Developing Integrated Quality and Safety Management System Model in the Process Industry: A Case of Awash Wine

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Declaration

I hereby declare that the work which is being presented in this thesis entitled “Integrating Quality and Safety Management System in the Process Industry to Enhance Productivity: A Case of Awash Wine” is original work of my own, has not been presented for a degree of any other university and all the resource of materials used for this thesis have been appropriately acknowledged.

Henok Eshetu Date

This is to certify that the above declaration made by the candidate is correct to the best of my knowledge.

Dr. Kassu Jilcha (Associate Professor) (Advisor) Date

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ABSTRACT

Quality and safety management systems are essential in the beverage industry for ensuring the production of safe, high-quality beverages and increasing productivity and efficiency. Currently, Awash Wine faces significant challenges, such as employee safety problems, inefficiency, and the unproductive use of full employee working hours per day for wine-making processes. The primary objective of this research is to identify any existing gaps in the quality and safety management system of the case company. After assessing these gaps and their implications, the study aims to find effective solutions to address the identified issues, ultimately leading to improved productivity. The research methodology involves conducting a comprehensive literature review, collecting, and analyzing quantitative and qualitative data on the main factors that affect the productivity of the company regarding safety and quality. The collected data using both primary and secondary data collection methods was thoroughly analyzed using statistical software SPSS. The research methodology involves conducting a comprehensive literature review, collecting and analyzing quantitative and qualitative data on the main factors that affect the productivity of the company concerning safety and quality. The data was collected using both primary and secondary methods and thoroughly analyzed using the statistical software SPSS. The quantitative data was obtained from questionnaires administered to 86 employees, and their responses were analyzed using SPSS. The analysis revealed that continuous improvement, employee involvement, and safety evaluation and monitoring have a substantial positive correlation with organizational productivity, with results of $r = 0.546$, $p = 0.000$; $r = 0.602$, $p = 0.000$; and $r = 0.572$, $p = 0.000$, respectively. Additionally, the analysis showed that safety and quality leadership and customer focus also have a positive relationship with organizational productivity, albeit with a relatively lower result, with $r = 0.489$, $p = 0.000$ and $r = 0.456$, $p = 0.000$, respectively. The study's findings propose that a company's productivity is most impacted by two critical factors - the lack of monitoring and assessment of safety during regular operations, and the failure to prioritize continuous improvement. The researcher encountered constraints in terms of time, money, and access to important people and resources at Awash Wine, which could limit the scope and depth of the study. This indicates that the organization does

not place a strong emphasis on enhancing its working culture in terms of continuous improvement. The study has the potential to be a useful tool for academics and industry consultants who are seeking to improve customer satisfaction and productivity in the process industry.

***Key Words**: Integrated Management System, Quality Management system, Continuous Improvement, Efficiency and Effectiveness.*

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ACRONOMY

AWSC = Awash wine share company

IMS = Integrated management system

QMS = Quality Management System

SMS = Safety Management System

SMS= Safety Management System

PV=Pitch Vodka

HSM= Health and Safety Management

QSMS= Quality and Safety Management System

PDCA= Plan-Do-Check-Act

KPIs= Key Performance Indicators

CS= Customer Satisfaction

CHAPET ONE

1. INTRODUCTION AND BACKGROUND

1.1 INTRODUCTION

Quality refers to the characteristics of a product or service that satisfy customers' needs and expectations in the supply chain. Shah et al. (2019) stated that "ensuring the high quality of food products poses a significant hurdle for the food processing industry, consequently, organizations must embrace quality standards across their supply chains to cultivate a competitive atmosphere and fulfill customer expectations while maintaining their satisfaction".

The effectiveness of a beverage manufacturing system's quality management system is directly tied to the overall quality of the system. This includes factors such as the quality of raw ingredients, the layout of the processing facilities, the quality of equipment used, and the satisfaction of consumers. Failing to meet any of these factors can lead to consumer rejection of the company's products. Many beverages are recalled due to various food safety issues, including the risk of contamination in the packaging, outbreaks of microorganisms, and the presence of undesirable product characteristics such as off-flavors, unpleasant taste and smell, or textural abnormalities (Giacomarra et al., 2016).

Quality management (QM) is crucial for organizations to achieve world-class product and service quality and market success. Adopting QM principles enhances companies' ability to deliver exceptional products and services, positioning them for sustained market success (Kumar et al., 2018). The development of a quality management system (QMS) involves the deliberate planning and establishment of documented procedures that govern the organizational processes, with the aim of meeting the needs and exceeding the expectations of both internal and external customers (Natarajan, 2017).

Safety management encompasses the policies, strategies, procedures, and activities that are implemented or followed by an organization's management with the aim of ensuring the safety of their employees(Wachter & Yorio, 2014; Wold & Laumann, 2015).

To foster a strong safety culture, it is crucial to reorient the attitudes of workers through the adoption of best practices, emphasizing good housekeeping, and implementing changes in work culture and practices. By embracing these approaches, organizations can create an

environment where safety is prioritized and ingrained in the mindset of every worker (Unnikrishnan et al., 2015).

According to Hernandez-Vivanco et al. (2018) "to meet the encounter of innovating effectively and maximizing the value of sustainability demands, it is necessary to have well-structured management systems" . Organizations nowadays are adopting various standardized Management Systems (MSs) in response to the demands and expectations of relevant stakeholders. These MSs are being planned and implemented while taking into account the internal and external context of the organization(Rebelo et al., 2016).

Quality and safety management is gaining significant attention in workplaces worldwide. Consequently, there is a growing trend towards the evolution of safety and quality management concepts within beverage companies (Odigie, 2015).

Quality and safety management systems are essential in the beverage industry for ensuring the production of safe, high-quality beverages and increase productivity and efficiency.

In response to changing industry dynamics, there has been a notable shift towards the proactive identification and assessment of potential risks, coupled with the elimination of those risks that are considered unacceptable.

Recent research strongly advocates for the incorporation of safety and health functions into all facets of organizational operations, as this integration significantly enhances the likelihood of attaining safety objectives. A comprehensive safety management system (SMS) encompasses various interconnected components, including a well-defined safety policy, thorough job hazard analysis, and a robust safety and health awareness program. These elements synergistically collaborate to ensure the effective management of safety within organizations (Law et al., 2006).

Integrating management systems, including quality, offers a practical approach to drive down organizational costs, optimize resource utilization, enhance employee motivation, and effectively adhere to social obligations and stakeholder requirements (Paraschivescu, 2016).

The primary objective of this research is to identify existing gaps (product rework, down time, unsafe work, non-confirming product and product return from the market) in the quality and safety management system of the case company that may have a detrimental

impact on productivity. By assessing these gaps and their implications, the study aims to find effective solutions to address the identified issues, ultimately leading to improved productivity and efficiency within the company.

1.2 BACKGROUND AND JUSTIFICATION

In today's market conditions, the sustainable and successful operation of an enterprise is determined by several key factors; these factors include the ability to meet consumer needs, the provision of high-quality products, and the assurance of safe production processes.

Both quality and safety functions have a positive impact on the organization's value, quality enhances the value of a product by generating savings or driving increased sales revenue, while safety enhances the value of the product by reducing costs associated with injuries (Ladewski & Al-Bayati, 2019).

According to Vyas et al. (2023) definition, quality management as practices encompass a wide range of programs and plans aimed at generating improved products and services, reducing costs, enhancing customer satisfaction, and achieving better financial performance; these practices are designed to optimize various aspects of quality within an organization, ultimately leading to positive outcomes for both the organization and its stakeholders.

Quality Management Systems (QMSs) represent an integrated business approach that encompasses the planning and implementation of quality management models, methods, and tools throughout an organization; this integration ensures alignment with the organization's business strategy as they strive to achieve and maintain high levels of quality (Garza-Reyes et al., 2015).

Maintaining quality in the food sector poses a significant challenge for the food processing industry, to thrive in a competitive environment and ensure customer satisfaction, organizations must adopt and adhere to quality standards across their entire supply chains and by doing so, they can address the various complexities and risks associated with food production, processing, and distribution (Shah et al., 2019). Management systems serve as a highly effective tool for organizations to optimize their operations while adapting to a continuously evolving business landscape and increasing competition (Akhmetova et al., 2017).

Based on the International Labor Organization (ILO) statistics from 2022, approximately 2.3 million individuals, both men and women, lose their lives each year due to work-related accidents or diseases. This staggering figure translates to an average of over 6,000 deaths occurring every day. Furthermore, on a global scale, there are around 340 million work-related accidents and approximately 160 million individuals affected by work-related illnesses annually (Musungwa & Kowe, 2022).

Safety management techniques have generally followed two main approaches: the first approach involves managing safety by prioritizing compliance with the technical and training requirements set by organizations such as the Occupational Safety and Health Administration (OSHA) to avoid penalties and enforcement actions and the second approach focuses on managing safety through self-correction; this entails identifying and reporting hazards within the workplace or rectifying unsafe behaviors to proactively enhance safety measures (Ladewski & Al-Bayati, 2019).

To effectively address the challenge of innovation and fully leverage the value of sustainability requirements, it is crucial to establish robust and well-structured management systems. By implementing such systems, organizations can explore new opportunities, navigate changes, and capitalize on sustainability demands in a systematic and organized manner (Hernandez-Vivanco et al., 2018).

According to Ladewski and Al-Bayati (2019) stated ''there is a commonality between the management of quality and the management of safety, for example, four categories of "prevention, detection, internal failures, and external failures" used to drive decision-making and operating action for managing quality can be directly applied to managing safety.

Based on Movahedi et al. (2013) explanation, Quality management has played a crucial role in enhancing the competitiveness of companies and economies over the last six decades. Extensive literature on quality management systems has emphasized their strategic importance. Notably, the Global Competitiveness Report recognizes the integration of quality management as a significant factor in economic competitiveness. This acknowledgement underscores the recognition of quality management's contribution to fostering a competitive advantage on a global scale.

Recent investigations have explored the impact of quality management practices on safety performance. These inquiries have revealed that the application of quality management practices not only enhances efficiency in production sites but also leads to positive safety outcomes. This exploration highlights the correlation between quality management and safety, underscoring their collective ability to improve the overall functioning of production sites while maintaining favorable safety standards(Odigie, 2015). The beverage industry can improve productivity by implementing quality and employee safety management systems. These systems include clear quality standards, strong training programs, proactive hazards identification and risk assessment, regular safety inspections and audits, effective communication and employee engagement, a continuous improvement culture, and performance measurement and recognition. Clear quality standards help employees understand the expected level of quality, while comprehensive training equips them with the necessary knowledge and skills. Regular inspections and audits help identify potential safety hazards and improve safety conditions. A culture of continuous improvement encourages employees to identify opportunities for enhancing quality and safety, while performance measurement systems track key productivity and safety indicators.

The beverage industry can enhance productivity by implementing quality and employee safety management systems. These include clear standards, training programs, risk assessment, regular inspections, effective communication, a culture of continuous improvement, and performance measurement systems. Therefore, the integration of quality and safety is essential to improving the organization's productivity by enhancing efficiency and effectiveness.

1.3 PROBLEM STATEMENT

Ensuring and upholding quality in food products poses a significant challenge for the food processing industry. Consequently, organizations operating in this sector must embrace quality standards across their entire supply chains to foster a competitive environment and achieve customer satisfaction (Shah et al., 2019). Various factors have been identified as potential reasons for companies facing challenges in establishing effective and systematic Health and Safety Management (HSM) practices; these factors include an absence of commitment, insufficient knowledge, limited financial resources, absence of formalized

routines, and prioritizing productivity and profitability over safety (Nordlöf et al., 2017). The information shown in the table 1.1 below demonstrates the company's major operational difficulties, which are typified by growing losses in working hours and fiscal expenses as a result of reprocessing different product kinds over time. For the Cocktail Wine product, the company lost 300,000 birr in 2021 as a result of 250 lost working hours from reprocessing 27724 bottles of cocktail wine owing to product rework. Comparably, in 2022, 318 working hours were wasted on the Awash Wine product, resulting in a 550,000-birr loss from having to rework 43940 bottles of the product. The Gouder Wine product suffered 455 lost working hours and a startling loss of 780,000 birr in 2023 as the situation deteriorated. Additionally, the business needed to reprocess a75,622 bottles of the Gouder Wine product, a significant quantity.

Table1.1: Product Rework and Lost Working hours Data. (Source: Case company Record)

Parameters	Year		
	2021	**2022**	**2023**
Product Type	Cocktail Wine	Awash Wine	Gouder Wine
Amount of product return by bottles	27724	43940	75622
Lost hour/Year	250	318	455
Lost Birr/Year	300,000	550,000	780,000

The exploration of optimal integration between these systems has yet to yield conclusive findings, leaving room for further investigation and understanding of their interplay within the integrated scheme(Odigie, 2015).

The information provided provides light on an intricate operational issue that the business is dealing with and that is having a negative impact on both its financial performance and productivity. The company has not only lost a great deal of money and working hours, but it has also been plagued by health and safety-related problems that have made its productivity problems worse. The firm has lost between 450 and 530 working hours during the past three years (2021–2023) as a result of sick leave, medical treatment, and incidents involving injured personnel, according to statistics from the safety and health department and clinic. This has significantly impacted the company's overall production and profitability, with an anticipated loss of 900,000 birr per year. The combination of quality control issues leading to product reprocessing and the impact of safety-related incidents

has created a complex operational environment that is severely hindering the company's ability to achieve its strategic objectives. Failure to address these interrelated challenges through a comprehensive, integrated quality and safety management system during the operational period leads to the company losing its productivity. Resolving the disconnect between quality and safety management is crucial to enhancing the company's overall productivity and financial viability.

1.4 RESEARCH QUESTIONS

The following research questions will answer in this research study:

- What are the current challenges faced by the Awash Wine Company due to product rework and safety-related issues?
- How to identify the primary cause of product reprocessing and safety incidents of the case company?
- How can an integrated quality and safety management systems model be developed to address the challenges faced in the process industry?

1.5 OBJECTIVES

1.5.1 GENERAL OJECTIVE

The general objective of the study is to develop a comprehensive integration of quality and safety management system model within the process industry, specifically in Awash Wine.

1.5.2. SPECIFIC OBJECTIVE

Particularly the study has the following sub-objectives:

- To investigate the current challenges faced by the Awash Wine Company due to product rework and safety-related issues.
- To identify the primary cause of product reprocessing and safety incidents of the case company.
- To develop an integrated quality and safety management systems model to address the challenges faced in the process industry?

1.6. SCOPE

The study is to be conducted at Awash Wine Share Company in the production, safety, and Quality departments. The research focuses on the integration of quality and safety management systems in the process industry to enhance productivity. The primary emphasis of the study was the difficulties that AWSC faces. It's vital to remember that the study will not address marketing, finance, human resources, or other facets of winemaking operations outside of the integration of quality and safety. The suggested model in this study will be a new conceptual model of integrated quality and safety that will be validated.

1.7 LIMITATIONS

Due to Awash Wine's particular characteristics and contextual factors that may affect the implementation and results of the integrated management system, the generalizability of the study's findings to other process industry organizations may be limited. Furthermore, because Awash Wine might not have established procedures for collecting and reporting data, or because data sharing might be prohibited due to confidentiality concerns, the researcher's access to thorough and trustworthy information on the company's quality, safety, and productivity indicators may be limited. Lastly, the researcher might run into constraints with time, money, or access to important people and resources at Awash Wine, which could limit the scope and depth of the study. Finally, the researcher addressed and overcomes the specified limitations by improving the generalizability of findings by enhancing transferability, collaborating with Awash Wine's management and experts to establish data collection protocols, minimizing researcher bias through data triangulation, member checking, and acknowledging biases, and addressing resource constraints by planning, prioritizing critical research questions, and exploring collaborative arrangements.

1.8 SIGNIFICANCE

By analyzing the implementation and results of an integrated management system at Awash Wine, this study can offer important lessons for other process industry organizations looking to optimize their operations, quality assurance, and safety practices to better meet the changing demands of their customers. Additionally, the insights gained from this study can inform policy discussions and industry-wide initiatives aimed at promoting sustainable and socially responsible practices in the process industry. This study

is significant because it has the potential to provide insights on how the integration of quality and safety management systems can drive productivity improvements and enhance customer satisfaction within the process industry, particularly in the context of Awash Wine. This study provides a thorough analysis of the integration of quality and safety management systems and addresses research confines, it has the potential to be a useful tool for academics and industry consultants who are looking to improve customer satisfaction and productivity in the process industry.

1.9 ORGANIZATION OF THE RESEARCH

The study paper is structured into six chapters, each serving a specific purpose. The first chapter encompasses the following sections: introduction, background, problem justification, research question and objectives, scope of the study, expected limitations, significance of the study, and organization of the research. The second chapter of the research paper involves a comprehensive review of the related literature. Chapter three is dedicated to the research methodology and design framework of the study. Chapter four provides a concise summary of the data interpretation and analysis results. The five chapters focus on the conclusion and recommendations derived from the study. The final section of the research paper includes the reference list, which provides a complete and accurate citation of all the sources referenced throughout the paper.

