problems, disease, death(Dumitrescu & Deselnicu, 2018), and the core dimensions are experience, skills, education, abilities and training(Mubarik et al., 2018), low motivation of employee, theft by employees and lack of commitment also put SMEs at high risk (Githii Stephen Kagwathi1, 2020).

2.4.5 Operational risk factors

SMEs continuously face many operational risks and uncertainties in their daily operations such as reduce productivity, increase costs and reduce profits(Naude & Chiweshe, 2017), disruption of business operations, Low productivity, corruption, technical failure and decreasing quality, resulting in delays and obstacles in achieving the goals(Manas & Setapa, 2021), other risks of SMEs include increased uncertainty in production supply. The uncertainty of the production supply has led to an increase in business operating costs, labor costs, land rents, and taxes (Jiacheng Chen1, 2023).

2.4.6 Technological risk factors

Manufacturing SMEs have embraced technology in its operation main technological risk factors includes lack of innovation ideas, lack of research and development and equipment increasing costs of information and technology (IT)lack skills and knowledge, lack communication, (Ombongi & Long, 2018).

2.4.7 Social and political risk factors

Major SME's social and political risk factors are social instability and failure of urban planning, geopolitical instability and uncertainty is a major concern for all sectors and businesses, Failure of national governance and failure of regional or global governance, and largescale terrorist attacks.(Ozdemir2, 2020).

2.6 Postwar SMMMEs Reconstruction and Development

Rebuilding SMEs would involve certain key components such as identifying the priority economic sectors, ensuring security, evaluate the financing options, work on technological innovations, and prepare for energy efficient buildings (Gorodnichenko et al., 2022).The ILO's Five Point Crisis response for MSMEs offers support to policymakers and enterprises through: rapid assessments to pinpoint the constraints felt by MSMEs, advice through examples on managing credit, advice to policymakers on public procurement, advice and training on business development services, notably entrepreneurship and enterprise management training and, advice and training on supporting small business associations to take an active advocacy and support role during the crisis(Vandenberg, 2019).

To solve the survival dilemma of small and medium-sized manufacturing industry, the government should cut taxes and fees and deepen the reform of enterprises to improve regulation and service, subsidizes or relieves social security, rent, and employee salaries, improve the financing environment, establish a communication mechanism between banks and enterprises, lower the threshold of enterprise loans to help enterprises maintain their operations, ensuring information security, accelerate information sharing on market ,judicial decisions and enforcement, and tax and social security payments, strengthen cooperation with financial institutions and implement a risk-sharing model, reduce the negative impact of labor shortage, provide specific housing for workers and subsidize employees' wages in enterprises, reduce the cost of enterprise due to labor shortage

and other factors, corresponding forecasting plans for sudden external threats, improving the financing capacity of enterprises, and expanding their capital supply((Jiacheng Chen1, 2023).

The SMMEs post war comprehensive recovery package is with financing, inputs, market linkages and machinery leasing to support MSME recovery (Cipe, 2022). Signs of situational strategies may include developed to address specific problems or situations, short-term focus (oriented towards achieving a specific goal or solving a specific problem within a limited time frame), experimental nature (as such strategies may be experimental involving new ideas and approaches to problem-solving or improving outcomes), innovativeness (can stimulate innovative approaches and practices that help solve problems and develop the enterprise(Kylinich, 2023).

2.6 Relative important index

The Relative Importance Index (RII) is a statistical tool used to rank different factors by their level of importance or impact. Research commonly uses it to prioritize items based on respondents' ratings. The calculation of the Relative Relevance Index (RII) showed the ranking level of relevance. RII was used to rank the different Performance management factors(Kinemo, 2024). Relative Importance Index (RII) for Effective Evaluation of Construction Subcontracting factors are associated with subcontracting during the construction project(Genc, 2023), and used to identify the most critical Key Performance Indicators (KPIs) and determine their Relative Importance Index (RII)(Tarek et al., 2022). It was applied to prioritize the project risk factors(Kassem et al., 2020).

2.7 Literature Gap

The above existing Literatures finds that the impact of war on small and medium enterprises has been examined in different counties such as Somali, Yemen, Libya, sudan, Contidivar, Siralyon and Sirilanka have experienced conflict of comparable intensity to that of Tigray region. Somali, Libya, Sudan and Yemen also share the same level of economic development with Tigray. Those studies focuses the immediate impacts and damages of the war on SMEs. They didn't consider the post war risks and challenges to be faced in SMEs that hinder reconstruction and recovery of these enterprises.

Additionally Other studies have addressed s risks identifications different risk factors and managements in small and medium enterprise focusing on the areas such as financial, supply chain, market, human, technological, social operational and political. These studies, however, are

generally conducted under stable conditions and do not reflect the complexities of post-conflict environments.

Therefore the present study aims to investigation of risks and challenges facing in SMES during the post war recovery phase in Tigray and recommend strategic management measures tailored to these unique conditions.

Chapter Three: Research Design and Methodology

3.1 Research Design

This aim of this research is to investigate the postwar risks these SMMEs face and develop strategies for effective risk management. This study was mainly focused in Tigray small and medium manufacturing enterprises, This employed a mixed-methods approach, combining quantitative and qualitative data collection methods such as structured questionnaires, survey interview and collection past studies related to risk identification evaluation and developing mitigation strategies, and it is also used both qualitative and quantitative methods to analyses the result such as structured surveys and statistical analysis and relative important index to assess risk severity and prioritize mitigation strategies.

3.2 Study population and Sampling design

Total population study in mekelle are 1349 SMMEs. A stratified random sampling method was used to ensure representation samples across five key manufacturing sectors in Mekelle, including textile and garments , metal works and furniture's, chemical packaging, construction material manufacturer and Argo processor The research is used Proportion of quota sampling to determine specific representation of samples from each sector.

Based on below sample size determination formula, I got total sample size of 90 with a high degree of confidence (95%) and marginal error 5% the number of standard deviations that would include all possible (ρ) for five-point Likert type scale is four (two to each side of the mean) and additional 10 purposely selected SMES experts was also considered in study.

Using adjusted margin Yamane's formula Sample Size (n) = $N / (1 + (N \times \epsilon^2))$ (Adam, 2020)

Where:

- ✓ n = Sample size you need to determine
- ✓ N = Total population size =1349
- ✓ e = Margin of error (0.05 for 5%)
- ✓ ρ = the number of standard deviations that would include all possible values in the range =4
- ✓ t = t-value for the selected alpha level or confidence level at 95% =1.96
- ✓ ϵ = adjust margin of error $\epsilon = (\rho \times e) / t$

$$\varepsilon = (4 \times 0.05 / 1.96) = 0.102$$

$$n = 1349 / 1349 \times 0.102 \times 0.102 = 90$$

$$\text{Proportion of quota sampling} = 96 / 1349 = 0.066$$

Table 2 sample size determination

S/No	Sector	Population	Sample size
1	Textile and garments	283	283*0.066=19
2	Metals and furniture's	440	440*0.066=29
3	Construction material manufacturer	386	386*0.066=26
4	Chemical packaging	92	92*0.066=6
5	Argo processing	148	148*0.066=10

3.3 Data Collection Methods

Data collection is a process of gathering information's that are relevant to accomplish the research or the study. There are two data collection methods such as primary and secondary data collection and the researchers used both of the methods.

3.3.1 Primary Data Collection

Primary data was gathered through interviews and survey questionnaires.

Interviews: semi structured interviews was conducted with key stakeholders, including SMME owners, managers, industry experts and government officials to gain a deeper understanding of risks challenges and opportunities faced by the sector after the war and how to manage these risks.

Surveys Questionnaires: A five-point Likert scale questionnaire was distributed to SMME managers, owners, and experts. The questionnaire was translated into **Tigrigna** for better comprehension.

To attain the aim of the study, qualitative and quantitative data were collected. The study populations included 1349 of Small and medium enterprises from purposively selected 5 sub-sectors of the manufacturing sector. To carry out this study, 90 SMEs and 10 SMEs experts total of 100 respondents were selected.

3.3.2 Secondary data collection

Secondary data was sourced from published literatures, government reports, institutional data bases and previous research on post-conflict recovery and postwar risk assessment and management for SMEs in war-affected regions. Identify and list the risks and categorize the risks according their sources.

3.4. Data analysis methods

The research was Conducted qualitative and quantitative data analysis methods.

3.4.1 Qualitative data analysis method

Qualitatively the collected data was analyzed through interviews questionaries' literatures and brainstorming for:

- ✓ Identification of key risk factors and management strategies.
- ✓ Grouping responses into seven categories: financial, supply chain, market, human resource, operational, technological, and socio-political risks.
- ✓ Evaluating perceived risk likelihood and impact based on prepared qualitative 5 Point Likert scale questionaries' which contains very low (1pont), low (2point), medium (3 point), high (4 point) and very high (5 point). Then Calculate the risk level =f (likelihood, impact).

3.4.2 Quantitative data analysis method

The Relative Importance Index (RII) approach is a statistical tool (Kinemo, 2024),used to describe the relative importance of the specific risks and effects based on the likelihood of occurrence, impact and overall risk level on the enterprises using the Likert scale of five scales. RII is applied to rank the different Performance management factors(Kinemo, 2024), Evaluation of Construction Subcontracting factors (Genc, 2023), identify the most critical Key Performance Indicators (KPIs)(Tarek et al., 2022), and to prioritize the project risk factors(Kassem et al., 2020)

In addition, the higher value of the index of relative importance (RII) is the critical risk or impact component and is determined by equation:

$$RII = \Sigma W / (A \times N) \quad (0 \leq RII \leq 1)$$

W – Is the risk weight to each

A – Is the highest weight and;

N – Is the total number of respondents (Kassem, 2020)

Table 3 RII important level

RII	Important level
0.8-1	Very high
0.6-0.8	High
0.4-0.6	Medium
0.2-0.4	Low
0-0.2	Very low

3.5 Pilot study

A pilot study was conducted to assess the appropriateness, relevance, and internal consistency of the survey questionnaires and structured interview instruments. Ensuring the accuracy, consistency, and effectiveness of these tools is essential, and the concepts of reliability and validity play a critical role in both their development and application.

