Performance Measurement Integration And Performance Of Manufacturing Firms in Rwanda.

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ABSTRACT

Rwanda’s manufacturing industry is essential to the country’s economic growth and employment generation. Achieving sustainable development and global competitiveness necessitates the integration of performance assessment effectively. This entails measuring and optimizing organizational performance, especially in supply chains, using a variety of measures. Global market trends and resource limitations are two ongoing challenges that emphasize the necessity for reliable measuring methods. In order to give policymakers and business practitioners useful information, this study aims to assess the effect of performance measurement integration on manufacturing company performance in Rwanda, concentrating on important industries and geographical areas. Expectancy Theory and the Balanced Scorecard Framework (BSC), two important theoretical frameworks related to performance measurement integration in manufacturing businesses, are examined in the literature study. According to expectation theory, people are driven by their conviction that performance, effort, and results are all related. The BSC provides a strategy-based framework for decision-making at various organizational levels. It was created by Kaplan and Norton. The significance of integrating performance assessment in order to increase productivity, quality, customer happiness, and decision-making for small and medium-sized enterprises (SMEs) is underscored by empirical research. Performance in manufacturing is evaluated and optimized via the use of a variety of instruments and methods, including the BSC and KPIs.

The study methodology utilized a quantitative analytic strategy with an explanatory approach to comprehend the relationship between manufacturing company performance and supply chain integration. The research philosophy was shaped by positivism, which prioritized quantitative approaches. Semi-structured questionnaires were used to gather data from 213 manufacturing companies; 94% of the respondents answered the questions. The integration of performance measurement has been found to have a favorable influence on the performance of manufacturing organizations through effective communication, information exchange, and strategic supplier relationships. These findings were supported by descriptive statistics. The findings showed a positive relationship between measurement integration and company performance, with integration accounting for 49.9% of the variance in performance. The results showed that efficient decision-making and information exchange among supply chain participants were influenced. Notably, framework agreements with key suppliers were frequently used in emergency situations. The functions of logistics companies, funders, governments, media, and security personnel in relief efforts were emphasized using qualitative analysis. Issues with inadequate coordination and information exchange were noted. Enhancing IT infrastructure, adopting emerging technologies, collaborating with many stakeholders, and establishing legal frameworks for production readiness are among the recommendations. The study emphasizes how crucial technology, collaboration, and integration are to maximizing the performance of industrial firms and disaster relief in Rwanda.

Keywords: Performance Measurement Integration, Performance of Manufacturing Firms
I.0 INTRODUCTION

1.1 Background of the Study

The manufacturing sector plays a pivotal role in Rwanda's economic development, serving as a cornerstone for industrialization and job creation (Nduwimana, 2018). As the country strives to enhance its global competitiveness and achieve sustainable growth, the effectiveness of performance measurement within manufacturing firms becomes increasingly critical (Rwigema, 2020). Performance measurement integration, defined as the comprehensive utilization of various performance metrics to evaluate and improve organizational performance, emerges as a focal point for managerial decision-making and strategic planning (Bianchi, 2016). Measurement integration is one of the types of integration that occurs to ensure the organization that each component of the supply chain is accountable for reaching its own goals (Vergara et al., 2023). In this context, supply chain members must have standards in place that may create a report card on how each member is performing. A supply contract establishes the criteria that govern the buyer-supplier relationship. At every point of the supply chain, contracts influence the decisions made and the outcomes obtained (Baah et al., 2022; Panahifar et al., 2018). Apart from delineating the conditions of the buyer-supplier relationship, manufacturing businesses’ performance is also defined. Contracts should be written in such a way that they support desirable supply chain outcomes by increasing supply chain surplus and avoiding actions that harm performance (Vergara et al., 2023). A contract should ideally be structured to increase the firm's and supply chain profitability, avoid information distortion, and provide incentives to the supplier to improve performance across important dimensions (Mofokeng & Chinomona, 2019; Ruel et al., 2018). Many supply chain performance issues arise because the customer and supplier are separate companies, each attempting to maximize its profits (Vergara et al., 2023).

Rwanda's manufacturing landscape has witnessed remarkable growth and diversification in recent years, supported by government initiatives aimed at fostering industrial development and attracting foreign investment. However, amidst this growth, manufacturing firms face multifaceted challenges ranging from resource constraints to technological advancements and global market dynamics. In this context, the need for robust performance measurement systems becomes paramount to navigate complexities, optimize operational efficiency, and drive sustainable growth.