CHAPTER TWO

2. LITERATURE SURVEY

2.1 INTRODUCTION

The primary objective of this chapter is to introduce the literature related to the research topic and provide a comprehensive summary of previous studies conducted in the field. This summary encompasses all the relevant and significant subjects that contribute to the overall understanding of the research. Moreover, the literature review serves the purpose of identifying and discussing all the key points or findings that have emerged from previous research conducted on the topic. To conduct a comprehensive review of the topic, it is crucial to gather evidence from various sources, including academic journal articles, books, and publications. Recent studies hold particular value in demonstrating a deep understanding of the subject matter. The literature review focuses on identifying articles specifically related to integrated management systems, the integration of quality and safety, productivity, and the application of system dynamics and causal loop models. A wide range of resources were collected for this purpose, predominantly from online sources such as Google Scholar, academic journals, procedures, books, manuals, and any other relevant sources.

2.2 QUALITY MANAGAMENT SYSTEM

Quality management (QM) has been described and defined in various ways, but a commonly shared definition characterizes QM as a philosophy encompassing principles, practices, and tools. These principles and values include a focus on customer satisfaction, a commitment to continuous improvement, and the use of factual information to make informed decisions (Siva et al., 2016).

Quality management practices depend on the collective collaboration of an organization's resources. It is crucial for these resources to work together harmoniously with the aim of producing high-quality products and services, meeting customer demands, and ultimately improving overall performance. By integrating and aligning all aspects of the organization, including people, processes, and systems, effective quality management practices can be

implemented to ensure consistent quality, customer satisfaction, and continued growth (Vyas et al., 2023). According to Siva et al. (2016) the employment of Quality Management Systems (QMS) aims to enhance both the quality and customer satisfaction, both internally and externally, within an organization. This implementation process is designed to improve various aspects of quality, including product or service quality, process efficiency, and overall customer experience. Main Quality Management Process is explained as follow:

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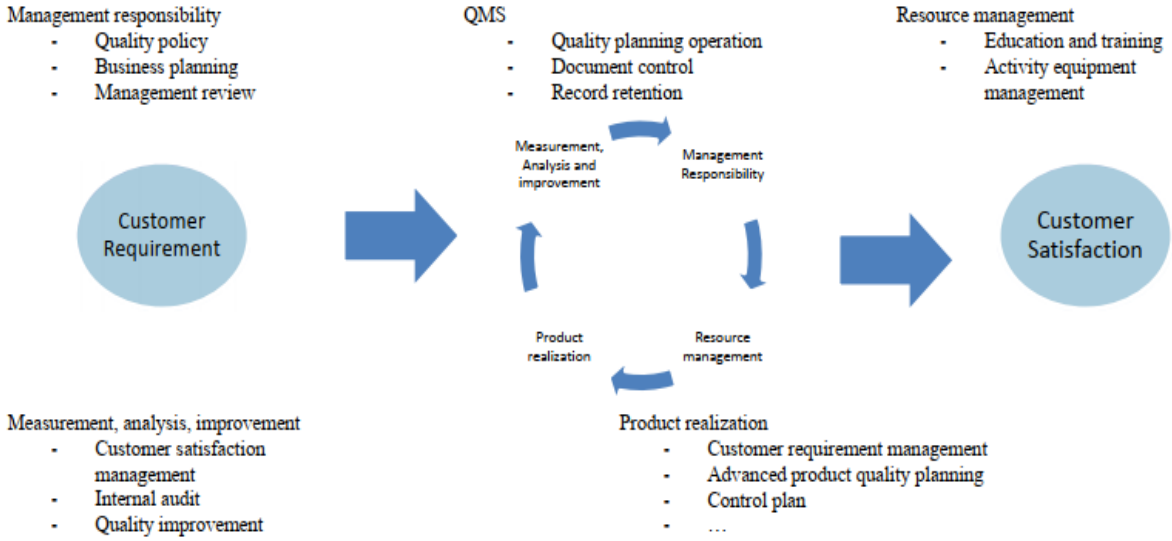

Figure 2.1: Process of QMS Source: (Movahedi et al., 2013)

According to Chakraborty et al. (2019), observation shows that "findings highlighted that there are seven barriers/factors hindering QM implementation manufacturing sector, namely, top management training, costs and actual performance, lack of external support, human resources' overload, aversion to change, resource shortage, and culture and training". Organizations should prioritize customer focus, strong leadership, employee engagement, process orientation, continual enhancement, evidence-based decision-making, relationship management, risk-based thinking, and continuous improvement to ensure the effectiveness of a quality management system. These guidelines support businesses in developing a quality culture, engaging staff, and clearly defining their goals and objectives. The following picture shows that theory of quality management factors

model.

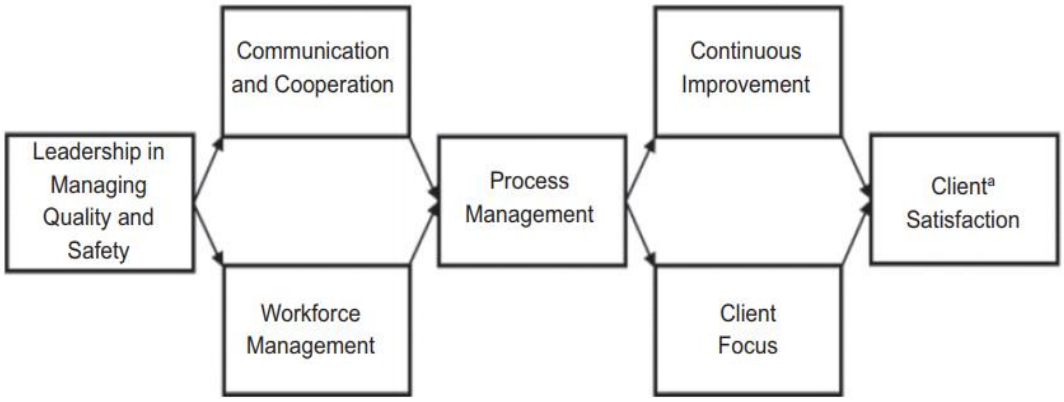

Figure 2.2: Theory of quality management factors model Source*:(Singh, J. 2018)*

Manufacturing businesses need to boost their competitiveness by integrating quality and performance improvement programs into every part of their operations to address the challenges presented by the current competitive environment (Singh et al., 2018) .

During the implementation process of a quality management system (QMS), organizations frequently encounter various challenges. These challenges include difficulties in developing QMS documentation due to a lack of understanding of the requirements, constraints in terms of limited resources and time allocated for QMS planning and implementation, as well as a lack of commitment from top management(Sawant, 2016).

Generally, Quality management (QM) is a philosophy aimed at customer satisfaction, continuous improvement, and informed decision-making. It involves collaboration among organizations to produce high-quality products and services. Quality management systems (QMS) aim to enhance quality and customer satisfaction. However, barriers like top management training, costs, and human resources overload can hinder QMS implementation. Prioritizing customer focus, strong leadership, employee engagement, and continuous improvement can ensure its effectiveness. Implementing a QMS leads to improved efficiency, customer satisfaction, and increased competitiveness.

2.3 SAFETY MANAGEMENT SYSTEM

According to Fernández-Muñiz et al. (2007) "the safety management system can be regarded as an antecedent of the firm's safety climate, with this being understood as the employees' attitudes and perceptions about the importance the organization attaches to

safety". A safety management system is simply a methodical and clear-cut approach to safety management, similar to how a quality management system is an organized and explicit approach to enhancing product quality to meet customer requirements(Li & Guldenmund, 2018). A safety management system (SMS) is characterized as a deliberate and documented safety program that integrates fundamental management concepts and operational elements into a structured safety system that consists of various safety activity areas and supporting elements that work together to attain the desired safety level or risk level, and the components within the SMS interact and influence each other to ensure the achievement of the organization's safety objectives (Li & Guldenmund, 2018). Effective safety management involves a comprehensive and systematic approach. Organizations must first identify and define their safety requirements, and this involves understanding the specific safety needs and expectations relevant to their industry, operations, and regulatory standards (Li & Guldenmund, 2018). It has been stated that a critical component of safety management is worker involvement. Consequentially, worker engagement in safety is regarded as a management practice and is evaluated based on factors such as worker representation on the safety committee, worker participation in decision-making related to safety, worker involvement in problem identification, and worker consultation regarding safety-related issues(Vinodkumar & Bhasi, 2011).

According to Katsuro et al. (2010) explained, a accidents can have severe repercussions, causing immense pain and suffering for the worker and their family. The consequences become even more devastating when accidents result in permanent disabilities. In such cases, both the victim and the company bear the brunt of the tragedy. The victim not only loses their earning capacity but also their ability to lead a normal, active life. Their skills and contributions to production are no longer accessible to society and the company, resulting in a loss for both. The impact of accidents goes beyond physical injuries; it affects the well-being and livelihood of individuals and has broader societal and economic implications. In the food and beverage industry, there is a widespread recognition and understanding of the hazards related to machinery, workplace accidents, and injury risks. This understanding stems from the nature of manual handling and repetitive motion tasks that are prevalent in the industry, which can lead to slips, trips, and falls (Musungwa & Kowe, 2022).

According to Fernández-Muñiz et al. (2007) definition “Safety management systems are mechanisms that are integrated in the and designed to control the hazards that can affect workers’ health and safety”.

The management of quality and the management of safety share a commonality, and it is suggested that the four categories of "prevention, detection, internal failures, and external failures" commonly used in quality management can directly be applied to managing safety, which implies that decision-making and operational actions driven by these categories in quality management can be similarly employed in safety management (Ladewski & Al-Bayati, 2019) .

In the summary, a safety management system is a systematic approach to ensuring a positive safety climate within an organization. It integrates management concepts and operational elements into a structured system, aiming to reduce risks and ensure workers' health and safety. In the food and beverage industry, hazards related to machinery, accidents, and injury risks are common. Safety management systems provide a framework for controlling hazards and protecting employees. The management of quality and safety can be applied, with decision-making and operational actions similar to those in quality management. Implementing safety measures directly impacts productivity in the process industry, reducing downtime, improving employee morale, decreasing absenteeism, and streamlining operations.

2.4 INTEGRATED MANAGEMENT SYSTEM

An organization's various management systems, including those for quality control, the environment, health and safety, and other pertinent areas, can be combined into a single, cohesive framework known as an integrated management system (IMS). By combining similar components from several management systems, an IMS aims to improve efficiency, reduce duplication, and streamline procedures object. Integrated Management System in beverage company organizations is to enhance organizational performance by developing information systems that incorporate knowledge management, this is achieved through the integration of various dimensions, risks, audits, and resources associated with quality, safety, and the environment(Laksana et al., 2020).

According to Nunhes et al. (2019) stated “IMS interconnects a set of processes through

sharing information, human and financial resources and infrastructure in order to satisfy the needs of different stakeholders". The integrated management system not only enhances the organizational and technical aspects of the company but also serves as a gateway for the enterprise to thrive in both local and global markets. The key advantages of an integrated management system include resolving conflicts between individual systems while optimizing resources, generating added value for the business by eliminating various forms of waste, managing sustainability components in a global market, enhancing partnerships with suppliers of goods and services, and reducing the frequency of internal and external audits (Purwanto, 2020).

The integrated management philosophy and set of practices revolve around continuous improvement and meeting customer requirements, it involves reducing rework, adopting long-range thinking, increasing employee involvement and teamwork for process redesign, implementing competitive benchmarking, utilizing problem-solving teams, constantly measuring results, and fostering closer relationships with suppliers (Pozo et al., 2018). The integration of management systems (IMS) enables organizations to achieve coherence and consistency in meeting sustainability requirements optimally. By integrating various management systems, such as quality, environmental, and social responsibility, organizations can align their efforts and resources to address sustainability challenges holistically (Hernandez-Vivanco et al., 2018). The primary emphasis of management systems should be on fostering synergy between customer-based quality, product-oriented environmental management that considers the entire life cycle, and corporate social responsibility. By integrating these three components, organizations can create a harmonious and mutually supportive framework that addresses customer needs, minimizes environmental impacts throughout the product life cycle, and fulfills social responsibilities (Rebelo et al., 2016). Many packaging manufacturing businesses need to boost customer satisfaction, competitiveness, corporate performance, environmental friendliness, and staff safety in order to compete globally. Implementing an integrated management system, which consists of the quality, safety, and environment management systems, is therefore one way to improve business performance(Purwanto, 2020). The use of an integrated management system to boost corporate performance has been covered in earlier studies. According to(Purwanto, 2020; Shah et al., 2019) the main advantages of an integrated

management system are resource optimization that eliminates conflicts between individual systems, adds value to the business by removing multiple forms of waste, integrates sustainability components in a global market, strengthens relationships with suppliers of goods and services, and decreases the frequency of internal and external audits. Focusing on internal improvement, having top management backing, designing the system around current processes, using information technology, having positive employee attitudes, and having employees use the system are the main elements determining the effectiveness of the deployment of an integrated management system(Purwanto, 2020).

An extensive evaluation of present procedures is required in order for Awash Wine Company to develop an integrated quality and safety management systems model. This include figuring out the current procedures, safety guidelines, educational initiatives, and incident reporting frameworks. It is necessary to design the model, defining its essential features and components as well as performance metrics. To encourage a culture of quality and safety awareness, the organization should get buy-in, offer thorough training, and set up communication channels. System dynamics modeling and simulation should be used to validate the model, assessing its influence on key performance indicators and pinpointing important variables.

In summary, A framework called an integrated management system (IMS) brings together several management systems to increase productivity, cut down on duplication, and simplify processes. By creating information systems that include knowledge management, risk management, audits, and resources for quality, safety, and the environment, an IMS is utilized in the beverage industry to improve organizational performance. In order to meet the needs of various stakeholders, IMS integrates processes and shares information, infrastructure, and financial and human resources. Resolving system disputes, maximizing resources, creating value, managing sustainability components in a global market, strengthening supplier relationships, and decreasing audit frequency are just a few of the major benefits of an IMS.

2.5 FACTORS AFFECTING INTEGRATING QUALITY AND SAFETY MANAGEMENT IN THE PROCESS INDUSTRY

Previous studies have identified a range of internal global factors that have an influence on

the implementation of safety and quality. These factors include the size of the business, safety training initiatives, employee involvement, safety policies, allocation of resources for safety costs, processes for identifying and reducing risks, system integration and managing uncertainty in reporting systems, employee commitment, fostering a safety culture, effective safety communication, adherence to safety regulations, and the establishment of proper safety procedures.

A good management system (one that makes the proper decisions) should address all pertinent issues, such as the economy and corporate social responsibility. Conversely, an integrated and targeted approach to effective management (doing the thing well) uses less resources by addressing identified factors, including opportunities and hazards (Abrahamsson et al., 2010).

Multiple issues impact the process industry's integration of quality and safety management systems. These include

- The culture of the business,
- Strong management and leadership,
- The need for regulatory compliance,
- The distribution of resources,
- Risk assessment and management,
- Competency development and training,
- Open communication and teamwork, and
- Ongoing assessment and improvement.

A process-based integrated study of aspects (risks and opportunities) is the first step towards an effective integrated management system. This analysis can be completed in multiple iterations. puts a greater emphasis on those outlining more crucial details. The right things are integrated into a minimum system to ensure that the IMS is done correctly. Additionally, the system needs to be flexible and adaptive to incorporate additional dimensions as needed(Abrahamsson et al., 2010).

2.6 CONCEPTUAL FRAMEWORK

The review of literature assists in developing the conceptual framework for the investigation of this research issue and enables us to find the crucial quality and safety management practices that have a major impact on the organization’s productivity.