The pilot study involved a purposive sample of 20 participants, comprising 10 leaders and experts from the Small and Medium Enterprise Development Agency, as well as 10 SME owners and managers. Of the participants, 11 held a Bachelor's degree, 5 held a Master's degree, 2 had a diploma qualification, and 2 had completed secondary education (10+2 level).

The pilot questionnaire included items related to the demographic profile of respondents, the sector in which their business operates, potential post-conflict risks and challenges faced by their enterprises along with their categorization the perceived likelihood and impact of these risks, possible mitigation strategies, responsible stakeholders, and identified risk triggers. A guide to the questionnaire used during the pilot testing is provided in the appendix.

The reliability of the questionnaire was evaluated to determine whether consistent results could be obtained from different respondents. Cronbach's alpha was employed to test the internal consistency of the instrument, and the analysis was performed using SPSS version 22.

Table 4 Coefficient of Cronbach's alpha and its reliability level

Coefficient of Cronbach's Alpha	reliability level
More than 0.90	Excellent
0.80-0.89	Good
0.70-0.79	Acceptable

0.6-.69	Questionable
0.5-0.59	Poor
Less than 0.5	Unacceptable

(Eslam Tarek1, 2022).

		N	%
Cases	Valid	20	100.0
	Excluded	0	.0
	Total	20	100.0

a. List wise deletion based on all variables in the procedure.

Reliability Statistics

Cronbach's Alpha	N of Items
.876	32

The resulting Cronbach's Alpha was **0.876**, indicating good internal consistency and reliability of the survey instrument.

3.6 Data cleaning, validation and reliability test

Data Cleaning: The data collected from primary sources and non-participatory observations were recorded, edited, ordered, analyzed, interpreted and presented based on research questions. Data Cleaning was done through the identification and correction spelling errors, removing duplicates and correcting inconsistencies in formatting within variables. After cleaning the responses were coded systematically and assigned to the underlying research questions to enable meaningful interpretation that is consistent with the study's objectives.

Data validation and reliability was conducted to check for logical consistency, accuracy and relevancy ensure all responses fell within expected ranges, and verify alignment between related variables.

To establish the internal consistency and reliability of the research instrument, in this case, the 5 point Likert-scale questions for perceived risks reliability testing was performed through pilot testing using Cronbach's Alpha using SPSS as described in the above.

Chapter Four: Result Analysis and Discussions

4.1 Risk identification and categorization

Depending up on the above interviews questionnaires and literature(list of SMEs risk factors, financial risk factors, supply chain risk factors, market risk factors, human resources risk factors, operational risk factors, technological, social and political risk factors) of qualitative analysis the post war risks faced in small and medium manufacturing enterprises identified risks and categorized into seven categories: financial, supply chain, market, human resource, operational, technological, and socio-political.

A. Financial risks

- ✓ Limited access to financial loans and supports
- ✓ Increasing interest rate
- ✓ Inflation
- ✓ Lack of foreign currency and Currency insatiability
- ✓ Inability to repay loans

B. Supply chain related risks

- ✓ Raw material shortage
- ✓ Broken supply chain (Supply chain disruption)
- ✓ High transport and logistics costs
- ✓ Displaced customers and suppliers
- ✓ Fluctuation of customer demand (Unpredictability of Demand)

C. Market related risks

- ✓ market competition
- ✓ Decreasing market demand
- ✓ Fluctuation market price
- ✓ Change customers market needs and wants
- ✓ Lack of knowledge to new market
- ✓ Lack of market integration
- ✓ Increasing cost of raw materials

D. Human resource related risks

- ✓ Loss of skilled labor

- ✓ Lack of skilled labor
- ✓ Insufficient employee training

E. Operational related risks

- ✓ Decreasing product quality
- ✓ Increasing production cost
- ✓ Infrastructure and facilities damage
- ✓ Decreasing productivity

F. Technological related risks

- ✓ Lack of new technology training
- ✓ Lack of IT and innovation
- ✓ Lack of networking and communications
- ✓ High cost of new technology

G. Social risks and political risks

- ✓ Security risks
- ✓ Psychological risks
- ✓ Political instability
- ✓ Change in government regulation

4.2 Risk registration

A risk register was developed to document each identified risk, its causes, potential impacts, owners and control mechanisms. This tool serves as a central reference for ongoing monitoring and mitigation planning. The risk registration template is attached in appendix.

The risk registration template contains the risk and its category, description of the specific risk factor, consequence of the risk on the SMMEs, likelihood of the risk, impact of the risk, overall risk level , rank, responsible person to handle the risk ,risk trigger and risk response action.

The consequence of these risks on SMMES are decreasing in revenues, increasing in cost of business operations, inability to expand the business, decrease income and decreasing SMMEs survival offer the war, their likelihood and impacts of these risks is higher, from these to mitigate those risks risk owners are SMMEs owner mangers and government. The trigger the signal or symptom the risk are decreasing SMEs survival.

4.3 Quantitative risk analysis

4.3.1 Risk likelihood analysis

The calculated average likelihood of the risk.

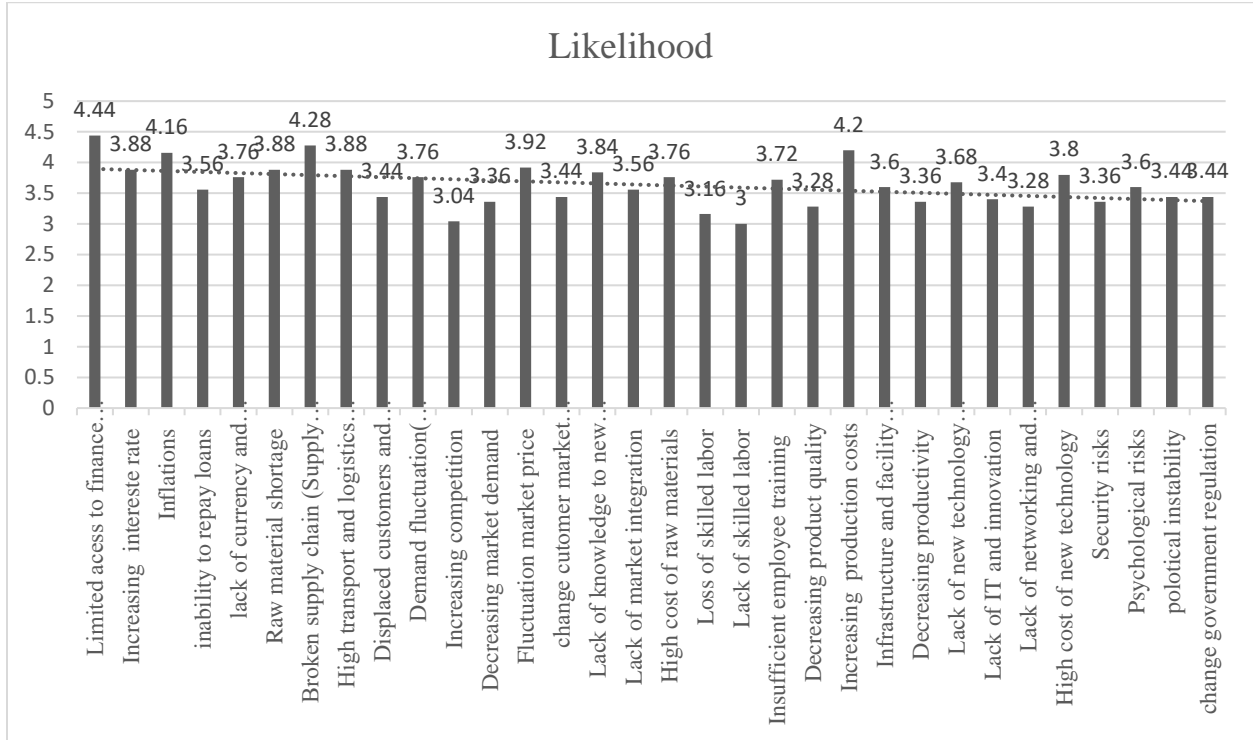


Figure 1 Likelihood of the risk factors

4.3.2 Risk impact analysis

Average risk impact is calculated as the following.