Understanding the dynamics of performance measurement integration within Rwanda's manufacturing firms holds significant implications for enhancing competitiveness, fostering innovation, and promoting economic resilience. By examining the extent to which manufacturing firms in Rwanda integrate performance measurement practices into their organizational processes, this study seeks to uncover the underlying factors influencing performance measurement adoption, identify challenges encountered, and explore opportunities for improvement.

On the other hand, measurement integration can also include the Key Performance Indicators that organizations concentrate on the most important components of a company’s performance and consider both present and future success. Relevant KPI metrics are frequently already known to a business (Vergara et al., 2023). However, they may not have been identified as a key performance indicator (KPI) or the measurement may be unknown to the present management team. KPIs in Supply Chain integration include “backorder percentage,” “emergency purchases,” and “late delivery to important customers” (Wijeyaratne, 2018). Because KPIs indicate the company's performance in the most crucial variables, managers may substantially improve performance by taking control of these elements. Organizational measurements can be seen at different levels, which correspond to the levels of hierarchy of a supply chain. The top ones are of great strategic importance and aggregation. In contrast, the lowest level of measurement is highly diagnostic and commonly assessed (Ali et al., 2023). As a starting point for deciding which performance measurement level to adapt to, consider generic performance characteristics such as cost, quality, flexibility, dependability, and speed. In this context, objectives can then be broken down into individual measurements or combined to form composites. This study will use indicators such as lead time, key performance indicators (KPIs), and contract management from other previous studies. Measurement integration is one of the types of integration that occurs to ensure the organization that each component of the supply chain is accountable for reaching its own goals. In this context, supply chain members must have standards in place that may create a report card.
on how each member is performing (Ali et al., 2023). A supply contract establishes the criteria that govern
the buyer-supplier relationship.
Contracts have a substantial influence on the behavior and performance of all stages in a supply chain, in
addition to making the terms of the buyer-supplier relationship apparent. Contracts should be written in such
a way that they support desirable supply chain outcomes by increasing supply chain surplus and avoiding
actions that harm performance (Vergara et al., 2023). A contract should ideally be structured to increase the
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study will also use indicators such as lead time, key performance indicators (KPIs), and contract
management and environmental sustainability from other previous studies.
Moreover, the study aims to contribute to the existing body of knowledge by providing insights into the
effectiveness of performance measurement integration strategies within the unique socio-economic context
of Rwanda. By bridging the gap between theoretical frameworks and practical applications, this research
endeavors to offer actionable recommendations for policymakers, industry practitioners, and stakeholders to
enhance performance measurement practices, drive continuous improvement, and ultimately foster the
sustainable growth of Rwanda's manufacturing sector.
In essence, this study underscores the significance of performance measurement integration as a catalyst for
organizational effectiveness, strategic alignment, and competitive advantage within Rwanda's manufacturing
landscape. By elucidating the intricacies of performance measurement integration and their impact on firm
performance, this research endeavors to provide a foundation for informed decision-making, innovation, and
strategic management in the pursuit of sustainable development goals.

### 1.2 Statement of the Problem
More than 75% of the manufacturing sector in Rwanda and Job opportunities come from SME
manufacturing industries (NISR, 2022). For the past ten years, the emphasis has been on how SME supply
chains could become more competitive. International Finance Corporation (IFC) in 2022 reported Rwandan
SMEs to have an average ROI (return on investment) of 20%. Comparing the country to other African
countries, the favorable business climate and government support for small and medium-sized enterprises
(SMEs) account for the higher return on investment. Meanwhile, the manufacturing sector's contribution is
still low compared to other industries like agriculture, energy, ICT, financial service sectors, and
transportation. In developing countries, over 70% of registered SME ‘firms shut down during the first two
years of operations.
Although the manufacturing sector has strong links to other industries and a lot of potential for economic
growth, its GDP value-added has been steadily declining at around 5%, and it only makes up a relatively
small share of all product exports (IMF( International Monetary Fund), 2022; National Bank of Rwanda et
al., 2020). The food and beverage industries, which make up the two largest subsectors of Rwanda's
industrial sector, did not do as well as they had the previous year (National Bank of Rwanda et al., 2020).
Other tactics that Rwandan manufacturers might employ to increase productivity and competitiveness include supply chain integration, governmental backing for e-commerce projects, legislative actions, and promotion of SME growth (Omwoyo et al., 2020a).