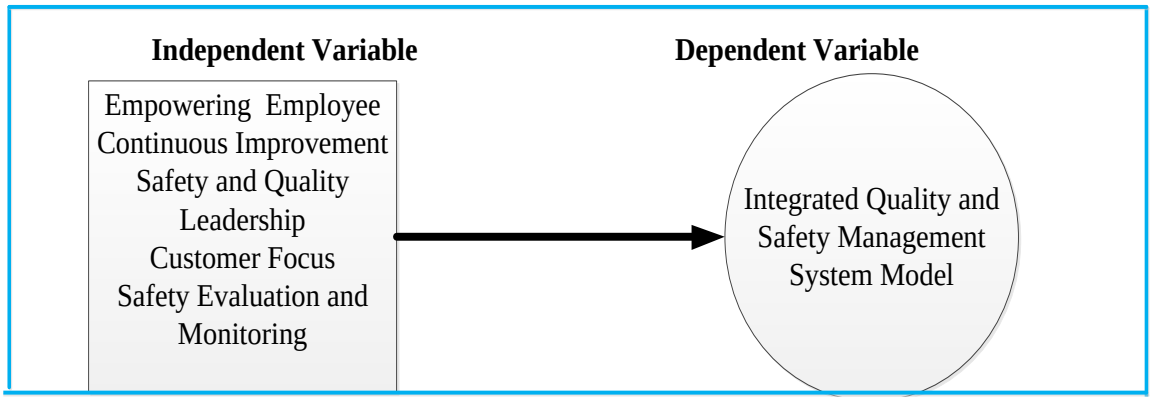

Figure 2.3: Conceptual frame work *(Source: own work)*

2.7 QUALITY MANAGEMENT SYSTEM FRAMEWORK MODEL

The diagram emphasizes the importance of a continuous improvement mindset in quality management. It highlights the iterative nature of the process, where insights gained from the output stage feed back into the input stage, leading to a cycle of ongoing improvement. The concept illustrated in the diagram aligns with the principles of continuous improvement and the Plan-Do-Check-Act (PDCA) cycle, a widely recognized quality management approach. By following this systematic approach, organizations can drive continuous improvement, enhance the quality of their products or services, and ultimately achieve higher levels of customer satisfaction and organizational performance(Kazhymurat et al., 2020).

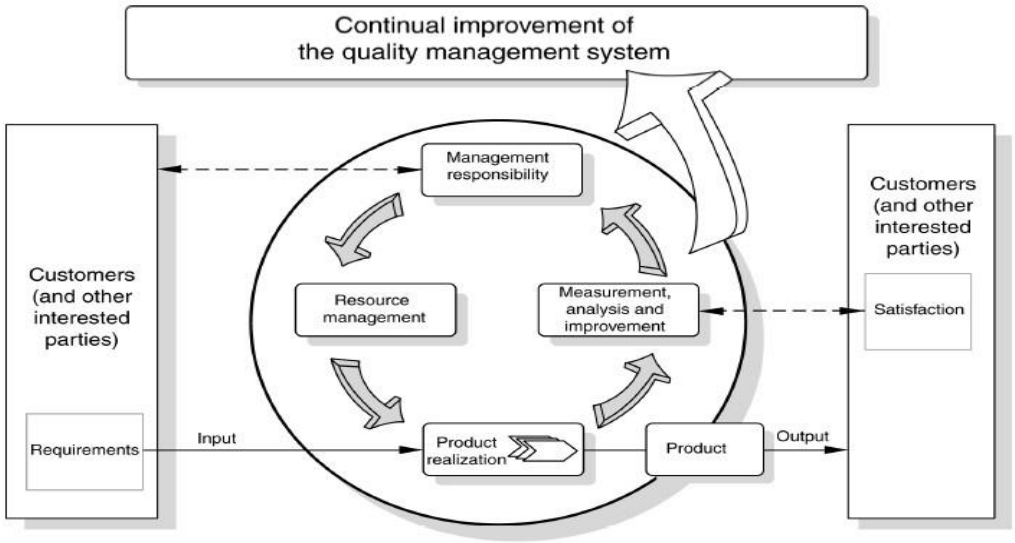

Figure 2.4: Quality management system framework model Source: *(Kazhymurat et al., 2020)*

A circular process is shown in the diagram, with arrows referring to the input, measurement, analysis, improvement, and output phases of the process. The input stage, which is when information about the quality management system is gathered, is the first stage of the improvement process. Customer reviews, internal audits, performance measurements, and other pertinent data sources might be examples of this. In order to acquire insight into the current status of the quality management system, the measurement step entails quantifying and assessing the data that has been gathered. Finding metrics and key performance indicators (KPIs) that may be used to gauge the system's efficacy is the main goal of this stage. In the analysis stage, potential causes of quality problems and areas for improvement are determined by analyzing and interpreting the data that has been gathered. In order to find patterns and trends, this stage may entail methods like statistical analysis, trend analysis, and process mapping.

Action plans are created and put into action to address the areas that have been highlighted for improvement during the improvement stage. Processes, methods, training materials, and other components of the quality management system may need to be modified in order to achieve this.

The output stage is where the outputs and results of the process of improvement are represented. It entails keeping an eye on the effectiveness of the modifications that have been put into place and assessing how they will affect the quality management system as a whole. Additionally, feedback loops where additional modifications are made based on outcomes observed.

2.8 SAFETY MANAGEMENT SYSTEM MODEL FRAMEWORK

While management endeavors to establish safety systems to enhance job safety, it is equally crucial for employees to be prepared to actively participate in and comply with these systems (Edmund et al., 2020). The connection and integration of these elements within the QMS are highlighted in the diagram. As (Kazhymurat et al., 2020) emphasizes how crucial it is to design safety goals, create policies and procedures, put training, audits,

and inspections into action, as well as to regularly assess safety performance. The objective is to provide a comprehensive system that eliminates hazards, guarantees a safe working environment, and safeguards workers' wellbeing. By using this approach, businesses may create a strong safety management system that fosters a culture of safety, lowers the number of incidents and injuries, and improves workplace safety performance overall.

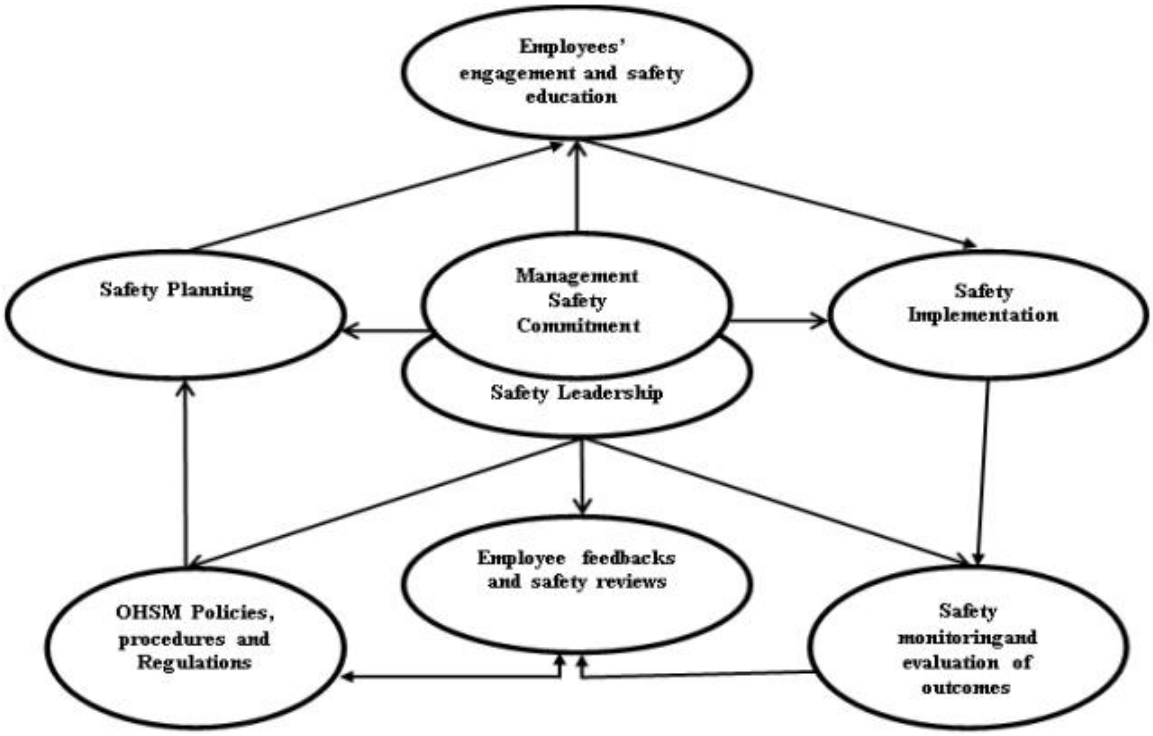

Figure 2.5: Safety management system Model. ***Source***: (Edmund et al., 2020)

A model of a quality management system (QMS) specifically focused on safety. It is divided into three main sections: safety planning, safety implementation, and safety evaluation(*Edmund et al., 2020*).

2.8.1 PLANNING FOR SAFETY

Safety Objectives: This section outlines the precise safety-related goals and objectives that a company hopes to accomplish. The safety management system has a clear direction thanks to these aims.

Safety Policies: These set forward the organization's stance on maintaining a secure workplace. They lay up the values, guidelines, and obligations about safety. Safety procedures are detailed instructions that tell workers how to carry out their jobs safely and efficiently. These protocols aid in maintaining uniformity and standardization in safety

protocols.

2.8.2 IMPLEMENTING SAFETY

Safety Training: Programs for safety training give staff members the information and abilities they need to carry out their jobs safely. This can involve receiving instruction in emergency response, specialized equipment, or general safety awareness.

Safety audits: are methodical evaluations carried out to gauge how well workplace safety policies and procedures are working. They guarantee adherence to safety rules and regulations and assist in identifying areas that require improvement.

Safety inspections: Safety inspections entail routine evaluations of the workplace to spot any risks, verify that safety rules are being followed, and put corrective measures in place to lessen risks.

2.8.3 ASSESSMENT OF SAFETY

Safety performance indicators: are quantifiable measurements that are used to evaluate the overall efficacy of the safety management system as well as the success of individual safety initiatives. A few instances may be the quantity of near-misses, accidents, or occurrences about safety.

Safety Metrics: Safety metrics offer numerical information on performance in terms of safety. These measures may comprise injury rates, completion rates of safety training, or adherence to safety protocols.

Safety Reviews: The safety management system is periodically assessed and evaluated as part of safety reviews. They aid in determining advantages, disadvantages, and areas in which progress can be made. Independent auditors may do safety reviews inside or externally.

2.9 LITERATURE GAP SUMMARIES

When comparing the benefits of managing management systems (MSs) separately versus integrating them, it becomes evident that integration leads to greater advantages, and the scope of the integration impact is wider and more substantial compared to managing the systems separately (Chakraborty et al., 2019). When assessing the reimbursements of managing management systems (MSs), it becomes clear that integrating the systems allows for greater advantages compared to managing them separately, and additionally, the wider

scope of integration impact supports the significance of implementing multiple management systems correctly, as it enables organizations to attain enhanced benefits from the integration process(Bernardo et al., 2015). Therefore, the researcher uses integration model for the improvement of the organizational productivity to overcome the gap. Organizations must recognize and resolve the problems and barriers associated with the integration process if they are to fully benefit from integrating standards and if these problems are not resolved early on, the integration process may take longer to finish. Therefore, in order to guarantee a seamless and prompt integration of standards, companies must proactively identify and resolve these issues (Purwanto, 2020). Scholars generally agree that the best way for companies to support sustainable development is to integrate their various management systems and in addition, when multiple management systems are used in a single organization, an integrated management system (IMS) must be investigated in order to enable the effective implementation of overlapping or similar processes, practices, and tools from different management systems (Siva et al., 2016). Because a lack of expertise and a lack of resources are the main excuses given by businesses for not implementing quality management (QM) practices, organizations should look at solutions that solve these issues and make it possible for QM practices to be implemented successfully (Chakraborty et al., 2019). Without taking into account the significance of effective human capital management inside the organization, a quality management system cannot be executed with effectiveness. Organizations may encounter major difficulties in obtaining qualified human resources if they do not organize their human resource management in a methodical and structured manner. This could develop into a significant barrier to putting in place a quality management system (Ong et al., 2020). Exploring these findings further can provide valuable insights into the importance of human resources, overcoming integration challenges, addressing resource constraints, and maximizing the benefits of integrating quality and safety management systems.

To summarize, the researcher filled in the gaps using an integration model, but pointed out that in order to get the most out of integrated management systems, it's critical to proactively recognize and address integration challenges, deal with resource and expertise constraints, and ensure effective human resource management.

CHAPTER THREE
3. METHODOLOGY

3.1 INTRODUCTION

The methodology section of this study outlines the approach and steps taken to look into the Integration of Quality and Safety management systems in the process industry to enhance productivity in the case of Awash wine share company. To guarantee the transparency, repeatability, and trustworthiness of the study, this section attempts to give a clear and organized description of the research methodologies used. The researcher will first go over the research design that was chosen for this study in this part. Next, it describes the data-gathering techniques that were used, including the data sources, tools, and processes used. The researcher also goes over the measures taken to guarantee the validity, reliability, and quality of the data. Lastly, the researcher gives a summary of the statistical procedures and data analytic strategies used to examine.

3.2 RESEARCH DESIGN AND APPROACH

A mixed-methods research approach was used for this study, which blends qualitative and quantitative techniques into one investigation. In order to provide a more thorough understanding of the elements impacting the integration of quality and safety management systems and their influence on organizational productivity at Awash Wine, a variety of sources and viewpoints were considered while selecting this approach for obtaining and evaluate data. Conducting interviews with key Awash Wine people, such as managers, supervisors, and frontline staff, was part of the qualitative component. This made it possible to investigate the difficulties, obstacles, and facilitators of combining safety and quality systems.

The quantitative component comprised gathering and evaluating numerical data on several organizational productivity measures, including the quantity of rework, safety incidents, and important safety and quality performance indicators. The databases and internal records of Awash Wine provided this information. Regression modeling is one statistical analytic technique that was used to investigate the links between the variables of the integrated management system and the outcomes that were measured.

Primary and secondary data are collected in different ways during the data-collecting

process. Surveys, interviews and questionary and observation of recorded data are used to acquire secondary data. After that, the data is examined and improved for appropriateness and validity. Lastly, depending on the data, judgments and suggestions are made. The detailed and sequential methodology of the study presented by the following Figure 3.1 below.

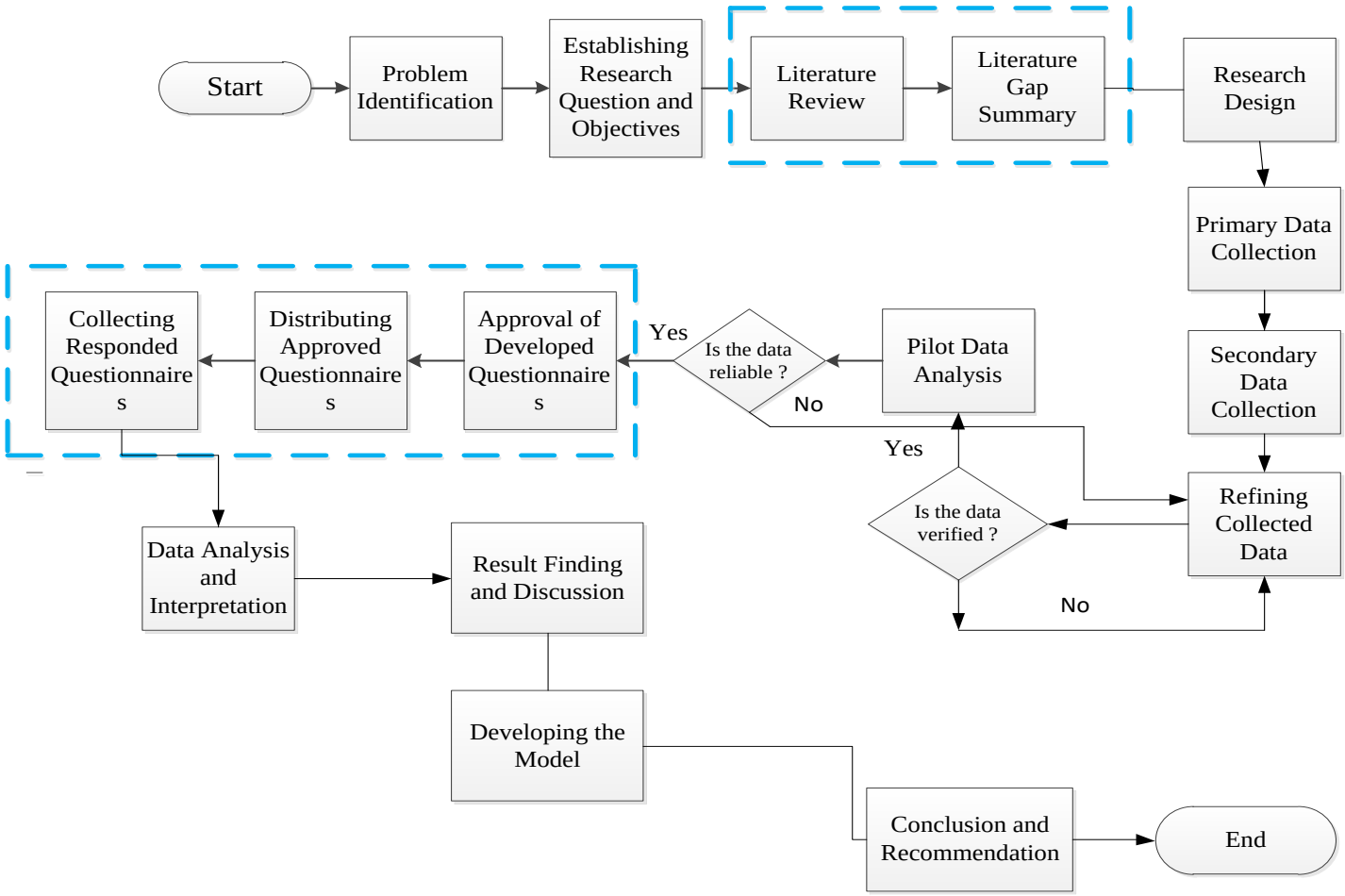

Figure 3.1: Research Methodology Framework *(Source: own work)*

3.3 DATA COLLECTION TECHNIQUE

This study's primary data were gathered through a quantitative descriptive method. The principal data collection instrument utilized was a self-administered, structured, closed-ended questionnaire to investigate the research topic and aims. There were two sections on the questionnaire:

Section A: Background Information

Section B: Integrating Safety and Quality Management Systems is covered

Section C: Semi-structured interview Questions for intermediate managers

There were many different kinds of questions in the questionnaire, including both closed-ended and open-ended inquiries. The top management of Awash Wine S.C., the organization's expert level, and the quality assurance team were among the respondents chosen for the study. Respondents' replies were automatically collected on the email by sharing links to the Google Form, which was used to administer the questionnaire

3.4 POPULATION AND SAMPLING TECHNIQUES

The descriptive research design generally employs random probability sampling while selecting sampling groups. In this case, the randomness may be because of the large number of populations in the sample group. This study ensured that the sample would be representative of the Awash wine company employees. This was crucial as it allowed for the making of valid inferences such that the conclusions that have been drawn reflect the entire population. So, from the total employees of the organization, **185, 110** the research targeted employees as the primary population for the study, as this group requires a minimum of a college certificate, ensuring their understanding of the content and scope of the questionnaire. Additionally, the selection of participants was based on their department and working area, which were used as criteria to design the assumptions for the sampling process at Awash Wine. Random sampling techniques were used to ensure equal participation of employees in the production, quality, and marketing departments.