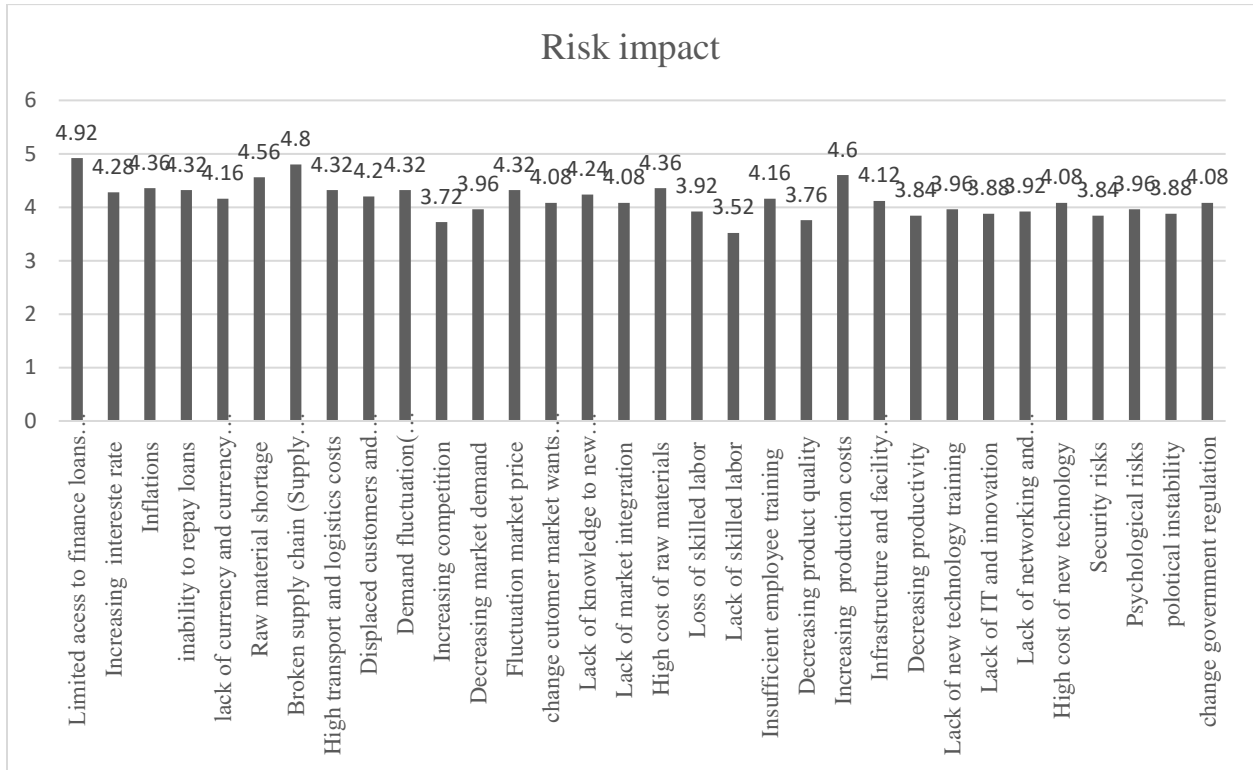


Figure 2 Impact of the risk

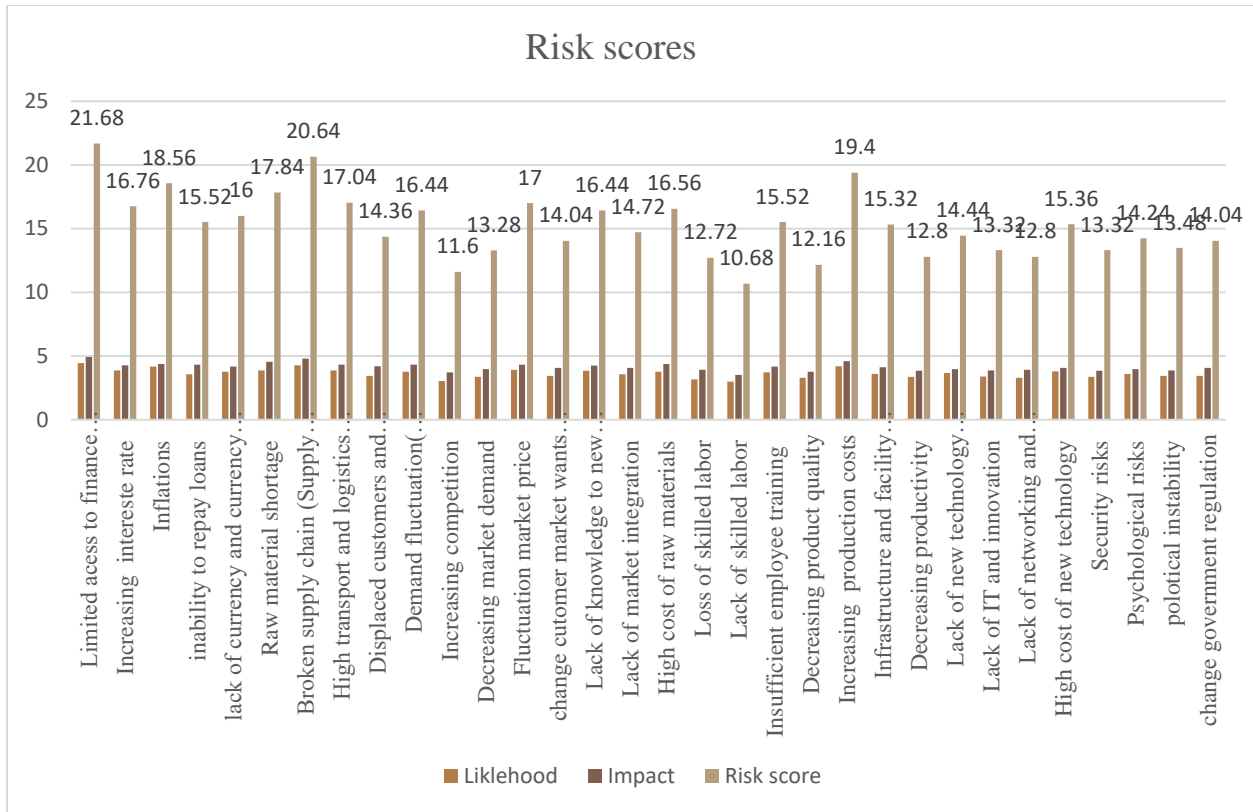


Figure 3 Risk score

Where Risk = Likelihood of occurrence × consequence (impact)

4.3.3 Risk analysis using relative important index

The various risks categorized under different categories was calculate relative important index using the above formula. The higher value of RII represent significant postwar risks affecting SMEs performance. According the result of RII Rank and prioritize the risks according to their impact on the business performance ‘If the RII value is high then the risk is severe and must be on priority. If the RII value is low then the risk is Low or moderate.

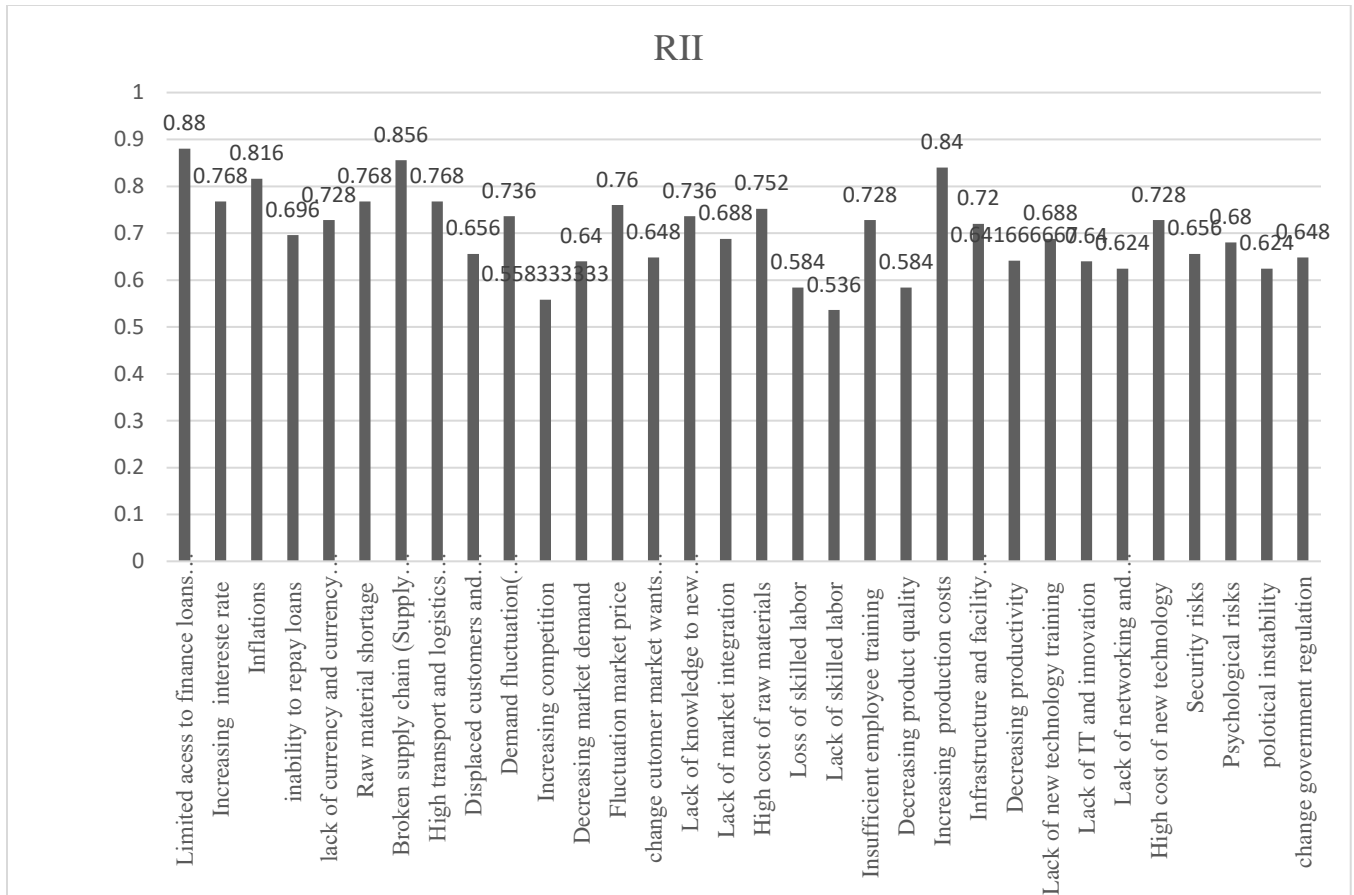


Figure 4 RII

Table 5 quantitative analysis using RII

Risk categorizes	Risk NO.	Risks	RII	RANK
Financial	FR1	Limited access to finance loans and supports	0.88	1
	FR2	Increasing interest rate	0.768	5
	FR3	Inflation	0.816	4
	FR4	Inability to repay loans	0.696	11
	FR5	Currency insatiability and lack of foreign currency	0.728	9
Supply chain related risks	SR1	Raw material shortage	0.768	5
	SR2	Supply chain interruption	0.856	2
	SR3	High transport and logistics costs	0.768	5