However, studies (Fernando & Wulansari, 2020; Min et al., 2005; Mofokeng & Chinomona, 2019; Omwoyo et al., 2020b; Zhong et al., 2023) show that one of the factors of the inability to compete relies on SMEs’ reluctance to work with other businesses. By promoting effective communication and accurate data sharing among the key stakeholders, companies may reduce their expensive transportation expenses while simultaneously improving productivity and setting themselves apart. Given Rwanda’s landlocked location and inadequate transportation infrastructure, this is extremely important for the nation. Digital supply chains can help manufacturing organizations with governance, collaboration, performance measurement systems, and integration of customers, which allows flexibility and the development of unique capabilities (Ali et al., 2023; Panahifar et al., 2018). Manufacturing firms must actively collaborate, forge solid bonds with various supply chain partners, and make technological investments to improve integration and communication to address these issues. Thus, the purpose of this study was to investigate the relationship between performance and to suggest a model for enhancing the performance of manufacturing Performance measurement systems and industrial system firms across supply chain integration parameters.

1.3 Objectives of the study
The general objective of this study was to evaluate the effect of performance measurement integration on the performance of manufacturing firms in Rwanda.

1.4 Research Questions
i. What is the effect of performance measurement integration on the performance of manufacturing firms in Rwanda?

1.5 Research Hypothesis
H₀. There is no significant effect of performance measurement integration on the performance of manufacturing firms in Rwanda.
H₁. There is a significant effect of performance measurement integration on the performance of manufacturing firms in Rwanda.

1.6 Scope of the Study
This research aims to determine the effect of performance measurement integration on the performance of manufacturing firms in Rwanda. The study focuses on the manufacturing firms in Rwanda because it is considered one of the pillars of national development. It also promotes socio-economic growth to achieve a high economic growth of Vision 2050. This is achieved through employment, pieces of training among others. The research will concentrate on seven (7) dominating clusters giving a total of six hundred eight - two (682) registered firms in Rwanda. The seven (7) dominating clusters are food and Beverage, Metal and Allied, Energy, Coffee and Tea Processing, Building and construction materials, Plastic and Rubber, and Pharmaceuticals and Medical equipment firms in Kigali City, Musanze, Rwamagana, and Muhanga Town. The study targets Kigali city, Musanze town, Muhanga town, and Rwamagana town. This is because Kigali is the capital city where the majority of the firms are concentrated because of the population and good infrastructural network; Musanze town is in the northern province; the second largest town after Kigali city experiences heavy rainfall throughout the year and very high in agricultural production, bordering Uganda and DRC countries hence higher population; Muhanga town is closer to Kigali and because of the good road network and land availability, many investors are putting up manufacturing firms in the area; Rwamagana town is closer to Tanzania border and because of land availability, good road network, and high population.

2.0 LITERATURE REVIEW
2.1 Theoretical Review
2.1.1 Expectancy theory
The theory of motivation known as expectancy theory can be characterized as a process theory. The theoretical framework was established by Edward C. Tolman in 1955 and subsequently validated by Vroom, Porter, and Lawler in 2015. It offers a rationale for people’ selection of a certain behavioral option above others. It underscores the notion that individuals are driven to engage in an activity due to their belief that their activities will result in their intended consequence. (Redmond, 2014). Expectancy is a psychological
construct that pertains to the expectation that expending effort will result in successful performance. Instrumentality refers to the conviction that achieving achievement will lead to the attainment of desired goals or rewards. Valence pertains to the intrinsic worth or appeal of the results or incentives to the individual. Individuals are inclined to exert effort when they hold the belief that their efforts will result in good performance and desirable outcomes, as posited by expectancy theory. According to Fang (2008), expectancy theory posits that work motivation is contingent upon the perceived correlation between performance and results. Therefore, individuals adjust their behavior in response to others' assessment of the expected outcome.

According to Rahayu, Sulistyowati, Pratikto, Hidayat, Narmaditya, Zainuddin, and Indarwati (2024), expectancy theory is a psychological framework that suggests individuals are driven to engage in specific behaviors due to their perception of the probability of desired outcomes and their perceived competence in attaining those outcomes. According to expectancy theory in the field of organizational behavior, employees' motivation levels are impacted by their expectations of the connection between effort, performance, and outcomes. In contrast, the integration of performance measurement in manufacturing enterprises entails the methodical synchronization of performance measurement systems with the aims and objectives of the organization, hence facilitating the effective monitoring and evaluation of performance (Mitchell, 2021).