The researcher can identify the limit value of the error when using the Slovin formula, which employs a normal distribution technique with p=0.5 (Ismail et al., 2022).The ideal number of employees in the target group was calculated from the total population of 110 employees in the company using Slovins in's formula:

n= N/(1+Ne2) Source: (Ismail et al., 2022)

Where n is the sample size

N-the population size

E-margin of error

And the total number of target groups in the sampling size will be:

$n=110/ (1+110(0.05)^2)$

=**86**

3.5 DATA COLLECTION

Collected data on the current safety and quality recording from the safety and quality department respectively, the quality record on the product rework, and the downtime. The data collection method for this study was through a survey, interviews with experts, observations of the company, and a review of records on safety and quality.

3.6 PRIMARY DATA COLLECTION

A questionnaire was prepared and distributed to the case-company experts, and the responses were collected and analyzed with proper statistical tools. An interview will also be conducted with the quality and safety team to understand and consider their perspective on the current safety and quality management system overview, working principles, and procedures, and gather responses to use as input for the research. Observation is the other type of primary data collection method that will be used in this research and includes observation of some specific areas of quality, safety, and production. In this case, quality standards and procedures, safety incidents, and safety measurements will be observed to identify any areas for improvement.

3.6.1 OBSERVATION

In order to gather information for the study "Integrating Quality and Safety Management Systems to Enhance Productivity: A Case Study of Awash Wine," the researcher used an observational technique to visit wineries. The investigator conducted on-site observations and documented various aspects of Awash Wine's operations with regard to productivity, safety, and rework. Throughout the observation process, the researcher methodically observed and recorded events, rules, and practices inside Awash Wine's operations. The researcher set out to record the quality and safety management system in its current state,

highlighting any defects and possible directions for improvement. The researcher gained important insights into the company methods, product rework rate, adherence to safety protocols, and overall productivity through direct observation of the operations.

3.6.2 INTERVIEW

Interviews with pertinent stakeholders at Awash Wine was done for the study project titled "Integrating Quality and Safety Management Systems to Enhance Productivity: A Case Study of Awash Wine," which is focused on the wine sector. The purpose of the interviews is to get opinions and ideas about the integration of the present quality and safety management system and how it affects output. The interview questions that the researcher prepared centered on important topics such the current safety and quality procedures, difficulties encountered, the integration of the two systems, and the perceived consequences on productivity. Interview targets included comprise members of the middle management team, quality and safety personnel, and other individuals with knowledge of Awash Wine's operations and procedures.

To find recurring themes, patterns, and insights on the integration of the quality and safety management system and its effect on productivity, the data acquired from the interviews was evaluated. The interview questions prepared for quality and safety personnel and middle management are presented in Appendix A.

3.6.3 QUESTIONNAIRES

This survey aims to collect information and opinions from people working in the wine business, particularly at Awash Wine, about the productivity effects of integrating quality and safety management systems. The purpose of the questionnaire is to investigate the difficulties encountered when integrating various systems, look at how the integration is thought to have affected productivity, and get suggestions for future development. Through the organized series of questions supplied in the questionnaire, the respondents which include staff members, managers, and other stakeholders involved in quality and safety management at Awash Wine shared their opinions and views. Before dispatching the questionnaire to the employees, a pilot test was conducted with middle managers and supervisors. The purpose of this pilot study was to test the clarity and comprehension of the questions, assess the flow and structure of the questionnaire, identify and resolve potential issues and evaluate the reliability and validity of the measures. The feedback and

insights gained from this pilot study were then used to refine and improve the final version of the research questionnaire before deploying it for the main data collection phase of the study. This process helped ensure the questionnaire was well-designed, user-friendly, and generated reliable and valid data.

In the context of Awash, the questionnaire was a useful instrument for gathering information and viewpoints about the integration of quality and safety management systems and how it affects productivity in the context of Awash Wine.

3.7 SECONDARY DATA COLLECTION

The researcher used a range of secondary data sources to create an integrated quality and safety management system model for increasing productivity at Awash Wine. The best practices for quality and safety management in the wine production industry were studied by the researcher by looking through academic and industry publications. Internal corporate data: Production logs, quality control guidelines, and safety incident reports were among the internal records kept by Awash Wine that offered insights into the condition of their management systems at the time. To keep up with new developments and standards pertaining to quality and safety management in the wine business, the researcher examined industry publications and reports.

The researcher was able to create strategies to improve productivity through better integration of these systems, identify areas for improvement, and gain a thorough understanding of Awash Wine's current quality and safety management practices by combining data from these various secondary sources.

3.8 DATA DESIMINATION

A process of spreading and exchanging research or statistical data with pertinent parties, including other researchers, organizations, and members of the public, is referred to as data dissemination. Encouraging a broad audience to access and comprehend statistical information and research findings is the aim of data dissemination. Planning ahead, communicating clearly, and taking the intended audience into account are all necessary for effective data distribution. The researcher will distribute data or information to encourage knowledge sharing, evidence-based decision-making, and increased public involvement with research and statistical information by making data accessible, intelligible, and

relevant. Generally, the methodology of the research will be interconnected with the research objectives, summarized as follows in the table:

Table 3.1: Methodology and Objectives Relationship

S.no	Specific Objectives of the Research	Tools /Instruments	Method/Approach
1	SO1	• Questionary • Observation	• Literature Review • SPSS
2	SO2	• Questionary • Sem structured interview	• SPSS
3	SO3	• SPSS Result	• SPSS

.

3.9 VALIDITY AND RELIABILITY INSTRUMENT

3.9. 1 VALIDITY

The researcher in this study aimed to develop content-valid constructs by conducting an extensive literature review. This process involved carefully selecting all the relevant factors related to the quality and safety of the organization. Furthermore, the measures were reviewed and validated by the managers of Awash Wine S.C.'s safety, quality, operations, technical, and quality assurance departments. Additionally, the researcher's advisor and co-advisor evaluated the measurements, along with input from colleagues, to ensure that the statements appropriately represented the full range of potential factors to be tested in the study. Based on the feedback received, the questionnaires were subsequently modified.

3.9.2 RELIABILITY

The researcher conducted a pilot study at the Lideta and Mekanisa branches of Awash Wine S.C. with several groups consisting of 8 managers, 3 supervisors, and 15 employees from different departments in order to confirm the instrument's dependability. The internal consistency coefficient, Cronbach's alpha, was employed to ensure the study's dependability. An exclusive quantitative assessment of the internal consistency of the scale is given by this coefficient. According to Cooper and Schindler (2007), a coefficient of over 0.7 is necessary for the instrument to be considered reliable.

Table 3.2. Reliability Analysis

Variables	Cronbach's Alpha coefficient score	No. of Items	Comments
Quality and Safety Leadership	0.845	5	Reliable
Continuous improvement	0.787	5	Reliable
Employee Involvement	0.778	5	Reliable
Customer Focus	0.735	5	Reliable
Safety Evaluation and Monitoring	0.893	5	Reliable
Organizational Productivity	0.769	5	Reliable

CHAPTER FOUR

4. DATA ANALYSIS AND PRESENTATION

4.1 INTRODUCTION

This chapter carefully links the study's results with the research objectives and questions presented in Chapter One by thoroughly analysing and presenting the data. Descriptive statistics are thoroughly examined at the outset of the study to provide a full and nuanced knowledge of the data. The researcher analysed the data using the Statistical Package for Social Science (SPSS-26) program to guarantee accuracy and dependability. How the study's results are presented is designed to methodically answer every research objective and topic.

4.2 DEMOGRAPHIC DESCRIPTION OF RESPONDENT

A total of 86 questionnaires were distributed to selected employees of Awash wine S.C. in both branches which have direct contact with quality safety and also productivity. Out of 86 questionnaires, 80 returned, and were correctly filled and used, while 6 questionnaires were incomplete and disqualified. The response rate achieved in this study was 93.7%, which is well above the acceptable threshold established by (Rog Elberg and Stanton,2007; Saunders et al.,2007). According to their findings, a response rate of 50% is deemed acceptable, while a rate of 60% is considered commendable, and a response rate of 70% or higher is regarded as exceptional. Therefore, the response rate of 93.7% attained in this study is, indicating a strong level of engagement and participation from the selected employees at Awash Wine S.C. Based the analysis of demographic results, the researcher used only a profession, level of education, and years of experience. This information is crucial for the success of any endeavor, as it provides valuable insights into the characteristics and qualifications of the participants.

Figure 4.1 illustrates that a significant portion of the respondents possessed higher education qualifications. Specifically, (45%) had a second degree, (35%) had a first degree, and (7.5%) had a second degree or higher. Additionally, (22.5%) of the respondents had attained a college-level education. These findings indicate that all the respondents were well-educated and possessed the necessary capacity to comprehend and respond effectively to the displayed questions. Their educational background suggests a level of knowledge

and understanding that contributes to the reliability and quality of their responses in the study.

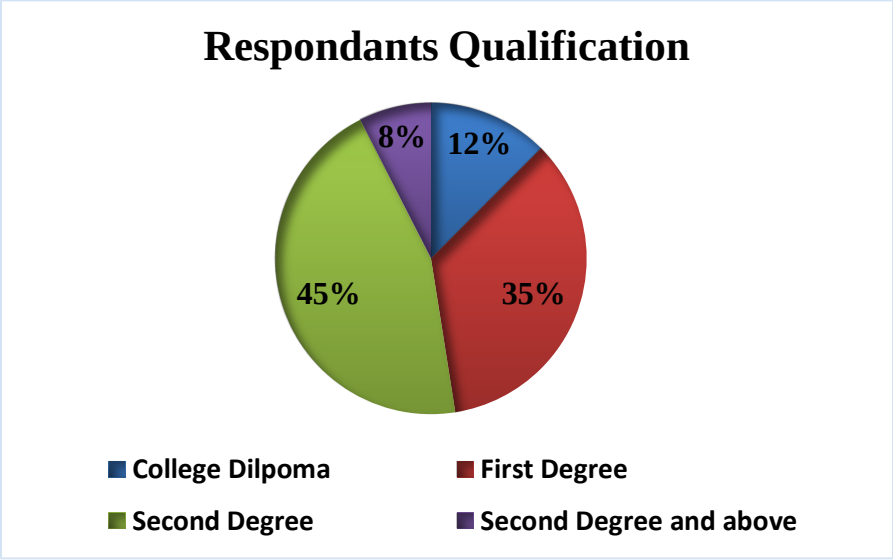

Figure 4.1: Respondent Qualification

As depicted in Table 4.2 the distribution of respondents' working departments and specializations reveals that the largest proportion (32.5%) had a specialization in engineering and maintenance. Furthermore, (16.3%) of the respondents specialized in human resource management, while (15%) were from the production department. Additionally, (8.8%) were from the quality assurance department, (10%) were from the finance department, 12.8% were from the marketing department, (9.8%) were from the human resource department, and (7.5%) belonged to other departments. This distribution signifies that quality and safety issues are relevant across all departments within the company. It indicates that employees from various departments are well-informed and aware of the importance of these issues. The diverse representation of departments in the study ensures a comprehensive understanding of the organization's quality and safety perspectives, reflecting a holistic approach to addressing these concerns.

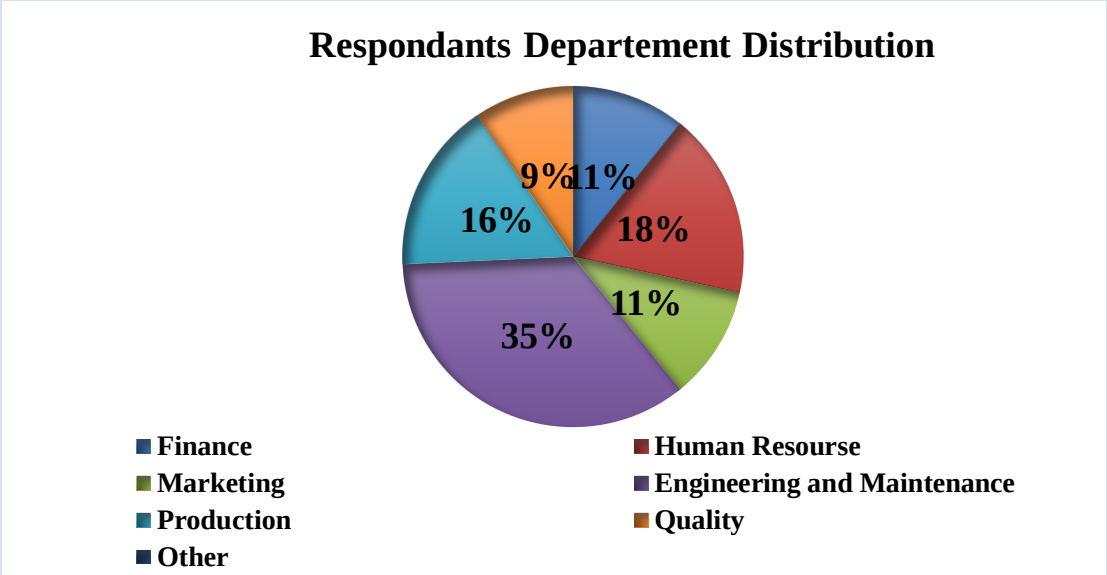

Figure 4.2: Respondent Department Distribution

Figure 4.3 presents the work experience of the respondents within the selected organization. The majority of respondents (48.8%) had work experience ranging from 6 to 10 years. This was followed by 36.3% of respondents who had 3 to 5 years of experience, and 13.3% who had over 10 years of experience. Only a small percentage (1.3%) of respondents had less than 2 years of work experience. Given that a significant portion of respondents had 6 to 10 years of work experience, it can be inferred that they possessed a strong understanding of the overall quality and safety practices within their company, as well as their relationship with organizational productivity. Overall, the study highlighted the engaged and knowledgeable workforce at Awash Wine S.C and emphasized the importance of promoting inclusivity, expanding research scope, and leveraging employees' expertise to address quality, safety, and productivity concerns effectively.