	SR4	Displaced customers and suppliers	0.656	14
	SR5	Customer demand fluctuation	0.736	8
Market related risks	MR1	Increasing market competitions	0.5583	20
	MR2	Decreasing market demand	0.64	17
	MR3	Fluctuation of market price	0.76	6
	MR4	change customer want and need	0.648	15
	MR5	Lack of knowledge to new market	0.736	8
	MR6	Lack of market integration	0.688	12
	MR7	Increasing cost of raw materials	0.752	7
Human resource related risks	HR1	Loss of skilled labor	0.584	19
	HR2	Lack of skilled labor	0.536	21
	HR3	Insufficient employee training	0.728	9
Operational related risks	OR1	Decreasing product quality	0.584	19
	OR2	High production cost	0.84	3
	OR3	Infrastructure and facility damage	0.72	10
	OR5	Reduce productivity	0.6416	16
Technological risks	TR1	Lack of new technology training	0.688	12
	TR2	Lack of IT and innovation	0.64	17
	TR3	Lack of networking and communications	0.624	18
	TR4	High cost of new technology	0.728	9
Social risks	SSR1	Security risks	0.656	14
	SSR2	Psychological risks	0.68	13
	SSR3	Political instability	0.624	18
	SSR4	Change government regulation	0.648	15

Table 6 Average RII

RISK	RII
Financial risks	0.777
Supply chain risks	0.75
Market risks	0.683
Human resources risks	0.61
Operational risks	0.696
Technological risks	0.67
Sociopolitical risks	0.652

4.4 Risk prioritization

Risk prioritization is the process of analyzing the identified risks and deciding the order in which their mitigation deserves you time and attention. Based on RII values and quantitative assessment, risks were ranked to determine those requiring immediate intervention. High-priority risks were selected for further analysis and strategic planning so from the above RII result post war SMMEs risk prioritization is follows.

Table 7 Risk prioritization

Risk NO.	Risks	RII	RANK
FR1	Limited access to finance loans and supports	0.88	1
SR2	Supply chain interruption	0.856	2
OR2	High production cost	0.84	3
FR3	Inflation	0.816	4
FR2	Increasing interest rate	0.768	5
SR1	Raw material shortage	0.768	5
SR3	High transport and logistics costs	0.768	5
MR3	Fluctuation of market price	0.76	8
MR7	Increasing cost of raw materials	0.752	9

SR5	Customer demand fluctuation	0.736	10
MR5	Lack of knowledge to new market	0.736	10
TR4	High cost of new technology	0.728	10
HR3	Insufficient employee training	0.728	10
FR5	Currency insatiability and lack of foreign currency	0.728	10
OR3	Infrastructure and facility damage	0.72	15
FR4	Inability to repay loans	0.696	16
MR6	Lack of market integration	0.688	17
TR1	Lack of new technology training	0.688	17
SSR2	Psychological risks	0.68	19
SSR1	Security risks	0.656	20
SR4	Displaced customers and suppliers	0.656	20
MR4	change customer want and need	0.648	22
SSR4	Change government rule and regulations	0.648	22
OR5	Reduce productivity	0.6417	24
TR2	Lack of IT and innovation	0.64	25
MR2	Decreasing market demand	0.64	25
TR3	Lack of networking and communications	0.624	27
SSR3	Political instability	0.624	27
OR1	Decreasing product quality	0.584	29
HR1	Loss of skilled labor	0.584	29
MR1	Increasing market competitions	0.5583	31
HR2	Lack of skilled labor	0.536	32

The Risk ranks and importance are attained from the analysis done by using Relative Importance Index (RII). This is based on the obtained responses via the Questionnaire survey. The ranks of the risks are based on how much affected they can cause to the SMMEs in post war period. According to the RII important analysis the first four (12.5%) risks FR1, SR2, OR2, and FR3 with RII >0.8 have very high important level that means those are critical risks that needs immediate response to

enhance post wars economic recovery through improving SMMEs performance and the last four (12.5%) risks OR1, HR1, MR1 and HR2 have RII between 0.4 and 0.6 so those risks have medium risk important levels. The remaining 24 (75%) risks are ranged their RII value between 0.6-0.8 this indicated higher risk level.

Lack of finance (Naradda Gamage et al., 2020) (Mulugeta, 2022) (Karmaker et al., 2023), (JIBREL, 2023), increase interest rate (Karmaker et al., 2023), supply chain interruption (Karmaker et al., 2023) (Malik et al., 2022), technological risks (Karmaker et al., 2023), demand fluctuations (Foli et al., 2022) (Turgay & Aydin, 2023), transportation disruption (Turgay & Aydin, 2023), spike in raw materials cost, extended loss of electricity, cash crisis (Sunjka et al., 2020), Access to Markets and Disruptions in the Supply Chain, high cost of transportation, and Foreign exchange shortages (Morvey et al., 2024), losing the customers (Dvorský et al., 2018), strong competition (Hudakova & Dvorský, 2019), lack of knowledge about marketing channels and a failure to develop marketing networks, lack of good relationships with other domestic and foreign firms (Manas & Setapa, 2021) (Dvorský et al., 2018), lack of employee training (Holátová & Brezinova, 2019) (Knezović et al., 2020) (Githii Stephen Kagwathi1, 2020), lack of employee knowledge, skills, (Dumitrescu & Deselnicu, 2018) (Mubarik et al., 2018) (Githii Stephen Kagwathi1, 2020), reduce productivity, increase production costs (Naude & Chiweshe, 2017) (Manas & Setapa, 2021) (Jiacheng Chen1, 2023) technological aspect (Ombongi & Long, 2018), social and political instability (Ozdemir2, 2020) are the critical risk in SMEs

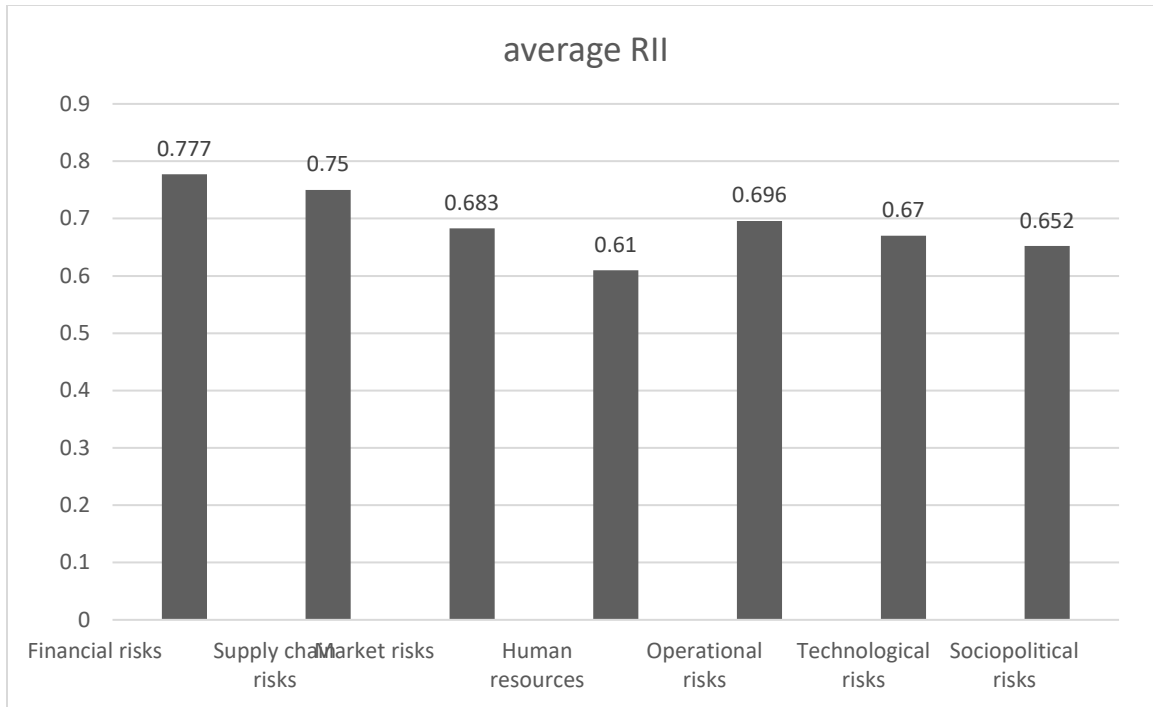


Figure 5 Average RII

Each risk category was ranked using the average Relative Importance Index (RII). The highest-ranked risks category were financial risks (RII = 0.77), supply chain risks (RII = 0.75), operational risks (RII=0.696), market (RII=0.683), technological (RII=0.67), sociopolitical (RII=0.61) and human resource risks (RII = 0.61).

These rankings highlight areas that require immediate attention and strategic intervention. And Qualitative feedback indicated that many risks are interlinked. Financial shortages contribute to operational delays, while supply chain issues lead to reduced productivity and market competitiveness. This interconnectedness underscores the need for integrated risk management strategies. SMEs fail to survive due to post war risks and challenges in Tigray .regardless of sources of risks financial risks are the highest risks affected SMMES after the war and this is risks can main source of all the other factors so managing of financial risks is the corner stone for mitigating the other remaining post war risk factors. Next to financial risks supply chain risks are the second major risks and from the supply chain risks supply chain disruption or broken supply chain is the most critical risk. Supply Chains are subject to disruptions potentially resulting in financial and/or other non-financial losses. In the case of Small and Medium Enterprises (SMEs) these disruptions and subsequent impacts can have severe effects which can jeopardize their survival.

4.5 Risk matrix

The standard risk map, which is used to determine the risk zone for each identified risk factor. The matrix is 5 X 5, with the impact ranging from VL to VH on the horizontal axis and probability of occurrences (with the same range) on the vertical axis. The vertical axis represents likelihood of the risk and the horizontal axis indicates impact of the risks.

The matrix is divided into four distinct color coded zones green, yellow, orange and red each indicating a different level of risk severity.

- ✓ Red zone: This zone represents the most critical risks, with a risk score ranging from 16 to 25 (high Vs high or very high and vice versa). These are classified as extreme or very high-level risks, demanding immediate attention and mitigation strategies.
- ✓ Orange Zone: Risks within this category have scores between 10 and 15 (low Vs very high, medium Vs high or very high and vice versa) are categorized as high-level risks. These require proactive management to reduce potential adverse outcomes.
- ✓ Yellow Zone: Representing moderate level risks, this zone includes risks with scores from 5 to 9 (very low Vs very high, low Vs low, medium or high and vice versa). While not urgent, these risks still warrant monitoring and possible intervention.
- ✓ Green Zone: This area denotes low-level risks, with scores ranging from 1 to 4. These are considered minimal threats and typically require only routine observation.

The classification of each risk within the matrix is based on likelihood and impact. The overall risk score is calculated using the formula:

Risk Level = Average Likelihood × Average Impact)

Table 8 risk matrix

L I K E L I H O O D	5(frequently)	5Medium	10Medium MR1	15High FR4,TR4,S SR2	20extreme FR3,	25extremeFR1, SR2
	4 (often)	4law	8Medium	12High SR4,MR2, MR4,MR6, HR1,OR1, OR4.SSR3	16extrem FR2,FR5, SR3.SR5, MR5,MR 7,HR3	20extremeSR 1,MR3,OR2
	3(moderate)	3law	6Medium	9Medium	12High TR2,TR3, SSR1	15High eOR3,TR1,SS R4
	2 (unlikely)	2law	4law	6Medium	8Medium	10Medium R2
	1 rare	1law	2law	3law	4law	5Medium
		1(in significant)	2(minor)	3(significa nt)	4(major)	5(extreme)
		Impact				

4.6 Major risk descriptions

From the above risk prioritization of both RII and risk matrix the first top ten (10) risk descriptions is summarized as the flowing:

Table 9 Major risk descriptions

	Risk	Couse	Impact
1	Limited access to financial loans and supports (0.88)	unstable banking sector and other financial institution limiting their ability to provide support to SMEs and economic instability	Difficult for businesses to access loans, financial resources and supports, limits the ability to invest in growth and manage cash flow
2	supply chain interruptions or broken supply chain (0.856)	breakdown in transportation and logistics networks, displacements of customers and suppliers, communication break dawns	Disrupting production and delivery schedules, delays in product availability, missed deadlines, and lost sale
3	Increasing production cost (0.84)	disruptions in supply chains, raw material shortages and inflation	Difficult for SMEs to remain competitive and reducing buying power of the customers and profitability
4	Inflation (0.816)	Economic instability, scarcity of goods, and the devaluation of currency	Increase the costs of raw materials and labor for SMEs, decreasing their ability to remain profitable and increasing production cost
5	Increasing interest rates (0.768)	To control inflation or stabilize the currency and private lenders lack of hard currency	Making it difficult to reinvest or expand business, unable to repay loans
6	Increasing transport and logistics costs (0.768)	Damaged infrastructure, increase fuel cost and equipment's	Making it more expensive for SMEs to move goods or raw materials within and outside of Tigray inflate operating costs and decrease profit margins

7	Fluctuation of market price (0.678)	Prices of goods, raw materials, and products may fluctuate due to economic instability	Affects cost management and profitability
8	Increasing cost of raw materials (0.76)	Supply chain disruptions, inflation, currency instability and shortage of materials shortage of suppliers	Increasing manufacturing costs, reducing profitability and competitiveness
9	Customer demand fluctuation (0.752)	unpredictable demand patterns, economic uncertainty and changes in consumer behavior	Difficult to forecast demand, making it harder to plan production and manage inventory
10	Lack of knowledge to new market (0.736)	changes in the demographics and consumption patterns of the population and market instability	Decrease sales revenue and profitability
11	Increasing cost of new technology (0.728)	High costs associated with adopting new technologies	leads technological gap and prevent SMMEs from keeping up with industry advancements
12	Insufficient employee training (0.728)	lack the resources to provide effective training programs, financial constraints are severe	Reduce the overall efficiency and performance of their work force, decreasing quality and productivity
13	Currency insatiability and lack of foreign currency (0.728)	Disrupted international trade, lack of foreign reserves and decreasing export products	Make importing materials or paying foreign suppliers difficult and expensive, which severely impacts overall manufacturing operations
14	Infrastructure and facility damages (0.72)	as factories, warehouses, water, electricity and roads have been damaged or destroyed during the conflict	Making difficult SMMEs operations, decrease productivity and efficiency

4.7 SMMEs Risk management strategies

From the above risk identification qualitative and quantitative risk analysis process various risk factors under the categorization of financial risks, supply chain risks, market risks, human resources risks, operational risk, technological risks and sociopolitical risks are identified, analyzed and prioritized to be taken attention and managed for these extremely affected risks.

Risk management is vital in SMMEs to reduce exposure to business loss and create a better chance of survival. The management strategies are:

- ✓ Micro finance institutions and other financial organizations should improve access to finance through offering a better lending terms and conditions and government to establish a centrally managed marketing sites that will equally give access to market in order to improve performance of SMEs (Mulugeta, 2022).
- ✓ SMEs basic risk mitigation strategies are diversification, collaboration, insurance, and use of credit score cards
- ✓ The basic requirements for SMEs developments to be fulfilled are financial loans and supports, adequate infrastructure, adequate materials supply, market knowledge, certification standard, technical assistance, management capabilities, distribution channels, effective training and technological aspects.
- ✓ SMMEs survival strategies are expanding dynamic capabilities, R and D expenditure, technological innovation, New partnership, being part of internal supply chain, FDI, social capital and flexible relationship with partners, internet and electronic commerce, credit grant schemes, linkage of formation, skills developments (Gamage, 2020).
- ✓ Implementation of SMEs post war improvements such as tariff reductions, reduction or elimination of nontariff barriers, better market access, easier interactions with customs, trade facilitation, intellectual property protection, a more efficient and transparent regulatory environment, and dispute resolution mechanisms (Deanna Tanner Okun, 2020).

4.7.1 Financial risk management strategies

Limited Access to finance, inflation, high interest rate, inability to repay loans and lack of foreign currency or currency instability are a key post war risk and obstacle for the growth and

development of small and medium-sized manufacturing enterprises in conflict affected situations in Tigray. Financial issue is the core and basic issue associated to all other risk so the strategies conducting to mitigate financial risks are taken as one step to mitigate all other risks. Those basic strategies are:

- ✓ Access to loans, reducing interest rates on loans, and the design of repayment plans exerted positive and statistically significant effects on the financial resilience of SMEs. These factors' crucial role in determining SMEs' financial stability (MSOMI1, 2023) (Wajebo, 2022).
- ✓ Strengthening the rule of law, government effectiveness, and control of corruption while increasing financial depth and reducing public sector borrowing and banking market concentration can help close the small and medium-sized enterprise financial inclusion gap between fragile and conflict affected situation countries and the best performing countries (Calice, 2023).
- ✓ Developing social capital through networks; SME friendly policy framework; proper information management; and improvement of management skills.
- ✓ Alternative sources of finance available to SMEs include; investment into capital markets, long term financing, leasing and franchising. SMEs should put emphasis on the development of social networks as a mechanism to develop financing opportunities. (Eluphy Banda-Nyirenda1, 2023).
- ✓ Provide financial assistance through lowering the interest rates and simplifying the borrowing procedures must be given to SMEs to enable them to avail the necessary finance and capital for their business also the government must support SMEs by simplifying the regulations for SMEs such as levying taxes (Mboya, 2019).
- ✓ Ensuring stable macroeconomic conditions especially regarding exchange rates, interest rates and inflation, facilitation of partnerships; entrepreneurial promotion and support; ease of access to finance; focus on export promotion; and competitiveness development (Meyer D.F., 2017).
- ✓ Establishing a formal financial institution or bank to facilitate and provide loans at lower interest rate, flexible and affordable collateral, and long repayment period to secure the financial needs of SMEs (HAGOS, 2020).

If financial risk control techniques are implemented effectively, SMEs will operate at enhance to a moderate extent (AJAYI, 2023). There is significant relationship between financial risk control techniques and organizational performance, financial risk control should be put in place to reduce the unlikely risk that can affect the business (Sunday Adekunle Aduloju1, 2022).

4.6.2, Supply chain risk management strategies

The main post war risks in SMMES are broken supply chain or supply chain disruption Raw material shortage, High transport and logistics costs, displaced customers and suppliers and Change in customer demand or demand fluctuation. These supply chain risks cannot be eliminated entirely, but their impact can be mitigated by proactively evaluating the supply chain's risk level and developing a risk management plan to mitigate their effect.

- ✓ work with customer on SCRM, work with law enforcement/emergency management, on SCRM, risk manager goes beyond just buying insurance, have business continuity manager or group, have emergency operations center and stimulate different supply chain risks and distributions (Sunjka1, 2022).
- ✓ Supply management (SM), proficient information management (IM), streamlined distribution strategies, and strong marketing and sales strategies, in addition to customer relationship management (CRM) and effective post-sales services (Boadi, 2024).
- ✓ Eliminating unreliable suppliers to reduce supply risk and impact-oriented measures, as possible (Aleksandra Aleksić, 20121).
- ✓ Mitigation measures can be implemented at the strategic level alternative suppliers), the tactical level (improved demand forecast) as well as at the operational level (business continuity plans) (Ziegenbein, 2020).