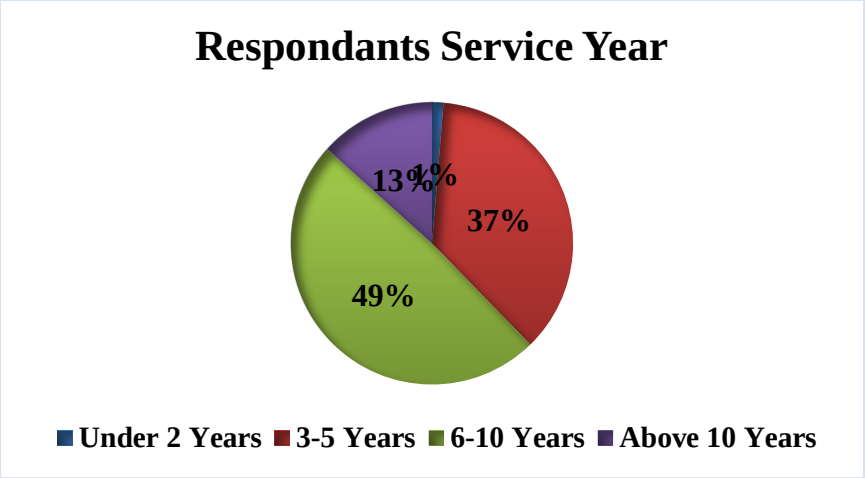

Figure 4.3: Respondents Work Experience

4.3 DESCRIPTIVE STATISTICS

The researcher used a collection of statistical techniques known as descriptive statistics that is employed to enumerate, arrange, and explain the most important characteristics of a dataset. Descriptive statistics are primarily used to give for a researcher a clear and insightful summary of the data without drawing conclusions or inferences from the data itself. The researcher employed descriptive statistics in the context of the Awash Wine case study to enumerate and characterize the key characteristics of the data gathered, including quality concerns, productivity measures, and safety event rates. This instructed the subsequent system dynamics modeling and analysis and served as a basis for understanding the condition of integrated the quality and safety management system model at the time. Descriptive statistics were specifically employed by the researcher for the following crucial goals:

- **Data summarization**: To improve comprehension of the data for both the researcher and readers, the researcher used measures of dispersion, such as standard deviation and mean to summarize and characterize the essential features of the data.
- **Data exploration**: The researcher was able to examine and comprehend the distribution, trends, and patterns within the dataset attributable to the descriptive statistics. This made it easier to identify any discrepancies, deviations, or possible problems that needed more research.

- **Assumptions testing**: The descriptive statistics, including tests of normality, were used to ascertain whether the data met the underlying assumptions, informing the appropriate statistical techniques to use. This was done because the researcher intended to use advanced statistical analyses, such as regression or ANOVA.

The researcher was able to present a thorough overview of the Awash Wine data by using these descriptive statistical techniques, which prepared the groundwork for the system dynamics modeling and analysis that proceeded. Therefore, let see each status and result of each variable used in the to develop integrated quality and safety management system model for the case company to enhance productivity

4.3.1 QUALITY AND SAFETY LEADERSHIP

Analysis of the Findings: The result from table 4.1 below interpreted as, the standard deviation of 0.9284 indicates that there is some variation in the perception of quality and safety leadership within the organization, while the average mean suggests that the system or organization has a well-established and successful leadership approach when it comes to quality and safety management. These factors are used to identify leadership competencies, align organizational duties and structure, generate performance indicators, and promote continuous improvement in the development of an integrated quality and safety management system model. Additionally, the system dynamics model and simulation for scenario analysis, stock and flow modeling, and causal loop analysis use this variable. Overall, the data show that the organization can benefit greatly from the strong quality and safety leadership. This leadership has the potential to increase productivity, guide the creation of an integrated quality and safety management system, and offer insightful information for modeling and simulating system dynamics.

4.3.2 CONTINUOUS IMPROVEMENT

Analysis of the Findings: The organization has put in place some procedures and practices to promote gradual and continuous progress, but there is still opportunity for improvement, as evidenced by the average mean of 3.54 according to table 4.1 below. The organization's understanding and application of continuous improvement are reasonably consistent, as seen by the standard deviation of 0.7762. The following benefits of moderate, continuous improvement can be applied to increase productivity: small but steady increases in

efficiency; empowerment and involvement of employees; and creative and problem-solving thinking. Furthermore, applications in creating a model of an integrated quality and safety management System putting procedures in place for continual improvement and coordinating it with safety and quality. The organization's overall continuous improvement strategy, objectives, performance evaluation, and feedback can all be correlated with quality and safety-related improvements by using the continuous improvement variable. This outcome finds use in stock and flow modeling, scenario analysis, and system dynamics model and simulation for causal loop analysis. All things considered, the data's reasonable level of continuous improvement can be a great advantage for the case company, as it has the ability to increase productivity gradually, guide the creation of an integrated quality and safety management system, and offer insightful information for modeling and simulating system dynamics.

4.3.3 EMPLOYEE INVOLVEMENT

Interpretation of the Results: The variance of 0.876 indicates that there is a reasonable degree of consistency in the way continuous improvement is understood and implemented, but some differences in perception may exist within the organization. The average mean of 3.348 from Table 4.1 below indicates that the organization has established some processes and practices to drive incremental and ongoing improvement, but there is room for further enhancement. Benefits for increasing productivity would include progressive efficiency gains, employee empowerment and engagement, creativity, and problem-solving. The system dynamics model and simulation can also use continuous improvement data in the following ways: scenario analysis, stock and flow modeling, and causal loop analysis. In general, the data's moderate level of continuous improvement can be a great asset for the company, as it has the ability to boost productivity gradually, guide the creation of an integrated quality and safety management system, and offer insightful information for modeling and simulating system dynamics.

4.3.4 CUSTOMER FOCUS

Analysis of the Findings: The average mean score of 3.218 from table 4.1 below indicates that the company places a reasonably high priority on comprehending and meeting the demands of its clients. This suggests that while the company has put in place some

procedures and methods to obtain feedback from customers and match its products and services to their needs, there is still opportunity for improvement. The 0.82 standard deviation indicates a moderate degree of heterogeneity in the organization-wide perception of the customer focus initiatives. This suggests that although there may be some variations in perspective within the company, there is a fair amount of consistency in the understanding and application of customer focus.

Benefits of Productivity Improvement: The following benefits of a moderate consumer focus on productivity enhancement are possible:

- **Enhanced customer happiness**: The company may boost customer satisfaction and generate more loyalty, recommendations, and repeat business by keeping a modest focus on comprehending and satisfying client wants.
- **Targeted development of products and services**: The information acquired about consumer needs can help with the creation and improvement of goods and services that better meet the needs of customers, which will increase resource allocation and efficiency.
- **Updated procedures**: By identifying and streamlining the activities that provide the most value to consumers, a business can increase overall productivity and operational efficiency by adopting a customer-centric attitude.
- **Employee engagement**: When employees see how their job directly benefits customers, they are more likely to feel purposeful and engaged in their work.

The following methods can be used to integrate the customer focus data into the system dynamics model and simulation:

Causal loop analysis: It is possible to investigate the dynamic links between consumer focus, quality, safety, and other system factors by including the customer focus variable in the causal loop diagrams.

Modeling of stocks and flows: The system dynamics model's stock and flow structures can be parameterized with the help of customer focus data, allowing for the modeling of how customer focus affects system performance as a whole.

Scenario analysis: To determine the possible effects on productivity, quality, safety, and other important performance indicators, the system dynamics model can be used to simulate various scenarios, such as adjustments to the organization's customer focus

strategy. All things considered, the data's moderate level of customer focus can be a great benefit for the case company, as it has the ability to boost output, guide the creation of an integrated quality and safety management system, and offer insightful information for modeling and simulating system dynamics.

4.3.5 SAFETY EVALUATION AND MONITORING

Analysis of the Findings: The organization has developed strong procedures and practices to evaluate and track safety performance, as seen by the average mean of 3.708 from table 4.1 below, showing a high degree of commitment to safety and the 0.77 standard deviation this suggests that, although there may be some variations in perception or application within various organizational divisions, safety evaluation and monitoring are understood and carried out with a fair amount of consistency. This outcome illustrates the applications of productivity enhancement as proactive risk management and enhanced safety performance are two benefits of a strong emphasis on safety evaluation and monitoring for productivity enhancement. Enhanced competitive advantage, regulatory compliance, and employee engagement and morale. Here are some ways that the robust safety evaluation and monitoring data can be incorporated into the creation of an integrated quality and safety management system model: establishing thorough safety performance metrics and smoothly incorporating safety into quality procedures putting in place reliable systems for safety reporting and monitoring and Processes linked to safety are always being improved: Robust safety assessment and monitoring data can be leveraged to pinpoint and rank chances to boost safety-related protocols and practices, propelling ongoing improvement of the company's safety performance. Furthermore, modeling and simulation of system dynamics were conducted using the interpolated data. The methods can be used to integrate the robust safety evaluation and monitoring data into the system dynamics model and simulation as scenario analysis, stock and flow modeling, and causal loop analysis purpose.

4.3.6 ORGANIZATIONAL PRODUCTIVITY

The primary goal of the analysis is to determine the impact and influence of each of the mentioned above independent variables on organizational productivity using the results and summary of those variables. Let's examine how each independent variable affects organizational productivity based on the data analyzed.

Quality and safety leadership: A strong emphasis on this variable indicates that the

organization has a well-established and successful strategy for promoting quality and safety initiatives from the top down. This strong leadership in quality and safety is likely to have a positive impact on organizational productivity because it guarantees that quality and safety are prioritized and integrated into the overall business strategy and operations.

Safety Evaluation and Monitoring: Protecting safety comes priority because it helps the company prevent productivity losses from accidents, maintenance, and legal problems, which raises total productivity. Thorough safety assessment and ongoing observation support the identification and management of possible safety hazards, the avoidance of mishaps, and the upkeep of a secure workplace.

Continuous Improvement: By focusing on continuous improvement, the company can find little improvements to its processes and make them gradually better, which lowers loss and boosts productivity. Although the business has a strong foundation in this area, more productivity gains could be achieved by reinforcing its efforts in continuous improvement.

Employee Involvement: Employee empowerment and engagement can boost creativity, problem-solving skills, and sense of ownership, all of which can boost output. Increasing staff engagement and cultivating a culture of ongoing learning and development can also increase organizational productivity.

Customer Focus: An organization could effectively tackle customer needs by matching market expectations with its processes, goods, and services when it has a strong customer focus. The company can improve its competitive position and maximize productivity to provide more value to its consumers by strengthening its focus on the needs of the client.

In conclusion, the analysis shows that the organization's robust safety evaluation and monitoring procedures, along with its strong emphasis on quality and safety leadership, have the biggest positive effects on overall organizational productivity. Although the company has a strong base in these areas, it may increase productivity even more by stepping up its efforts in customer focus, staff involvement, and continuous improvement. The company can maintain a competitive edge in the market and unleash significant productivity improvements by tackling these areas.

Table 4.1: Descriptive Analysis Result of the Variables

Variables	Average Mean	Average Standard Deviation	Indicator
Quality and safety leadership	3.604	0.9284	Strong
Continuous Improvement	3.54	0.7662	Substantial
Employee Involvement	3.348	0.876	Substantial
Customer Focus	3.218	0.82	Substantial
Safety evaluation and Monitoring	3.708	0.77	Strong
Organizational Productivity	3.608	0.8796	Strong

4.4 CORRELATION ANALYSIS

The study of the relationship between two or more quantitative variables is a crucial aspect of statistical analysis. Regression and correlation analysis can be used to examine relationships between two or more variables (Kafle, 2019). A statistical metric that measures the relationship or association between two or more variables is called a correlation. It evaluates the degree to which variations in one variable are correlated with variations in another. A correlation coefficient, which shows the relationship's intensity and direction, is commonly used to depict correlation.

Table 4.2: Correlation analysis result for dependent and independent variables (Source: Survey data 2024)

Person Correlation							
		QSL	CI	EI	CF	SEM	OP
QSL	Correlation Coefficient	1	0.658**	.683**	0.592**	0.305	0.489
	P- value		.000	.000	.000	0.006	.000
CI	Correlation Coefficient	0.656**	1	0.709**	0.456	.456	0.546**
	P- value	.000		0.000	.0.000	0.000	0.000

EI	Correlation Coefficient	.683**	.709**	1	0.609**	.394**	.602**
	P- value	0.000	0.000		0.000	0.000	0.000
CF	Correlation Coefficient	0.592**	.456	.609**	1	.514**	.450**
	P- value	0.000	0.000	0.000		0.000	0.000
SEM	Correlation Coefficient	0.305	.475	.394**	.514**	1	0.572**
	P- value	0.000	0.000	0.000	0.000	0.000	0.000
OP	Correlation Coefficient	.489	.546**	.602**	.450	.572**	1
	P- value	0.000	0.000	0.000	0.000	0.000	0.000
** Correlation is significant at the 0.01(2-tailed)							

Were

SQL= Safety and Quality Leadership *CI= Continuous Improvement*

EI= Employee Involvement *CF= Customer Focus*

SEM= Safety Evaluation and Monitoring *OP= Organizational Productivity*

An effective method for estimating how strongly two variables is linearly related is to use the correlation coefficient. Cohen and Holliday (1982) classified the range of correlation coefficients into the following categories: Very low is defined as 0.19 and below, low as 0.20 to 0.39, modest as 0.40 to 0.69, high as 0.70 to 0.89, and very high as 0.90 to 1. When two variables have a significant positive correlation, it means that when one increases, the other also tends to increase linearly. When two variables have a significant negative correlation, it means that one variable tends to drop as the other does.

The findings, which are displayed in Table 4.8, demonstrate that there was a positive association between each independent variable and the dependent variable, in this case, organizational productivity. Specifically, Continuous improvement, employee involvement and safety evaluation and monitoring have a substantial t correlation with organizational productivity with result of, r= *.546, P= 0.000, r= 0.602, r= 0.000 and P= 0.572 and 0.000* respectively. Based the result, Safety and quality leadership and customer

focus, even a positive relationship with a near-to-low result, *r= 0.489, p= 0.000 and r= 0.456*, p= 0.000

Overall, the correlation analysis shows that there is a positive and statistically significant association between the independent variables (QSL, CI, EI, CF, and SEM) and the dependent variable (organizational productivity). The aforementioned observation implies that businesses can improve their total productivity and performance by concentrating on these crucial elements. Additionally, the positive correlation between independent variables reveals that these factors are interdependent and reinforce one another.

4.5 REGRESSION ANALYSIS

A statistical method for modeling and analyzing the relationship between a dependent variable and one or more independent variables is regression analysis. It makes it possible for analysts and researchers to comprehend how, when one independent variable is changed while the other independent variables are kept constant, the value of the dependent variable changes. Two crucial hypotheses have been examined in this section: **multicollinearity**, which describes the level of correlation between independent variables, and **normality**, which deals with the residuals' distribution. We have tested the total data to see if it complies with the linear regression assumptions to ascertain the validity and reliability of the assessed results.

4.5.1 MULTICOLLINEARITY TEST

When there is a strong correlation between two or more independent variables in the regression model, multiple regression analysis is performed.

Table: 4.3: Multicollinearity test (Source: Survey data 2024)

Independent variables	**VIF values**	**1/VIF=tolerance**
Safety and Quality Leadership	2.417	0.414
Continuous Improvement	2.596	0.385
Employee Involvement	2.733	0.469
Customer Focus	2.132	0.469
Safety Monitoring and Evaluation	1.581	0.633
Mean of VIF	**2.292**	

The variance inflation factor (VIF) was used to determine whether or not there was any association between the independent variables. The correlation strength between the independent variables is ascertained via VIF. Regressing a variable against all other variables yields the prediction. The value of VIF =1 shows that the independent variables are not correlated to each other. A moderate degree of correlation exists between the variables if the VIF value is 1< VIF < 5. VIF has a difficult value of 5 to 10, which denotes highly connected variables. According to Belsley, D.A., (1991), multicollinearity among the predictors in the regression model is present if VIF = 5 to 10. If VIF > 10, the regression coefficients are weakly evaluated in the presence of multicollinearity.

According to the variance inflation factor (VIF), values show whether or not the independent variables are moderately associated if the VIF values fall between 1 and 5. As a result, this study's independent variables had a **modest** correlation.

4.5.2 REGRESSION COFFICIENT OF INDEPENDENT VARIABLES

In summary, as indicated by the table below, the regression model of independent variables demonstrates that organizational productivity is dependent on and independent of the other variables. The results indicate that all of the independent variables—safety and quality leadership, continuous improvement, employee involvement, customer focus, and safety evaluation and monitoring—have statistically significant positive relationships with organizational productivity at the 5% level or better. Employee involvement is the relationship with safety that is strongest, followed by safety evaluation and monitoring.

Table 4.4: Regression Model of Independent Variables

Coefficients [a]								
Model		Unstandardized Coefficients		Standardized Coefficients	T	Sig.	95.0% Confidence Interval for B	
		B	Std. Error	Beta			Lower Bound	Upper Bound
1	(Constant)	4.253	1.664		2.556	.013	.937	7.568
	Safety and Quality Leadership	.102	.097	.134	1.058	.004	-.090	.295

	Continuous Improvement	.033	.124	.035	.269	.003	-.214	.280
	Employee Involvement	.362	.130	.376	2.785	.007	.103	.622
	Customer Focus	.083	.116	.085	.715	.007	.314	.148
	Safet Evaluation and Monitor	.356	.089	.410	4.002	.000	.179	.533
a. Dependent Variable: Organizational Productivity								

4.5.3 NORMALITY TEST

To ascertain whether the residuals are normally distributed, this assumption is applied. Examining the model's P-P plot and histogram will allow you to test this. The histogram should be symmetric along the central 3.5, the P-P plot dots should be closer to the diagonal line, and the normal P-P plot points should sit on a reasonably straight diagonal line from bottom left to top right to indicate that the study's normality assumption is met. In this instance, the assumption of normality is satisfied since, as can be seen in Figures 4.1 and 4.2 below, the dots in the P-P plot are closer to the diagonal line and the histogram is symmetric.