4.6.3 Operational risk Management strategies

The main post war operational risks in SMMES are increasing production cost, decreasing product quality, decreasing productivity and infrastructure and facility damages. From these increasing manufacturing cost and facility and infrastructures damages are the most critical risks facing in SMES after the war in Tigray.

Operational risk management is linked to financial performance, has a significantly positive effect on improving the profitability of the enterprise and reducing the indebtedness of the enterprise, as well as reducing the inability to repay the enterprise's obligations (Mária,et,el, 2023), so its management strategies are

- ✓ collaboration with government and non-government organizations should focus on implementing stringent quality control measures and regular inspections throughout the production process
- ✓ Invest in upgrading machinery or systems to ensure product consistency and efficiency, Train employees regularly on best practices to maintain product standards.
- ✓ Optimize production processes by reducing waste and improving efficiency, Negotiate with suppliers for better pricing or find cost-effective alternatives
- ✓ Consider automation where possible to reduce long-term labor costs and develop contingency plans, such as backup facilities or alternative supply chain routes, to minimize disruption.
- ✓ Invest in infrastructure insurance to protect against significant losses and Prioritize repairs and use temporary solutions if necessary to keep operations running (Isnaini Rodiyah(B), 2023).
- ✓ Through effective Risk Management System into the Quality Management System raising the quality of their goods to increase competitiveness (Isnaini Rodiyah(B), 2023).

4.6.4 Market risk management strategies

SMEs in postwar market contains huge marketing problems such as increasing competition, decreasing market demand, Fluctuation market price, Market demand fluctuations, Lack of knowledge to new market, Lack of market integration Increasing cost of raw materials and Fluctuation of commodity price are post war SMMEs risk factors related to market.

- ✓ The major post war marketing strategies in SMEs are competitive marketing strategy, relationship marketing strategy, social network marketing strategy, related diversification and green marketing strategy, for development of SMEs in the postwar frontier market, in terms of financial perspective, customer perspective, people or employee perspective, growth of enterprise and social development or social results and these of all strategies are also roadmap to foothold the nation towards the emerging market.
- ✓ Relationship marketing attempts to involve and integrate customers, suppliers and other infrastructural partners into a firm's developmental and marketing activities. Sophisticated technology application like computers and telecommunications that allow the producers to interact with the customers. Social network marketing strategy in the SMEs, firms can employ these marketing strategies to disseminate the information to customers and all

other stakeholders to deal with global competition. This innovation social network marketing strategy comprises a unique, innovative and coherent design of the strategic marketing for the SMEs. Market diversification also drives high performance in medium enterprises (Sathana, 2018).

- ✓ Monitor market information regularly as to apply any modifications to its products or services so they can reduce their exposure to market risk.
- ✓ Creation of specialized training and development programs that are intended to help businesses increase their overall knowledge of the financial risks (Isra Ismail Ahmed, 2023).
- ✓ Conducting marketing research on the area of customer demand and market behavior regularly is very significant for knowing new market and improve sales profit. To fully recover, SMEs need to build their capacity and invest more in market intelligence (Boadi, 2024).

4.6.5 Human resource risk managements strategies

The most important post war SMMEs human resource risk factors are insufficient employee training, lack of skilled workers and loss of skilled and experienced workers. And their management strategies are:

- ✓ HRD activities are essential for SMEs for long term survival. Focuses on HRD activities such as training and development, career planning, self-directed learning, employee motivation have led towards a better performance, higher creativity and innovation, retaining, staff, better service, equality and enrich human capital (Omar, 2019).
- ✓ Identification, evaluation and checking of desired knowledge, traits, skills and characteristics which are considered relevant for realization of tasks on certain position in the enterprise, are carried out. More severe competition on the market is characteristic of modern business, and employees with higher degree of education/training often represent competitive advantage of SMEs.
- ✓ Improving entrepreneur skills, transform to advanced technology, enhancing staff skills help to reduce business failure (B.E.A. Jayasekaraa, 2020).
- ✓ Provide sufficient training on skill development of all stakeholders owners, managers and employees

4.6.6 Technological risk management strategies

The post war technological risk are high cost of new technology, lack of new technology training, lack of IT and communications. Management strategies are:

- ✓ Digitalization of value-adding activities in order to pursue new digital manufacturing levers to eventually realize higher productivity levels, higher quality, an optimized use of resources, and increased production throughput (Lechuga, 2021).
- ✓ Government and support agencies should focus on providing appropriate training and facilitate the acquisition of new technology and skill required to operate machinery to improve technical and managerial skill of enterprises owners and managers.
- ✓ Provide support for R&D activities, establish business development centers, support of innovation and create inter-firm linkage through various business premises (HAGOS, 2020) (Ombongil 2018).

4.6.7 Social and political risk management strategies

The main post war SMEs risks related to socio political are security risks, psychological, political instability and change government rules and regulations.

- ✓ The most efficient way to reduce risk in the context of economic and political instability is diversification (distribution of risks between several business participants) (Gestión,et,el 2018).
- ✓ Ensuring the wellbeing and general satisfaction of the workforce. Further, the level of attention that is paid to managing psychosocial risks appears to depend on managers and the extent to which they understand taking care of their workers wellbeing is part of their ethical responsibility and something that needs to be carried out as a core element of their job.
- ✓ Creating a good atmosphere in case of security, political stability and government regulations so that people feel comfortable in sharing issues of concern to them ((EU-OSHA), 2022).

Chapter Five: Conclusions and Recommendations

5.1 Conclusions

This study assessed the post-war risks faced by small and medium manufacturing enterprises (SMMEs) in Mekelle, Tigray, and proposes management strategies to support their recovery and sustainability. The findings indicate that SMMEs are exposed to a range of risks categorized into seven major groups: financial, supply chain, market, and human resource, operational, technological, and socio-political risks. These risks have significantly affected the survival and recovery of SMMEs.

The top important risk factors were identified through statistical tool using Relative Importance Index (RII) ranking result. According to RII results lack of financials loans and supports, supply chain disruption (broken supply chain), increasing overall production cost and inflations are top four factors with RII >0.8 have very high important risk level indicates those are critical risks that needs immediate response to enhance post wars economic recovery through improving SMMEs performance) and will hinders their growth, performance and survival of small and medium manufacturing enterprises in Tigray. The study finds that with appropriate identification, categorization, and prioritization of risks, followed by tailored management strategies, the negative impacts can be mitigated.

A collaborative of government, funding agencies, technical institutions, business owners, managers and business associations to improve financial loans and supports, diversification of markets and supply chain, enhance human resource development through effective training and educations, process optimizations and digitization of manufacturing process, conducting research development and innovations on markets and customers and creating a good atmosphere in security, psychological and political stability are risk management strategies, and plays and crucial role in SMMES post war survival.

5.2 Recommendations

Based on the study findings, the following recommendations are proposed

- ✓ Develop flexible and low-interest loan schemes and establishing partnerships between banks, microfinance institutions, and development agencies to ease financing requirements and collateral demands targeted at post-war SMMEs.
- ✓ Promote the diversification of suppliers and distribution channels to minimize market and suppliers disruptions and facilitate logistics support programs to reduce transportation costs and ensure material availability
- ✓ Collaborate with universities, colleges, and vocational training centers to upskill the employees, managers and owners.
- ✓ Adopt customer-focused market research and product diversification strategies to help SMMEs reach broader markets.
- ✓ Invest in product developments and market research development after the crises to overcome the post war challenges related to market and business operations
- ✓ Government should implement policies and strategies that prioritize SMME recovery in postwar development agendas and support SMMEs in finance loans and supports, human capital developments, marketing linkage, introducing new technologies, strengthen local business associations and provide access to essential machineries and digital tools
- ✓ Federal and regional governments should prioritize rebuilding infrastructure (roads, power, water and telecom).

5.3 Future Research Studies

The study focuses on the identification of post-war risk factors associated with Small and Medium Manufacturing Enterprises (SMMEs) and the management strategies employed to address them. However, to build upon the findings of this research, the following areas are recommended for future study.

- ✓ Post-war risk assessments and managements in SMMEs using advanced decision-making tools such as Monte Carlo Simulations, the Analytic Hierarchy Process (AHP), and sensitivity analysis, to enhance the accuracy and reliability of risk evaluation.
- ✓ The interrelationships among identified post-war risk factors, which could provide a deeper insight into how these risks interact and compound each other.

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Appendix

Date

Title: Post war risk identification and evaluation small and medium manufacturing enterprises (SMMEs) in Tigray

Section 1: Demographic profile

- Name:
- Sector:
- Position:
- Educational level:

Section 2: Risk identification and evaluation

#1: List the Postwar Risk and challenges facing Small and Medium Manufacturing Enterprises in Tigray. And what do you think their likelihood (probability of these risk occurring) and potential impacts/consequences of each risks on your business performance?

Assign the symbol ☑ in which do you agree according to the following scale. Where (1= very low, 2=low, 3=medium, 4=high, 5= very high)

s/n	Risk type	likelihood						Impact				
		1	2	3	4	5		1	2	3	4	5
	Financial risks											
1												
2												
3												
4												
5												
	Supply chain related risk											
1												
2												
3												
4												

	Market related risks													
1														
2														
3														
4														
	Human resource related risks													
1														
2														
3														
4														
	Operational risks													
1														
2														
3														
	Technological risks													
1														
2														
3														
	social risks	1	2	3	4	5				1	2	3	4	5
1														
2														
3														
4														
5														
	Other risks													
1														
2														
3														
4														

Section 3: Risk Mitigation Strategies

#2: What strategies has your enterprise adopted to mitigate these risks since the war?

Answer:

.....

Thank you for your time!

Table 10 pilot testing results

s/ n	Risk type	Respondents																			
		R 1	R 2	R 3	R 4	R 5	R 6	R 7	R 8	R 9	R 10	R 11	R 12	R 13	R 14	R 15	R 16	R 17	R 18	R 19	R 20
	Financial risks																				
1	Limited access to financial and loans and supports	25	20	25	25	20	25	20	20	20	20	16	20	25	20	25	25	20	25	20	20
2	Inflation	16	20	25	16	12	12	12	16	20	16	16	20	16	20	25	16	12	12	12	12
3	Increase interest rate	16	20	25	16	12	12	12	16	20	20	20	16	16	20	25	16	12	12	12	12
4	Inability to repay loans	15	20	25	16	9	12	12	16	16	12	12	16	16	20	25	16	9	12	12	12
5	Lack of currency (currency instability)	16	20	25	16	12	12	12	20	20	16	12	16	16	20	25	16	12	12	12	20
	Supply chain related risk																				
1	Broken supply chain (Supply chain disruption)	20	20	25	20	16	12	12	16	20	20	12	12	20	25	20	25	16	12	12	12
2	Lack of raw materials	25	20	20	25	12	12	12	20	20	12	12	20	25	20	25	25	12	12	12	20

3	Increase transportation and logistics costs	2 0	2 0	2 0	2 0	1 6	2 0	1 6	1 6	1 6	1 6	1 6	1 9	2 2	2 0	2 0	2 0	1 6	2 0	1 6	1 6	
4	Displaced customer and suppliers	1 5	1 6	2 0	1 5	1 6	1 6	1 2	1 6	2 0	1 2	1 9	1 8	1 5	1 6	2 0	1 5	1 6	1 6	1 6	1 2	1 6
5	Fluctuation of commodity price	1 6	2 0	2 0	2 0	1 6	2 0	1 6	2 5	1 2	1 6	1 2	1 9	1 6	2 0	2 0	2 0	1 6	2 0	1 6	2 5	
Market related risks																						
1	Increasing market competitions	9	9	5	6	4	6	9	6	2	9	0	9	9	9	5	6	4	6	9	6	
2	Decreasing market demand	1 6	2 0	1 6	1 6	1 6	1 6	1 2	1 5	1 2	1 0	1 8	1 2	1 6	2 0	1 6	1 6	1 6	1 6	1 2	1 5	
3	Fluctuation of market price	2 0	2 0	1 6	1 2	1 9	1 6	1 6	2 5	1 9	1 2	1 6	2 0	2 0	2 0	1 6	1 2	1 9	1 6	1 6	2 5	
4	change customer want and need	9	6	6	2	2	6	0	2	2	2	9	9	9	6	6	2	2	6	0	2	
5	Lack of knowledge to new market	2 0	2 0	1 6	2 0	1 6	1 6	1 2	2 5	1 9	1 6	1 9	2 6	1 6	2 0	2 0	1 6	2 0	1 6	1 6	2 5	
6	Lack of market integration	1 6	1 2	2 0	1 6	1 6	2 5	1 2	9	0	2	2	6	1 6	1 2	1 6	1 6	1 6	1 5	2 9	1 9	
7	Increasing cost of raw materials	1 6	2 0	2 0	1 6	1 6	1 5	2 0	2 6	1 6	1 6	2 0	1 2	1 6	2 0	2 0	1 6	1 6	1 6	1 5	2 0	
Human resource related risks																						
1	Loss of skilled workers	2 0	1 2	2 0	2 0	1 9	1 2	1 2	9	6	8	9	9	2	1	2	2	9	2	2	9	
2	Lack of skilled workers	1 6	1 6	1 6	1 6	9	6	8	9	6	9	6	9	6	1	6	6	6	9	6	8	9
3	Lack of new training	1 6	1 6	1 6	1 6	1 6	1 6	2 2	1 0	1 6	1 2	1 6	2 0	1 6	1 6	1 6	1 6	1 6	1 6	1 2	2 0	
Operational risks																						
1	Decreasing product quality	1 6	1 6	1 6	1 6	9	9	8	0	6	2	6	9	6	1	6	6	6	9	9	8	0

2	Increasing production cost	2	1	2	2	1	1	2	2	1	2	2	1	2	1	2	2	1	1	2	2
		0	6	0	0	6	6	5	0	6	0	0	6	0	6	0	0	6	6	5	0
3	Infrastructure damage	1	1	1	1		1	1	2	1	1		1	1	1	1	1		1	1	2
		6	2	6	6	9	2	6	0	6	2	9	2	6	2	6	6	9	2	6	0
4	Decreasing productivity	1	1	2	1		1	2	1	1	1		1	1	1	2	1		1	2	1
		6	2	0	6	9	6	0	6	2	2	3	6	6	2	0	6	9	6	0	6
	Technological risks																				
1	Lack of new technology transfer	1	1	1	1	1	1	2	1	2	1	1		1	1	1	1	1	1	2	1
		6	6	6	6	2	6	0	6	0	6	2	8	6	6	6	6	2	6	0	6
2	High cost of new technology	1	1	1	1	1	1	2	1		1			1	1	1	1	1	1	2	1
		6	2	6	2	6	2	0	6	9	6	8	9	6	2	6	2	6	2	0	6
3	Lack of new technology training	1	1	1	1	1	1	2	1		1		1	1	1	1	1	1	1	2	1
		6	2	6	2	6	6	0	6	9	2	8	2	6	2	6	2	6	6	0	6
4	Lack of IT and innovation	1	1	1	2	1	2	2	1	1	1	1		1	1	1	2	1	2	2	1
		6	6	6	0	6	5	5	6	6	6	2	9	6	6	6	0	6	5	5	6
	Social and political risks																				
1	Security risks	1	1	1	1			1	1	1	1		1	1	1	1	1			1	1
		6	2	6	6	6	9	2	6	6	2	9	6	6	2	6	6	6	9	2	6
2	Psychological risks	1	1	1	1	1	1	1	1	1	1	2	1	1	1	1	1	1	1	1	1
		2	6	6	2	6	6	2	6	6	6	0	2	2	6	6	2	6	6	2	6
3	Political instability	1		1		1	2		1	1	1		2	1		1		1	2		1
		2	9	6	9	6	0	9	6	6	6	9	0	2	9	6	9	6	0	9	6
4	Change government regulations		1	1	1	1	1	2	1	1	1				1	1	1	1	1	2	1
		9	6	6	2	2	6	0	2	2	2	9	9	9	6	6	2	2	6	0	2

Date

Title: Post war risk identification and evaluation small and medium manufacturing enterprises in Tigray

Section 1: Demographic profile

- Name:
- Sector:
- Position:
- Educational level:

Section 2: Risk identification and evaluation

#1 Review the following post war risks facing Small and Medium Manufacturing Enterprises in Tigray and give your opinion on the likelihood of these risks occurring and potential impacts/consequences of these risks on the business performance? Assign the symbol in which do you agree according to the following scale. Where (1= very low, 2=low, 3=medium, 4=high, 5= very high)

s/n	Risk type	Likelihood						Impact				
		1	2	3	4	5		1	2	3	4	5
	Financial risks											
1	Limited access to finance and loans											
2	Inflation											
3	Increase interest rate											
4	Inability to repay loans											
5	Lack of currency (currency instability)											
6	Lack of loan availability											
	Supply chain related risk											
1	Broken supply chain (Supply chain disruption)											
2	Lack of raw materials											
3	Increase transportation and logistics costs											
4	Displaced customer and suppliers											
5	Demand fluctuation											
	Market related risks											
1	Lack of customer demand											
2	Lack of market integration											
3	Fluctuation of commodity price											
4	Lack of knowledge to the new market											

5	Increase competition													
6	Change customer need													
7	Increasing cost of raw materials													
	Human resource related risks													
1	Loss of skilled workers													
2	Lack of skilled workers													
3	Lack of new training													
	Operational risks													
1	Decreasing product quality													
2	increasing production cost													
3	Infrastructure damage													
4	Decreasing productivity													
	Technological risks	1	2	3	4	5			1	2	3	4	5	
1	Lack of new technology transfer													
2	High cost of new technology													
3	Lack of new technology training													
4	Lack of IT and innovation													
	Social risks													
1	Security risks													
2	Psychological risks													
3	Political instability													
4	Change government regulations													
	Others													

Section 3: Risk Mitigation Strategies

#2: What strategies has your enterprise adopted to mitigate these risks since the war?

Answer:

.....

Thank you for your time!