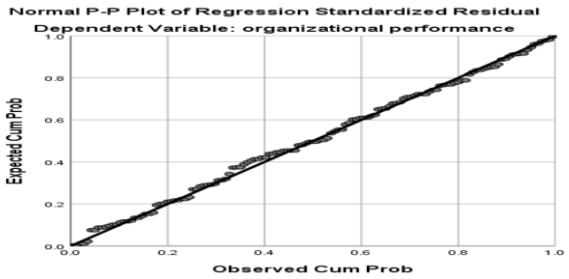

Figure 4.4: Distribution of mean (Source: survey data 2024)

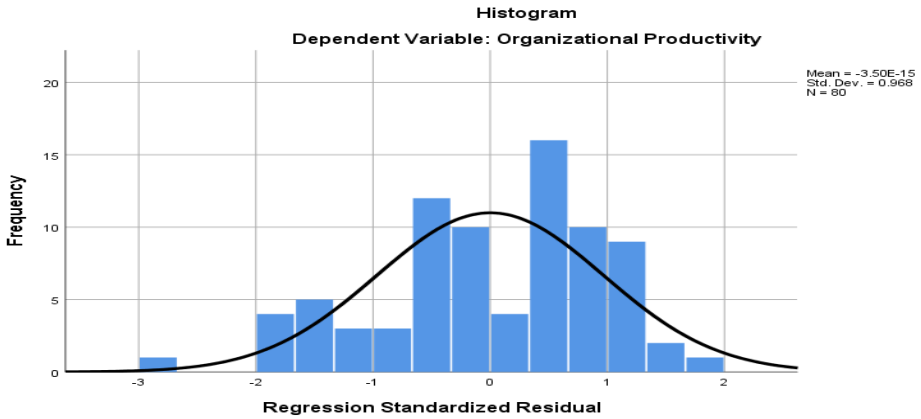

Figure 4.5: Normal P-P plot showing a correlation between expected cumulative probability and observed cumulative probability (Source: Survey data 2024)

4.6 MULTPLE REGRESSION ANALAYSIS

Multiple regression analysis is an advanced statistical technique that allows researchers to investigate the complex relationships between multiple variables (Saunders et al., 2009). This powerful analytical method is particularly well-suited for exploring the complex interplay among various factors, such as identifying the key integrating quality and safety management practice elements that serve as the strongest predictors of organizational productivity and quantifying the overall variance explained by all quality and safety management practices. By leveraging multiple regression analysis, researchers can make stronger causal inferences based on the observed interrelationships among the variables. This approach also enables the prediction of a dependent variable based on the values of several independent variables. This capability is invaluable for gaining a comprehensive understanding of the complex dynamics that exist within organizations, empowering managers to make informed, data-driven decisions aimed at improving overall performance. Multiple regression analysis is a versatile and indispensable tool for both researchers and managers. It provides a deep and nuanced understanding of the intricate relationships that drive organizational success, equipping decision-makers with the insights needed to implement targeted interventions and strategies for enhanced performance.

Based on the provided Model Summary table 4.10 below, we can interpret the results as follows:

R: The multiple correlation coefficient (R) is 0.712, which indicates a strong positive

relationship between the independent variables (Safety and Quality Leadership, Continuous Improvement, Employee Involvement, Customer Focus, and Safety Evaluation and Monitoring) and the dependent variable (Organizational Productivity).

R-Square (R^2): The R-square value is 0.508, which means that the independent variables in the model explain 50.8% of the variation in the dependent variable, Organizational Productivity.

Adjusted R-Square: The Adjusted R-Square is 0.474, which is slightly lower than the R-Square. This indicates that the model fit has been adjusted for the number of predictors in the model, and the adjusted value is a more accurate estimate of the true population value.

Standard Error of the Estimate: The standard error of the estimate is 2.02784, which represents the average amount that the observed values vary from the predicted values. This suggests a reasonably good model fit.

Durbin-Watson: The Durbin-Watson statistic is 1.986, which is close to 2. This suggests that there is no significant autocorrelation in the residuals, indicating that the assumption of independent errors is met.

Generally, based on the results, the model appears to have a good fit, with the independent variables collectively explaining a significant portion (50.8%) of the variance in Organizational Productivity and the Durbin-Watson statistic also suggests that the assumption of independent errors is met.

Table: 4.5. The regression model statistics for Quality and Safety management practice and organizational productivity

(Source: Survey data 2024)

Model Summary [b]					
Model	R	R Square	Adjusted R Square	Std. Error of the Estimate	Durbin-Watson
1	.712[a]	.508	.474	2.02784	1.986
a. Predictors: (Constant), Quality and safety leadership, continuous improvement, employee involvement, customer focus and safety evaluation and monitoring					
b. Dependent Variable: organizational productivity					

Based on Table 4.11, the ANOVA table shows that the regression model is statistically significant overall. The F-statistic of 15.255 with a p-value of 0.000 indicates that the

model, as a whole, significantly predicts the dependent variable, Organizational Productivity. This means that the independent variables (Safety and Quality Leadership, Continuous Improvement, Employee Involvement, Customer Focus, and Safety Evaluation and Monitoring) collectively have a significant impact on the dependent variable. Based on the ANOVA results, the significant F-statistic and low p-value suggests that the model is a good fit for the data and that the independent variables are meaningful predictors of Organizational Productivity.

Table: 4.6. The regression model statistics for quality and Safety management practice and organizational productivity (Source: Survey Data 2024)

ANOVA[a]						
Model		Sum of Squares	Df	Mean Square	F	Sig.
1	Regression	313.652	5	62.730	15.255	.000[b]
	Residual	304.298	74	4.112		
	Total	617.950	79			
a. Dependent Variable: organizational productivity						
Predictors: (Constant), Quality and safety leadership, continuous improvement, employee involvement, customer focus, and safety evaluation and monitoring						

Multiple regressions, semi-structured interview responses, and company-observed data led to the analysis's conclusion, which is shown in Table 4.12 below. The following conclusions were reached by the researcher: The regression model's high R-squared and modified R-squared values suggest that it is well-specified and a reliable predictor of organizational productivity. This shows that to promote increased productivity, the company has made great progress in integrating quality and safety management procedures.

4.7 SURVEY RESULT AND INTEGRATION MODEL

The regression analysis provides empirical evidence for the significance and relative importance of the various components within the Integrated Quality and Safety Management System Model in predicting Organizational Productivity. This information can be used to refine and optimize the model to enhance the organization's overall performance and productivity. For example:

- Safety Evaluation and Monitoring has the highest standardized coefficient (**0.410**), suggesting it has the strongest influence on Organizational Productivity among the variables included in the model.
- Employee Involvement has the next highest standardized coefficient (**0.376**), indicating it is also a significant predictor of Organizational Productivity.
- A one-unit increase in Safety Evaluation and Monitoring is associated with a **0.356** increase in Organizational Productivity, holding other variables constant.
- A one-unit increase in Employee Involvement is associated with a **0.362** increase in Organizational Productivity.

The main purpose of analyzing the correlation coefficient, coefficient of independent variables, mean and standard deviation of the variables are:

- Understand the interrelationships between the various components of the Integrated Quality and Safety Management System Model.
- Identify the most critical and reliable relationships that should be the focus of the model's development and implementation.
- Quantify the impact of different factors on the overall performance and outcomes of the integrated system.
- Develop more accurate and data-driven models that can be continuously refined and optimized to meet the organization's needs.

4.8 IMPROVED INTEGRATED QUALITY AND SAFETY MANAGEMENT SYSTEM MODEL FRAMEWORK

All of the independent factors have a positive and significant link with the dependent variable of organizational productivity, according to the analysis and interpretation of the regression model of independent variables. Thus, the relationship between each independent variable and dependent variable served as the foundation for the integrated management system model that was created below.

The integrated system has multiple effects on productivity. First, the company can limit accidents and injuries and the downtime they entail by implementing strong safety measures that ensure a safe working environment. Improved productivity and a continuous

workflow are the results of this. Second, the company can improve the quality of its goods or services by the use of quality management systems, which will satisfy clients and grow its market share. Productivity is enhanced as a result, allowing the company to concentrate on providing excellent goods and services. The following model framework shows the new and adopted proposed integrated quality and safety management system that boosts or enhances productivity in the process industry.

The following are the case company's advantages if they employ its developed integrated management system model:

Integrated Management System: This concept creates a single, cohesive framework by merging the Safety and Quality Management Systems. Enhanced effectiveness, enhanced coordination, and decreased effort duplication throughout the company can result from this integration.

Improvement of the Entire Management System: The "continuous improvement" component at the core of the model proposes an emphasis on this process. This can assist the company in continuously modifying and enhancing its procedures, which will increase output and efficiency.

Organizational Productivity: Because the different components like integrated safety and quality systems, quality leadership, and organizational productivity are interrelated, it is possible that the application of this process. This can assist the company in continuously modifying and enhancing its procedures, which will increase output and efficiency.

The case company could: Perform a gap analysis to evaluate their current management systems and find areas for improvement that this integrated model can address in order to justify its theoretical advantages.

To assess the effect of the model's implementation on critical performance metrics, including operational effectiveness, safety records, customer satisfaction, and employee engagement, a pilot program will be launched in a designated business unit or department.

To estimate the possible savings, productivity increases, and other financial gains that could be obtained by putting this approach into practice, do a cost-benefit analysis.

To obtain knowledge and best practices, speak with consultants or industry professionals who have implemented integrated safety and quality management systems. Through a careful assessment of the possible advantages and data-driven analysis to

support the implementation, the case. The new integrated quality and safety management model has advantages over the model developed by Kazhymurat et al.'s at 2020. The limitations of the model are that it's primarily focused on quality management without addressing safety or other organizational aspects; it doesn't provide a comprehensive view of interconnected systems and may not be sufficient for holistic organization needs.

Advantages of the Integrated Safety and Quality Management System Model:

1. It illustrates a holistic approach to managing both safety and quality aspects within an organization.
2. The model emphasizes the integration of various elements such as the quality management system, safety management system, customer requirements, and organizational productivity.
3. It highlights the importance of continuous improvement through the "Continual Improvement" feedback loop.
4. The model acknowledges the key roles of employees, customer satisfaction, and safety monitoring in the overall system.

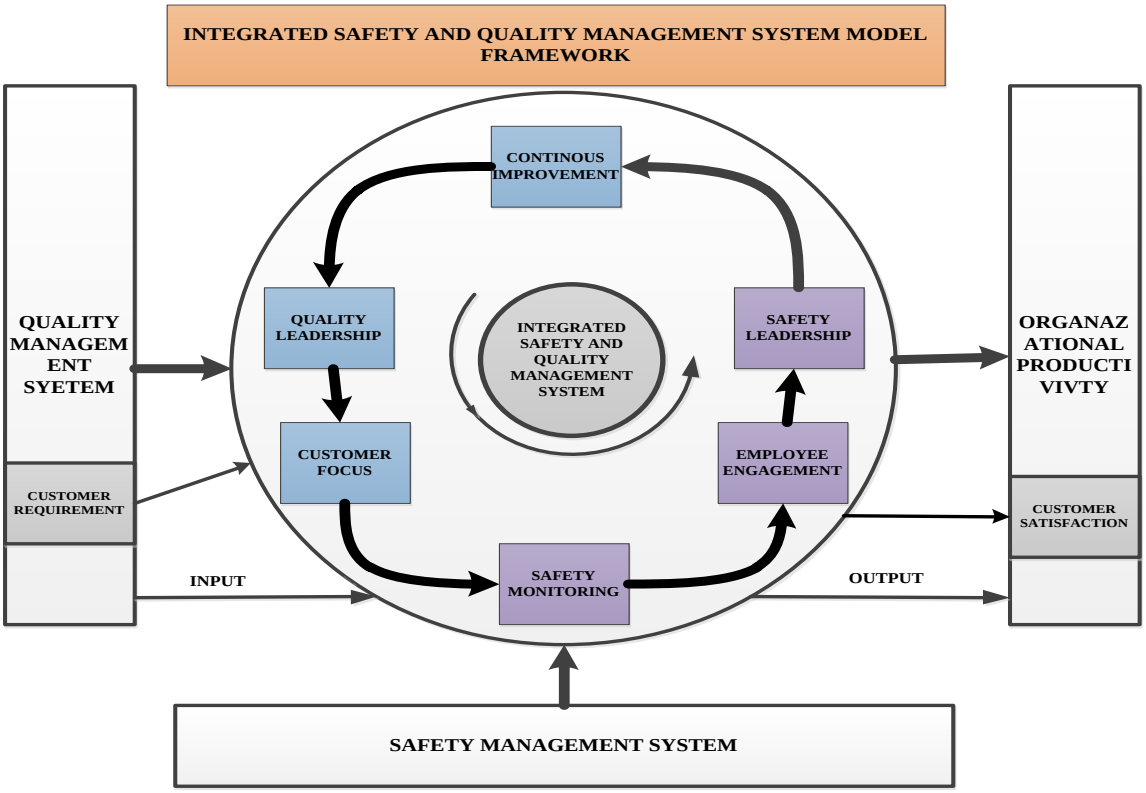

Figure 4.6: Proposed Integrated Quality and Safety Management System Model Framework: Source (own work)

The figure presents an integrated quality and safety management system designed to increase the beverage industry's productivity. Let's dissect the elements and examine how they affect output:

Safety Systems: The organization's safety systems are represented by the connected circles. The purpose of these technologies is to guarantee a secure workplace for workers. Through the implementation of strong safety protocols, training, and procedures, the company can reduce the number of accidents, injuries, and lost work hours resulting from safety incidents. Employees are able to work more productively as a result of not having to worry about possible risks.

Quality Management Systems: The organization's quality management systems are represented by the sequence of rectangles. The goal of these systems is to preserve and raise the caliber of goods and services. The organization can lower errors, faults, and customer complaints by putting quality control procedures into place, carrying out comprehensive inspections, and putting corrective measures into place. Higher customer happiness, repeat business, and a strong brand reputation are all correlated with improved quality, and these factors boost productivity.

Organizational Structures: The integrated safety and quality management system's supporting organizational structures are shown by the boxes in the diagram. Roles, duties, and routes for communication are all part of these frameworks. Coordination, cooperation, and effective decision-making are made easier by well-functioning organizational structures. A clear understanding of duties and responsibilities among employees lowers confusion and boosts overall efficiency in the workplace.

Finally, efficient coordination, transparent communication, and effective decision-making are made possible by the efficient organizational structures shown in the diagram. Processes are streamlined, delays are reduced, and a productive work atmosphere is promoted.

In conclusion, the beverage industry's productivity is greatly impacted by the integrated safety and quality management system depicted in the graphic. The firm can optimize its operations, prevent disruptions, and offer high-quality products or services by giving priority to safety, quality, and efficient organizational structures. This will ultimately result in enhanced productivity.

4.9 CONNECTIVENESS OF THE INTEGRATION MODEL

By using SPSS to analyze these variables, organizations can gain valuable insights into the strengths, weaknesses, and interdependencies within the Integrated Quality and Safety Management System Model. This analysis can inform the refinement and optimization of the model, ensuring it effectively addresses the organization's holistic needs and supports continuous improvement in quality, safety, and overall organizational performance. The SPSS analysis can provide quantitative and statistical data to complement the qualitative understanding gained from the system analysis, process mapping, risk analysis, and other approaches. This combination of analytical methods can lead to a more comprehensive and data-driven development of the Integrated Quality and Safety Management System Model. The relationship between the integration of quality and safety management systems can be observed as follows:

- **Interconnectedness**: The model depicts the quality management system and the safety management system as interconnected components within the overall integrated framework. This suggests that these two management systems are not standalone entities, but rather work in tandem to achieve the organization's objectives.
- **Continuous Improvement**: The "Continuous Improvement" element in the center of the model serves as the driving force that links the quality management system and the safety management system. This indicates that the integration of these systems is centered around a continuous improvement process, ensuring ongoing refinement and optimization.
- **Shared Elements**: The model highlights shared elements between the quality management system and the safety management system, such as "Customer Focus" and "Employee Engagement." This suggests that these elements are critical to both quality and safety management, and their integration enables a more holistic and aligned approach. In summary, the "Integrated Safety and Quality Management System Model Framework" illustrates the close relationship and interdependence between the quality management system and the safety management system,

highlighting the benefits of integrating these systems to achieve a more comprehensive and effective management approach.