Table 11 Risk registration

R/n	Risk category	Description	Consequence	Li ke li h o o d	I m p a c t	L e v e l	R a n k	Risk owner	Risk response	Trigger
	Financial risks									
F1	Limited access to financial loans and supports	Making it difficult for enterprise to access loans and financial resources	Prevent businesses from expanding, upgrading equipment, or investing in new projects, ultimately stunting growth and making it harder to compete	V er y hi g h	V e r y hi g h	V e r y hi g h	1	Government, funding agencies and financial institutions, owners and manager	Partnership with international organization, NGOs and funding agencies. government should access finance to SMEs	Declining credit worthiness or instability in financial institutions 'shortage of financial loans and supports
F2	increasing interstate rate	High cost of borrowing	reducing profitability and making debt repayment more difficult	M ed iu m	H i g h	H i g h	5	Government, financial institutions, owners	Advocate for government intervention to reduce interest rates or create SME-specific	Central banks, financial institutions and government

								and manager	financial institutions	s raising interest rate
F 3	Inflations	Financial instability, the general price level of goods and services rises	Difficult to secure funding and manage cash flow and reducing profit margins, increased production costs and reduced purchasing power for consumers	H ig h	H i g h	H i g h	4	Govern ment, financial intuition , owners and manager s	create cost-control measures like bulk purchasing or against inflation	Gradually rising prices of goods and services
F 4	Inability to repay loans	Failed in the design of loan repayment plans	Questioned enterprise survival leads to penalties and damaged reputation or legal consequences.	M ed iu m	H i g h	H i g h	1 1	Owner, manager s and governm ent	Revise the loan repayment plans and canceling for interest rate of war time periods of SMMEs	Decreased revenue or financial difficulties to repay loans
F 5	Lack of foreign currency and Currency instability	Unstable exchange rate of foreign currency and shortage of foreign currency	Difficult to import raw materials and equipment's	H ig h	H i g h	H i g h	9	Govern ment and financial intuition s	Create alternative funding options and digital payment system	Fluctuation in exchange rates or restrictions on foreign currency exchange
	Supply chain									

S1	Raw material shortage	Lack of necessary raw materials and equipment's	Production delays, higher costs, and inability to meet customer demand.	H i g h	V e r y H i g h	V e r y H i g h	5	Supplier owners and managers	Establish alternative source of raw materials suppliers and partnership between SMMEs	Scarcity of raw materials and equipment's
S2	Supply chain disruption	Broken the chain between suppliers, manufacturer and customers	Difficulties in sourcing raw materials and distributing finished products.	V e r y h i g h	V e r y h i g h	V e r y h i g h	2	Supplier, manufacturer, government and customers	Diversified supply chains by exploring multiple suppliers and customers, create partnership between SMMEs	Delay in receiving and delivering materials and products
S3	Increase transportation and logistics cost	High cost of transportation, materials and equipment's	Increasing production cost and time Cause to product delay and decrease profit margins	h i g h	H i g h	V e r y H i g h	5	Governments, owners and managers	Invest in local transportation solutions and partnerships with logistics providers and SMMEs each other	Increased fuel prices or logistical challenges
S4	Displaced customer and suppliers	Displaced former customers and suppliers	Difficult to find former customers and suppliers and leads break supply chain	M e d i u m	H i g h	h i g h	14	Government, owners and managers	Develop new customers bases and create network with nearby SMMEs	Instability of suppliers and customers

S 5	Demand fluctuation	Un stable customer demand or inaccuracy in demand forecasting	Overstocking of unwanted goods or missed sales opportunities due to inadequate inventory management	H ig h	H i g h	H i g h	8	Owners and managers	Conduct market research on customer behavior regularly, develop agile production systems	Change in customer preferences or macroeconomic instability
	Mark related risks									
M 1	Increasing market competitions	High internal and external market competition	Reducing in profitability, demand, market share and potential price wars.	M ed iu m	M e d i u m	M e d i u m	2 0	Owners and managers	Focusing on differentiations and quality improvements develop local market networks	Decrease market demand due to new competitors to the market
M 2	Decreasing product market demand	Reducing market demand for certain products	Decrease sales amount and decrease profitability increasing the risk of unsold inventory	M ed iu m	H i g h	M e d i u m	1 7	Owners and managers	Develop market research and create local and international market networks	Economic recession or shifts in consumer behavior reducing product sales
M 3	Fluctuation of	Unstable price of materials,	Difficult to predict costs and set competitive	H ig h	H i g h	H i g h	6	Owners and manager	Focusing on cost effective production	Instability in commodity markets or

	market price	equipment's and products	price affecting profitability		g h	g h		s with government	systems and flexibility pricing strategy, conduct market research	supply shortages
M 4	Change customer need and want	Changes in consumer behavior and market demand	Difficulties in demand forecasting, unstable customer behavior, Shorter product life cycle	M ed iu m	H i g h	M e d i u m	15	Owners and managers	Conducting market research on customer priorities	Changing customer priorities
M 5	Lack of awareness to new market	Insufficient information about the new market	Marketing dilemma, low sales and wasted investment	hi g h	H i g h	H i g h	8	Owners and managers	Provide SMEs market research, digitalizing market system and improve communication	Unpredictable market price, Demand and reduce sales revenue
M 6	Lack of market integrations	Fail businesses connect and collaborate with various parts of the SMMEs	Leads to inefficiency, missed opportunities, and reducing sales revenues	M ed iu m	H i g h	H i g h	12	Governments owners and managers	Improve partnerships, local networks and digital platforms for market penetration	Fragmentation of markets or failure to develop business networks
M 7	Increasing cost of	Gradually increasing	Decrease profitability	H ig h	V e r	V e r	7	Government. Owners	Build strategic partnerships with suppliers for long-term pricing	Higher cost materials

	raw materials	cost of raw materials	,increasing production cost	y h i g h	y h i g h			and manager s	agreements. Find alternative, lower-cost materials or production methods	and equipment's
	Human resource risks									
H 1	Loss of skilled worker	Reduced workforce due to displacement, injury or death	Tends to reduce product quality and productivity	M e d i u m	M e d i u m	M e d i u m	1 9	Govern ment ,TVETs ,owners and manager s	Find skilled and experienced workers and Conducting new trainings	Death, injured and displacement of skilled and experienced workers
H 2	Lack of adequate training for SMMEs	Insufficient government and non-government support in upgrading enterprise performance	Decreasing enterprises expansion and competition with time decrease productivity and quality increase error in work	H i g h	H i g h	H i g h	9	Govern ment, TVETs, owners and manager s	Strong collaboration with TVETs and colleges to enhance employee skill develop in house training programs	Insufficient workforce education or training
H 3	Lack of skilled labor	Insufficient skilled and trained labor	lower productivity, poor quality output, and	l a w i	M e d i	M e d i	2 1	TVETs, owners and manager	Collaborate with educational institutions such as	Reduce quality ,increase waste and

			operational inefficiencies	u	u				colleges and universities for employee skill improvement	inefficiencies
	Operational risks									
O1	Decrease product quality	Lower product quality	Decrease customer satisfaction and enterprises profitability	Medium	Medium	Medium	19	Owners and managers	Implement quality control tools and techniques, invest in employee training	Shortages of high-quality materials or disruptions in the manufacturing process
O2	Increasing production cost	Increase overall cost to produce a product	Decrease profit margins, making it difficult for businesses to remain competitive or sustain profitability	High	Very High	Very High	3	Owners and managers	Implement lean manufacturing principles, automation and reduce wastes	Increased cost of labor, raw materials, and overhead
O3	Infrastructure and facility damages	Physical damage to manufacturing facilities and equipment	disrupt production, delay deliveries, or render certain assets inoperable, leading to financial losses and delays	High	High	High	10	Governments owners and managers	Rebuilding and rehabilitations of infrastructure and facilities as soon as possible	Destruction or degradation of manufacturing facilities or infrastructure

O 4	Decreasing productivity	Lower overall production and efficiencies	fewer products are produced and ineffective productivity	M e d i u m	M e d i u m	M e d i u m	1 6	Owners and managers	Revise production system, process optimizations ,conduct trainings and continuous improvements	Insufficient product, reduce quality loss of operational inefficiencies
	Technological risks									
T 1	Lack of new technology training	Limited access to new technology and insufficient training program	Decreasing competition, quality, productivity, efficiency and innovation	M e d i u m	H i g h	H i g h	1 2	Government, owners and managers colleges and universities	Facilitate technology adoption programs and workshops for SMMEs	Lack of investment in technological education and skills development
T 2	Lack IT and innovations	Poor IT infrastructure and incapability of innovations	Inability to meet customer demands and hinder competitiveness	M e d i u m	M e d i u m	M e d i u m	1 7	Owners ,managers and governments	Conducting motivations for innovations and invest in IT infrastructures	Limited resources or investment in IT infrastructure and innovations
T 3	Lack of networki	communication	Operational inefficiencies,	M	M e e	M e e	1 8	Government,	Improve internet and	Breakdown of

	ng and communi cations	breakdowns difficult collaboration, information sharing, and business partnership	mistakes, and missed opportunities for business development or partnership	ed i u m	d i u m	d i u m		owners and managers	communication channels in the region, create strong partnership and communication s b/n SMMEs	communicat ion networks or post-war disruption to global trade networks
T 4	Increasin g cost of new technolog ies	Expensive in new technology based machineries and equipment's	Making it difficult to invest in new technology due to high costs inability to compete effectively in the marketplace	H ig h	H ig h	V e r y h i g h	9	Govern ment	Government shall reduce tax and fees for new technology infrastructure importers	Expensive infrastru ctur e upgrades and new technology based machineries
	Social risks									
S S 1	Security risks	Threats to employees, facilities ad assets.	Property damage, loss of assets, or interruption of business activities	H ig h	H ig h	H ig h	1 4	Govern ment and every one	Develop secure environment collaborate with government and peacekeeping forces	Political unrest or ongoing conflict after the war

S S 2	Psychological risks	Employees and customers may experience trauma or stress	Increased absenteeism, reduced employee morale, and lower customer satisfaction, leading to overall business disruption.	M ed iu m	H i g h	M e d i u m	1 3	Government, NGOs and owners	Offer mental health support for employees, suppliers and customers, increasing salaries for employee	Trauma experienced by employees or community members due to post-war conditions
S S 3	Political instability	Unpredictable political environment that makes long-term planning difficult.	Reduced investment, and difficulty in making strategic decisions, which can stifle growth and innovation	M ed iu m	M e d i u m	M e d i u m	1 8	Government, owners and managers	Develop contingency plans for political changes, including diversification of markets and operations	Post-war government transitions or unpredictable political shifts
S S 4	Change in government regulations	Change in government policies, strategies, taxation and legalizations of SMMEs	Compliance challenges, legal issues, or unanticipated costs and tax for businesses	M ed iu m	H i g h	m e d i u m		Government, owners and managers	Keep up to date with government policy changes and adjust business practices accordingly.	New post-war economic policies, tax changes, or trade regulations