4.10 MODEL IMPLEMENTATION BENEFIT AND JUSTIFICATION

If the case company implements the Integrated Safety and Quality Management System Model framework, they can potentially benefit in the following ways:

- **Improved Organizational Productivity**: The regression analysis shows that the various components of the model, such as Safety and Quality Leadership, Continuous Improvement, Employee Involvement, Customer Focus, and Safety Evaluation and Monitoring, have a significant positive impact on Organizational Productivity. By effectively implementing this integrated model, the company can leverage these critical factors to enhance their overall productivity.
- **Enhanced Safety and Quality Management**: The model provides a holistic approach to managing both safety and quality within the organization. By integrating these systems, the company can achieve greater synergies, better identify and address potential risks, and improve the overall quality of products and services. This can lead to increased customer satisfaction, reduced rework, and a more robust operational performance.
- **Fostering a Safety-Conscious Culture**: The model emphasizes the importance of safety leadership, employee engagement, and continuous improvement. By prioritizing these aspects, the company can cultivate a strong safety culture, where employees are empowered to identify and mitigate safety concerns, and the organization is proactive in addressing safety-related issues. This can contribute to a safer work environment, reduced accidents, and improved employee well-being.
- **Continuous Improvement and Adaptability:** The "Continuous Improvement" component of the model underscores the importance of ongoing optimization and adaptability. By embracing this mindset, the company can continuously refine its processes, address emerging challenges, and stay responsive to changing market conditions and customer requirements. This can lead to improved competitiveness, market responsiveness, and long-term sustainability.

- **Alignment with Industry Best Practices:** The Integrated Safety and Quality Management System Model is based on recognized frameworks and industry best practices. By implementing this model, the company can align its operations with established standards and guidelines, potentially leading to improved compliance, regulatory adherence, and industry recognition.

To justify the implementation of this model, the company can:

- Conduct a cost-benefit analysis to demonstrate the potential financial and operational gains from implementing the integrated model.
- Benchmark the company's current safety and quality performance against industry benchmarks and identify areas for improvement.
- Engage employees and stakeholders to understand their concerns and gather feedback on the proposed model implementation.
- Pilot the model in specific departments or business units to assess its effectiveness and make necessary adjustments before a full-scale rollout.
- Establish clear key performance indicators (KPIs) and track the improvements in safety, quality, productivity, and customer satisfaction over time.

By systematically justifying the implementation and demonstrating the tangible benefits, the company can build a strong case for adopting the Integrated Safety and Quality Management System Model and unlock the potential to enhance its overall operational excellence and competitiveness.

4.11 INTEGRATED MODEL VALIDATION

To validate that the new developed Integrated Safety and Quality Management System Model would perform better than the organization's current practices, the researcher gathered evidence through a rigorous evaluation process. The steps the researcher recommended were:

1. **Assessed the organization's current state**:

- Understood the organization's existing safety and quality management practices, processes, and performance metrics.

- Collected data on the organization's current safety and quality outcomes, such as incident rates, customer complaints, rework, productivity, and customer satisfaction.
- Identified any challenges or pain points the organization was facing with its existing approaches.

2. **Conducted a gap analysis:**
    - Evaluated the proposed Integrated Safety and Quality Management System Model against the organization's current practices.
    - Identified the key differences, potential benefits, and possible limitations of the new model compared to the existing system.
    - Determined the areas where the new model could address the organization's current challenges and improve overall performance.
3. **Performed a qualitative assessment**:
    - Gathered feedback from employees, managers, and customers involved in the newly developed model.
    - Understood their perceptions, experiences, and any concerns or resistance they had towards the new model.
    - Incorporated their insights to refine the model and address any challenges.

By following this comprehensive evaluation process, the researcher was able to gather the necessary evidence to validate the performance and feasibility of the Integrated Safety and Quality Management System Model compared to the organization's current practices. The data-driven analysis, benchmarking, and stakeholder feedback provided a solid foundation to make an informed decision on whether to adopt the new model and achieve better safety and quality outcomes.

4.12 FINDINGS AND RESULT DISCUSSION

The study titled "Integrating Quality and Safety Management Systems in the Process Industry to Enhance Productivity: A Case of Awash Wine" by the researcher examines the

integration of quality and safety management systems to improve productivity at the Awash Wine company in Ethiopia. The research aims to identify gaps in the existing quality and safety management systems at Awash Wine and propose solutions to address the issues.

The key findings of the study include:

- The company's inability to monitor and evaluate safety during routine operations and its unwillingness to place a high priority on the ongoing enhancement of its working culture both have a negative influence on productivity. The effectiveness of individual leadership features has been found to be the main focus of current research; safety leadership has been found to be one of the key factors that predict positive outcomes; organizational support has also been used to show the connection between work outcomes and organizational commitment to safety. Because of this, (Edmund et al., 2020; Levovnik & Gerbec, 2020).
- The business does not sufficiently regulate or ensure the safety of its employees during the production process. Safety is maintained as a non-core company responsibility that is there to avoid consequences or sanctions from the government but is not necessary for business operations when it is diverted to fulfill non-essential and unrecognizable activities(Ladewski & Al-Bayati, 2019).
- By the alignment of employee engagement and continuous improvement, organizations can develop a mutually reinforcing environment that propels sustained performance, higher productivity. The integration of cognitive and progressive workers into operations targeted at methodical process improvement is a prerequisite for continuous process improvement. In this instance, participatory management is used, and the participants in the process carry out the majority of the conceptual work pertaining to the enhancements and modifications made to it(Brajer-Marczak, 2014; Khan et al., 2019).

To address these issues, the paper suggests a framework for an integrated quality and safety management system that makes use of system dynamics modeling. Planning for quality and safety, putting quality and safety procedures into action, and evaluating the efficiency of these systems are all included in the framework. The results of this investigation support earlier studies on the significance of combining safety and quality management systems in

the process industry. The shortcomings that have been found, such the absence of continuous improvement and safety monitoring, are typical problems that companies in this industry deal with.

The system dynamics modeling-based integrated management system framework that has been suggested is a useful addition to the body of current material. A more comprehensive and dynamic understanding of the interactions between quality and safety aspects is made possible by the application of system dynamics, and this can result in the deployment and optimization of these systems that are more successful.

The Awash Wine Company is the subject of the study, which offers a thorough case study that can be helpful for other process industry firms, especially those in developing nations like Ethiopia. The fact that the researcher acknowledged potential limitations including time, money, and resource availability emphasizes the necessity of taking practical issues into. The fact that the researcher acknowledged that there might be limitations in terms of time, money, and resource availability emphasizes the practical issues that must be taken into account when carrying out this kind of research.

In summary, this thesis presents a thorough examination of the incorporation of quality and safety management systems and delivers a structure for enhancing efficiency and productivity within the process sector. Both industry practitioners and academic researchers can find great value in the findings and the suggested approach.

CHAPTER FIVE

5. CONCLUSION AND RECOMMENDATION

5.1 CONCLUSION

The study focuses on integrating quality and safety management systems to enhance the productivity of the process industry, specifically Awash wine. The literature review indicates that developing an integration of quality and safety models is essential for enhancing organizational productivity. Many researchers are working on modelling and simulating quality and safety management principles and factors to boost productivity and overall efficiency.

The main aspects of the study were to identify factors that affect organizational productivity and develop a model that emphasizes the complex interrelationship between the various factors influencing quality and safety management by developing and simulating system dynamics. Through a comprehensive literature review, a survey, interviews, and expert opinion, several key variables affecting quality and safety integration were identified. Building upon this foundational study, integrated quality and safety conceptual frameworks and a system dynamics model were developed to capture the interrelationships between these substantial factors.

As explained in the data findings and simulation results, process efficiency, employee skill, and organizational resources have a great impact on organizational productivity. The simulation and finding results revealed that considering safety compliance and process efficiency is very important for the organization to boost its overall productivity and increase customer satisfaction. The system dynamics model revealed the dynamic nature of the challenges faced by Awash Wine, including the feedback loops between employee safety, production efficiency, and overall productivity. The causal loop diagram illustrated how the integration of quality and safety management systems can lead to a virtuous cycle of continuous improvement, minimizing errors, and reducing rework. These modelling techniques provided valuable insights into the underlying dynamics and the importance of an integrated management approach. Based on the simulation output and sensitivity graph result, as the effective leadership and communication rises up, the organizational; productivity automatically increased.

In conclusion, the analysis revealed significant gaps in the existing quality and safety management systems at Awash Wine, including a lack of integration, inadequate documentation and monitoring, and inconsistent implementation across the organization. These gaps led to challenges related to employee safety, process inefficiency, and unproductive use of working hours due to downtime, rework, and non-conforming products. To address these issues, the researchers proposed an integrated management system framework that provides a structured approach to improving overall performance at Awash Wine.

5.2 RECOMMENDATION

To enhance organizational productivity and overall efficiency at Awash Wine, it is crucial to implement an integrated quality and safety management system that considers all the key factors affecting performance. The conceptual and system dynamics models developed in this research have highlighted the vital role of process efficiency, employee skill development, and customer focus in boosting organizational productivity. By integrating these crucial variables into the quality and safety management system, the organization can reduce product rework, minimize wasted working hours, and decrease waste. Particularly, the study findings emphasize the importance of implementing and continuously monitoring adherence to safety principles and practices. This will help engage employees in the overall improvement of organizational performance and efficiency.

Over the implementation of the proposed integrated management system framework, Awash Wine can increase employee safety, decrease reworking due to product returns, and minimize working-hour waste caused by noncompliance with safety protocols. The key recommendations based on the research results are as follows:

- **Continuous improvement principles**: Establish a culture of continuous improvement where quality and safety are prioritized and employees are empowered to identify and address issues proactively.
- **Monitoring and evaluation of safety**: Implement robust monitoring and evaluation systems to ensure consistent adherence to safety standards across the organization. This will foster a safety-conscious work environment and reduce incidents.
- **Integrated data management**: Develop an integrated data management system

that captures and analyses quality and safety-related metrics, enabling informed decision-making and data-driven process improvements.

It is important to note that the conceptual and system dynamics modelling in this study was based on a combination of data sources, including literature reviews, surveys, interviews, and observations. Due to the insufficiency of complete data in some areas, the study had to make certain assumptions.

5.3 FUTURE RESEARCH DIRECTION

Beyond the wine business, other process industry companies could benefit from additional case studies or pilot implementations of the proposed integrated quality and safety management system model to further validate it. This would enable the model's relationships and parameters to be adjusted in response to user feedback and lessons gained from practical applications. The integration of quality and safety management systems in other process industry sectors, including pharmaceuticals, chemicals, or food processing, might also be the subject of future research. Conducting comparative analyses among different sectors may facilitate the identification of sector-specific variables that impact the integration and execution of management systems. This more thorough investigation would offer insightful information about the integrated approach's adaptability and usefulness outside of the original case study. Therefore, the researcher recommends the following as a feature research area:

- Validation and Refinement of the Integrated Quality and Safety Management System Model
- Expansion to Other Process Industry Sector

6. REFERENCE

Abrahamsson, S., Isaksson, R., & Hansson, J. (2010). Integrated management systems: advantages, problems and possibilities. 13th Toulon-Verona Conference,

Akhmetova, S. O., Fuschi, D. L., & Vasiliūnaitė, R. (2017). TOWARDS FOOD SAFETY: QUALITY MANAGEMENT PECULIARITIES. *Journal of Security & Sustainability Issues*, *6*(3).

Alqumboz, M. A. A., & Abed, M. (2007). Developing a model for integrating safety, quality and productivity in building projects in the Gaza Strip. *The Islamic University of Gaza*.

Bala, B. K., Arshad, F. M., & Noh, K. M. (2017). System dynamics. *Modelling and Simulation*, *274*.

Bernardo, M., Simon, A., Tarí, J. J., & Molina-Azorín, J. F. (2015). Benefits of management systems integration: a literature review. *Journal of Cleaner Production*, *94*, 260-267.

Brajer-Marczak, R. (2014). Employee engagement in continuous improvement of processes. *Management*, *18*. https://doi.org/10.2478/manment-2014-0044

Cavallini, S., d'Alessandro, C., Volpe, M., Armenia, S., Carlini, C., Brein, E., & Assogna, P. (2014). A system dynamics framework for modeling critical infrastructure resilience. Critical Infrastructure Protection VIII: 8th IFIP WG 11.10 International Conference, ICCIP 2014, Arlington, VA, USA, March 17-19, 2014, Revised Selected Papers 8,

Chakraborty, A., Mutingi, M., & Vashishth, A. (2019). Quality management practices in SMEs: a comparative study between India and Namibia. *Benchmarking: An International Journal*, *26*(5), 1499-1516.

Edition, F., Kelton, W. D., Sadowski, R. P., & Swets, N. B. Simulation with Arena.

Edmund, N. N. K., Linda, A. S., & Kofi, P. M. (2020). Safety House: A developed Framework to Improve Safety Performance among Highly Risky Industries. *International Journal of Environment, Agriculture and Biotechnology*, *5*, 6.

Fernández-Muñiz, B., Montes-Peón, J. M., & Vazquez-Ordas, C. J. (2007). Safety management system: Development and validation of a multidimensional scale.

Journal of Loss Prevention in the process Industries, *20*(1), 52-68.

Garza-Reyes, J. A., Rocha-Lona, L., & Kumar, V. (2015). A conceptual framework for the implementation of quality management systems. *Total Quality Management & Business Excellence*, *26*(11-12), 1298-1310.

Giacomarra, M., Galati, A., Crescimanno, M., & Tinervia, S. (2016). The integration of quality and safety concerns in the wine industry: the role of third-party voluntary certifications. *Journal of Cleaner Production*, *112*, 267-274.

Hernandez-Vivanco, A., Bernardo, M., & Cruz-Cázares, C. (2018). Sustainable innovation through management systems integration. *Journal of Cleaner Production*, *196*, 1176-1187.

Ismail, I. A., Pernadi, N. L., & Febriyanti, A. (2022). How to grab and determine the size of the sample for research. *International Journal of Academic and Applied Research (IJAAR)*, *6*(9), 88-92.

Jones, L. (2014). Vensim and the development of system dynamics. *Discrete-Event Simulation and System Dynamics for Management Decision Making*, 215-247.

Kafle, S. C. (2019). Correlation and regression analysis using SPSS. *Management, Technology & Social Sciences*, *126*.

Katsuro, P., Gadzirayi, C., Taruwona, M., & Mupararano, S. (2010). Impact of occupational health and safety on worker productivity: A case of Zimbabwe food industry.

Kazhymurat, A., Uazhanova, R., Tungyshbayeva, U., & Tlevlesova, D. (2020). Model of integrated quality and safety management system for collagen production. *International Journal of Engineering Research and Technology*, *13*(11), 3675-3684.

Khan, S. A., Kaviani, M. A., J. Galli, B., & Ishtiaq, P. (2019). Application of continuous improvement techniques to improve organization performance: A case study. *International Journal of Lean Six Sigma*, *10*(2), 542-565.

Kumar, P., Maiti, J., & Gunasekaran, A. (2018). Impact of quality management systems on firm performance. *International Journal of Quality & Reliability Management*, *35*(5), 1034-1059.

Ladewski, B. J., & Al-Bayati, A. J. (2019). Quality and safety management practices: The

theory of quality management approach. *Journal of safety research*, *69*, 193-200.

Laksana, A., Arifuddin, R., Burhanuddin, S., & Abdurrahman, M. (2020). Integration conceptual framework of quality management system-occupational safety and health-and environment (QHSE) at PT. Wijaya Karya. IOP Conference Series: Earth and Environmental Science,

Levovnik, D., & Gerbec, M. (2020). *Role of Leadership Types in Managers' Commitment to Safety*. https://doi.org/10.3850/978-981-14-8593-0_3788-cd

Li, Y., & Guldenmund, F. W. (2018). Safety management systems: A broad overview of the literature. *Safety science*, *103*, 94-123.

Lu, Y., Qian, Y., Huangfu, H., Zhang, S., & Fu, S. (2019). Ensuring the safety sustainability of large UAS: learning from the maintenance risk dynamics of USAF MQ-1 predator fleet in last two decades. *Sustainability*, *11*(4), 1129.

Mažeika, E., & Pīlēna-Dālberga, A. (2022). The Impact of the Implementation of an Integrated Management System on the Operation of a Company: A Case of a Food Production Company. The 26th World Multi-Conference on Systemics, Cybernetics and Informatics (WMSCI 2022), Proceedings,

Movahedi, M., Teimourpour, M., & Teimourpour, N. (2013). A study on effect of performing quality management system on organizational productivity. *Management Science Letters*, *3*(4), 1063-1072.

Musungwa, T., & Kowe, P. (2022). Effects of occupational health and safety management systems implementation in accident prevention at a Harare beverage company. *Cogent Engineering*, *9*(1), 2124638.

Natarajan, D. (2017). *ISO 9001 Quality management systems*. Springer.

Nordlöf, H., Wiitavaara, B., Högberg, H., & Westerling, R. (2017). A cross-sectional study of factors influencing occupational health and safety management practices in companies. *Safety science*, *95*, 92-103.

Nunhes, T. V., Bernardo, M., & Oliveira, O. J. (2019). Guiding principles of integrated management systems: Towards unifying a starting point for researchers and practitioners. *Journal of Cleaner Production*, *210*, 977-993.

Odigie, M. E. (2015). *A study on the integration of quality and safety management systems in small to medium-size companies in the USA* Indiana State University].

Ong, F., Purwanto, A., Supono, J., Hasna, S., Novitasari, D., & Asbari, M. (2020). Does Quality Management System ISO 9001: 2015 Influence Company Performance? Anwers from Indonesian Tourism Industries. *Test Engineering & Management*, *83*, 24808-24817.

Paraschivescu, A. O. (2016). The advantages of the process of integrating quality management system. *Economy Transdisciplinarity Cognition*, *19*(2), 48.

Pozo, H., França Barcelos, A., & Kazue Akabane, G. (2018). Critical factors of success for quality and food safety management: classification and prioprization. *UJIBM*, *6*(2), 30-41.

Priede, J. (2012). Implementation of quality management system ISO 9001 in the world and its strategic necessity. *Procedia-Social and Behavioral Sciences*, *58*, 1466-1475.

Pruyt, E. (2013). Small system dynamics models for big issues: Triple jump towards real-world complexity. *Delft: TU Delft Library*.

Pun, K.-F., & Hui, I.-K. (2002). Integrating the safety dimension into quality management systems: a process model. *Total Quality Management*, *13*(3), 373-391.

Purwanto, A. (2020). Does quality, safety, environment and food safety management systemInfluence business performance? Answersfrom Indonesian packaging industries. *International Journal of Control and Automation*, *13*(1), 22-35.

Rebelo, M. F., Santos, G., & Silva, R. (2016). Integration of management systems: towards a sustained success and development of organizations. *Journal of Cleaner Production*, *127*, 96-111.

Sawant, M. A. (2016). *A quality management system implementation framework for small-sized companies* North Dakota State University].

Sellers-Rubio, R., Alampi Sottini, V., & Menghini, S. (2016). Productivity growth in the winery sector: evidence from Italy and Spain. *International Journal of Wine Business Research*, *28*(1), 59-75.

Shah, S. A. R., Jamaludin, K. R., Talib, H. H. A., & Yusof, S. r. M. (2019). Integrated quality environmental management implementation in food processing SMEs: A case study of a developing country. *The TQM Journal*, *31*(5), 740-757.

Shirali, G. A., Salehi, V., Savari, R., & Ahmadiangali, K. (2018). Investigating the

effectiveness of safety costs on productivity and quality enhancement by means of a quantitative approach. *Safety science*, *103*, 316-322.

Singh, J., Singh, H., & Singh, G. (2018). Productivity improvement using lean manufacturing in manufacturing industry of Northern India: A case study. *International Journal of Productivity and Performance Management*, *67*(8), 1394-1415.

Siva, V., Gremyr, I., Bergquist, B., Garvare, R., Zobel, T., & Isaksson, R. (2016). The support of Quality Management to sustainable development: A literature review. *Journal of Cleaner Production*, *138*, 148-157.

Sterman, J. (2002). System Dynamics: systems thinking and modeling for a complex world.

Surya, B., Menne, F., Sabhan, H., Suriani, S., Abubakar, H., & Idris, M. (2021). Economic growth, increasing productivity of SMEs, and open innovation. *Journal of Open Innovation: Technology, Market, and Complexity*, *7*(1), 20.

Sweeney, L. B., & Sterman, J. D. (2000). Bathtub dynamics: initial results of a systems thinking inventory. *System Dynamics Review: The Journal of the System Dynamics Society*, *16*(4), 249-286.

Tang, V., & Vijay, S. (2001). System dynamics. *Origins, development, and future prospects of a method*.

Unnikrishnan, S., Iqbal, R., Singh, A., & Nimkar, I. M. (2015). Safety management practices in small and medium enterprises in India. *Safety and health at work*, *6*(1), 46-55.

Vinodkumar, M., & Bhasi, M. (2011). A study on the impact of management system certification on safety management. *Safety science*, *49*(3), 498-507.

Vyas, N., Makinde, O., Akinlabi, B., & Adefulu, A. (2023). Quality management practices and productivity of selected food and beverages manufacturing firms in Lagos State, Nigeria. *The Strategic Journal of Business & Change Management*, *10*(2), 1266-1278.

Wachter, J. K., & Yorio, P. L. (2014). A system of safety management practices and worker engagement for reducing and preventing accidents: An empirical and theoretical investigation. *Accident Analysis & Prevention*, *68*, 117-130.

Wold, T., & Laumann, K. (2015). Safety management systems as communication in an oil and gas producing company. *Safety science*, *72*, 23-30.

ANNEX

APPENDIX A: SUMMARY OF LITERATURE REVIEW BASED ON OBJECTIVE, METHOD, AND FINDING

S. No.	Article Author(s)	Year	Title	Objectives	Method	Finding
1.	Jan K. Wachter, Patrick L. Yorio	2022	A system of safety management practices and worker engagement for reducing and preventing accidents: An empirical and theoretical investigation	Theoretical and empirical development of safety management practices and their relationship with objective safety statistics	Data collection using safety manager, supervisor, and employee surveys	Worker engagement acts as a mediator between safety management systems and safety performance outcomes
2.	Bilash Kanti Bala, Fatimah Mohamed Arshad, Kusairi Mohd Noh	2017	System Dynamics: Modelling and Simulation	-Presenting the principles of system dynamics. -Illustrating the use of system dynamics with case studies.	-Introducing complex interactions through dynamic models. - Simulating and evaluating models to depict reality	Addressing complex issues easily with system dynamics
3.	Anders Fundin, Bjarne Bergquist, Henrik Eriksson,	2018	Challenges and suggestions for research in quality management	-Identify challenges faced by quality management (QM) practitioners. -Understand how contemporary QM	-Literature review to investigate how each theme has been addressed in QM research. - Literature review to investigate how each theme	-Three themes related to future QM challenges were identified. -Six propositions for future research were

	Ida Germy			research addresses these challenges.	has been addressed in QM research.	proposed to reduce potential relevance gaps.
4.	Pankaj Kumar, J. Maiti, Angappa Gunasekaran	2018	Impact of quality management systems on firm performance	-Review and analyze various quality management systems. -Identify research gaps in the area of quality management	-Analysis of different quality management systems, research designs, -Performance categories and metrics, and application of tools/techniques	-Recommended implementation of multiple quality management systems. -Suggested studying the differences in quality management systems for manufacturing vs service organizations
5.	E.N. Kwame Nkrumah	2020	Safety House: A developed Framework to Improve Safety Performance among Highly Risky Industries	-Review and address gaps in previous industry-accepted Occupational Health and Safety Management Systems (OHSMS) models.	- Identification of gaps in terms of safety leadership, safety commitment, and integration among models.	-It also highlights the importance of employees' involvement in safety planning before and after the implementation. -Framework emphasizes the integration of safety leadership and safety commitment
6.	Manish Avinash Sawant	2016	A Quality Management System Implementation Framework for Small-Sized Companies	-To propose a quality system implementation framework for small-medium sized organizations. -To provide an effective maintenance tool for	-The study employs a do-it-yourself approach and a case study methodology. - The framework is validated through a case study of a small door manufacturing company.	-The proposed framework provides a cost-effective approach to quality management for small-sized companies. -The study identifies

				continuous improvement in organizations after implementing a quality management system.		setbacks in quality system implementation and provides means to overcome them
7.	Moheeb Abed Abu Alqumboz	2007	Developing a Model for Integrating Safety, Quality and Productivity	Investigating the relationship between construction safety, quality, productivity, time, and cost	-Conducting a survey using valid questionnaires received from construction firms working in Gaza Strip. -	- Workers' Problems" was highly ranked as a factor affecting construction productivity. - Safety expenditures are very much less than losses due to accidents was considered the most important factor related to safety and cost.
8.	Assemay T. Kazhymurat , Raushangul U. Uazhanova	2020	Model of Integrated Quality and Safety Management System for Collagen Production	-To create an integrated quality management system for collagen enterprise based on international ISO standards, HACCP principles, and FMEA. - To offer a technique for creating an integrated safety quality management system (ISQMS) for LPP "Antigen"	-The authors propose a conceptual model of the ISQMS and establish areas of integration for FMEA, HACCP, and QMS systems. - They choose an additive model for creating the ISQMS and create a network of processes based on process integration.	-An integrated system allows for linking safety requirements and product quality, managing them, and meeting customer requirements. - The proposed ISQMS model for LPP "Antigen" provides a framework for ensuring the necessary and stable quality and safety of products.
9.	Freddy Ong,	2020	Does Quality	To determine the impact	Data collection through online	The study found that

	Agus Purwanto		Management System ISO 9001:2015 Influence Company Performance?	of ISO 9001:2015 on the performance of tourism companies in Indonesia	questionnaires using Google form, data processed using partial least square with the LISREL program	several factors of ISO 9001:2015, such as organizational context, leadership, planning, support, operations, and performance evaluation, have a significant positive effect on company performance in the Indonesian tourism industry.
10.	Anrafel de Souza Barbosa, Luiz Bueno da Silva	2021	Integrated Management Systems: their organizational impacts	To map and analyze the literature on the impacts of Integrated Management Systems (IMS) on organizational performance.	Systematic Literature Review (SLR) based on the Preferred Reporting Items for Systematic Reviews and Meta-Analysis (PRISMA)	IMS offer important benefits for organizations, including improving operational performance, reducing costs.
11.	Hannah Whitley	2020	Factors affecting the profitability, productivity, and sustainability.	Identify factors that affect the profitability, productivity, and sustainability.	Mixed-method qualitative design.	Four sets of factors that constrain sustainable agriculture production for socially disadvantaged.
12.	Giuseppina Migliore, Alkis Thrassou	2020	Factors affecting consumer preferences for "natural wine": An exploratory study in the Italian market	To understand the wine quality characteristics, consumer attitudes, and socio-demographic factors	-Experimental research conducted with 613 Italian wine consumers within a hypothetical setting. - Tobit regression model was implemented to analyze the relationship between quality attributes and WTP	The study found that drink frequency and occasion, organic production method, sulfite content, income, and attitudes towards healthy eating and the environment are

						positively associated with a higher willingness to pay (WTP) for natural wine.
13.	Marcella Giacomarra, Antonino Galati, Salvatore Tinervia,	2016	The integration of quality and safety concerns in the wine industry: the role of third-party voluntary certifications.	Identify the key factors affecting the adoption of voluntary quality standards in the wine industry.	The study used survey data from 89 wineries, of which 68 were non-certified and 21 had one or more food quality certifications.	Internal motivations drive entrepreneurs to adopt voluntary standards in the wine industry.
14.	Sara D. Pemble	2020	Factors Associated with Enhanced Productivity of Remote Workers: A Mixed Method Study	To identify factors associated with enhanced productivity of remote workers	Mixed method study	
15.	Theeranun Janjarasskul & Panuwat Seppuku	2018	Active and intelligent packaging: The indication of quality and safety.	Review innovations of active and intelligent packaging, including scavenging and releasing systems for shelf-life extension, and diagnostic and identification systems for quality communication, tracking, and brand protection.	Literature review and analysis of active and intelligent packaging technologies and their applications in the food industry.	Active and intelligent packaging plays an active role in enhancing packaging technology and addressing the challenges of food safety, freshness, and traceability in the global food supply chain.

APPENDIX B: INTERVIEW QUESTIONS

- How would you describe the organization's current level of safety monitoring and evaluation in the integration of quality and safety to boost productivity?
- What are the key factors or practices that contribute to a strong customer focus in the integration of quality and safety to boost productivity? Please explain.
- How well does the organization ensure that quality and safety measures are aligned with customer needs and industry standards?
- How would you rate the overall level of leadership commitment within the organization to support quality and safety integration?
- How would you rate the overall level of productivity within the organization in relation to the integration of quality and safety?
- What are the key factors or practices that contribute to successful continuous improvement in integrating quality and safety?
- How well does the organization communicate the importance of employee involvement in quality and safety to its workforce?

These inquiries are intended to obtain information about Awash Wine's quality and safety management as it is today, as well as about difficulties encountered, the effect they are thought to have on productivity, and suggestions for enhancement.

APPENDIX C: RESEARCH QUESTIONARIES

Addis Ababa Institute of Technology
School of Mechanical and Industrial Engineering
Research Questionnaires

Dear respondents, I am a master's of science in industrial engineering master's student at Addis Ababa Institute of Technology and I have formulated the inquiries in the following questionnaire concerning the topic of the research study. This questionnaire has been designed to gather data and information on **Integrating quality and safety management systems to enhance productivity in the process industry** in the case of Awash Wine S.C. The data collection shall be for academic purposes only and thus not affect you in any circumstance. So, your honest, open, and appropriate response is crucial for successfulness

of the study. Your response will be kept confidential. Lastly, this questionnaire does not require the respondent's name, phone number, or email address. I respectfully ask that you carefully consider your responses to each question item.

Part I. Demographic Profile

Please tick (√) in the appropriate space.

1. Gender

   Male: ☐ Female: ☐

2. Please indicate your age

   Between 21-30 years ☐ Between 31-40 years ☐ Between 41-50 years ☐

   Above 50 years ☐

3. What is your highest level of education?

   College diploma ☐ First degree ☐ Second degree and above ☐

4. What is your department?

   Finance ☐ Human Resource ☐ Marketing ☐ Engineering and maintenances ☐Production ☐ Quality ☐ Other (please indicate) _____

5. The length of your service year within the company?

   Under 2 years ☐ 3 to 5 years☐ 6 to 10 years☐ over 10 years ☐

Part II. Integrating Quality and Safety Management systems and Organizational Productivity

The following statements on integrating quality and safety management systems and organizational productivity were adopted to address the questions and objectives of this research. Please indicate your rate of agreement as per your company case by ticking appropriately on a scale of 1–5, where l=strongly disagree, 2=disagree, 3=neutral, 4 = agree, and 5=strongly agree.

Table 3.1: List of Questionaries

	A. SAFETY AND QUALITY LEADERSHIP	1	2	3	4	5
1	Employees actively participate in safety and quality training and initiatives.					
2	The leaders actively promote a culture of quality and safety throughout the organization.					
3	The organization's top management allocates resources and supports initiatives aimed at improving quality and safety.					
4	Our organization leaders encourage open communication and reporting of quality and safety concerns.					
5	Key performance indicators (KPIs) are used to measure the effectiveness of an integrated safety and quality management system.					
	B. CONTINUOUS IMPROVEMENT	1	2	3	4	5
6	The organization encourages and supports ongoing efforts to improve quality and safety practices.					
7	Employees are actively involved in identifying opportunities for improvement in quality and safety.					
8	The organization promotes a culture of learning and innovation to foster continuous improvement in quality and safety.					
9	The organization regularly evaluates and revises quality and safety processes and protocols based on feedback and lessons learned.					
10	The organization actively seeks external benchmarks and industry standards to drive continuous improvement in quality and safety					
	C. EMPLOYEE INVOLVEMENT	1	2	3	4	5
11	The organization provides opportunities for employees to provide input and suggestions for improving quality and safety practices					
12	Employees are empowered to identify and report quality and safety concerns or hazards in their work environment.					
13	Employees understand the importance of their role in maintaining and promoting quality and safety within the organization.					
14	The organization fosters open communication and collaboration, enabling employees to share their ideas and experiences related to quality and safety.					
15	Employees are involved in the development and review of quality and safety policies, procedures, and protocols.					
	D. CUSTOMER FOCUS	1	2	3	4	5
16	The organization considers customer requirements and expectations when integrating quality and safety measures.					
17	The organization communicates with customers to understand their specific quality and safety concerns.					
18	The organization strives to exceed customer expectations by maintaining high-quality standards and safe operations.					
19	The organization has effective mechanisms to address customer complaints or issues related to quality, safety, and productivity.					

20	The organization measures customer satisfaction about the integration of quality and safety practices.					
E. SAFETY EVALUATION AND MONITORING		1	2	3	4	5
21	The organization has well-defined safety monitoring and evaluation processes in place.					
22	The organization conducts regular safety audits and inspections to identify potential hazards and risks.					
23	Safety monitoring and evaluation processes are integrated with quality and productivity improvement initiatives.					
24	Safety incidents and near-misses are reported, investigated, and analyzed to identify root causes and preventive measures.					
25	The organization implements corrective actions to address safety non-conformities and improve safety performance.					
F. ORGANIZATIONAL PRODUCTIVITY		1	2	3	4	5
26	The organization's quality and safety practices contribute to improved overall productivity.					
27	Integration of quality and safety processes reduces waste and inefficiencies within the organization.					
28	The organization's quality and safety measures lead to fewer errors, incidents, or accidents, resulting in increased productivity.					
29	The organization provides adequate resources and support to ensure employees can maintain productivity while adhering to quality and safety protocols.					
30	The organization regularly evaluates and measures the impact of quality and safety initiatives on overall productivity.					