According to Frederico, Garza-Reyes, Kumar, and Kumar (2021), the process of performance measurement integration entails the harmonization of performance measurement systems with the plans, goals, and objectives of an organization in order to efficiently monitor and analyze performance. Performance measurement systems in manufacturing organizations commonly incorporate a range of measures pertaining to production efficiency, quality, cost control, and customer satisfaction. According to Saleheen and Habib (2023a), the use of integrated performance measurement systems allows organizations to effectively monitor their advancement towards strategic goals, pinpoint areas that require enhancement, and make well-informed choices to optimize overall performance.

Expectancy theory ideas can be utilized to comprehend the impact of performance measurement integration on staff motivation and behavior in manufacturing companies. The motivation of employees to achieve high performance is contingent upon their perceptions on the interplay between their exerted efforts, actual performance, and resultant outcomes. According to Rahayu, Sulistyowati, Pratikto, Hidayat, Narmaditya, Zainuddin, and Indarwati (2024), the effective integration and alignment of performance measurement systems with organizational goals can enhance employees' perception of a distinct connection between their efforts, performance outcomes, and desired rewards.

2.1.2 Balanced Scorecard Framework (BSC)

The study delves into Balanced Scorecard Framework (BSC) that are pertinent to comprehending the effect of performance measurement integration on the performance of manufacturing firms in Rwanda. The concept of work of the balanced scorecard was developed in the 1980s and 1990s by academics and practitioners in various fields, such as financial and performance management accounting. The name given to this tool was first introduced by Kaplan and Norton in 1992 (Kaplan & Norton, 1992). Most organizations have a scorecard covering almost all key areas like human resource, IT, finance and customer care. It refers to a variety of performance measure sets designed to be used to manage and control the strategy of an organization. It facilitates continuous tracking of performance in the company on measures that represent progress. Awori (2007) states that the balanced scorecard is a strategy-based system used to make informed decisions at all functional levels in the organization while focusing on accomplishments and results. To ensure the effectiveness of the balanced scorecard, the organizations should focus not only on the performance measures but also on the desired results to be accomplished (Aswani, 2019). The balanced scorecard approach aims to provide management with a set of measures which combine to give a “comprehensive but quick” view of the business. Indeed, it is suggested that the score-card particularly meets the information needs of managers by combining in a single performance measurement reports the many disparate elements of a company’s competitive agenda while preventing suboptimization by managers, as they must consider all of their organization’s significant performance measures together (Kaplan & Norton, 2015). The balanced scorecard gives organizations a comprehensive review of their operations. Through use of the scorecard, organizations are offered a clear prescription as to what companies should
measure in order to “balance” the implications in all the functional areas, especially their human resource personnel as a matter arising out of the strategic intent.

2.2 Conceptual Framework

<table>
<thead>
<tr>
<th>Measurement Integration</th>
<th>Performance of Manufacturing Firms</th>
</tr>
</thead>
<tbody>
<tr>
<td>• Simulation Based</td>
<td>• Share Growth/Quality</td>
</tr>
<tr>
<td>• Quality of Network</td>
<td>• Customer satisfaction</td>
</tr>
<tr>
<td>• Quality of Goods/Service</td>
<td>• Market growth/Cost reduction</td>
</tr>
</tbody>
</table>

Figure 2.1 Conceptual Framework

2.3 Empirical Review

2.4.4 Performance Measurement Integration and Performance of Manufacturing

Improving the performance of manufacturing Small and Medium-sized Enterprises (SMEs) requires the integration of performance measurement (Saleheen & Habib, 2023a). Performance measurement integration helps ensure that key performance indicators (KPIs) align with the strategic objectives of SMEs (Kamble, Gunasekaran, Ghadge, & Raut, 2020). SMEs can enhance overall performance by assigning and prioritizing work. SMEs may increase overall performance by wisely allocating resources and prioritizing tasks by concentrating on indicators that support business objectives. SMEs can use performance measurement to identify operational and process inefficiencies (Takayabu, 2024). SME productivity and efficiency can be increased by identifying bottlenecks and making targeted improvements based on the key performance indicators (KPIs) in different functional areas, such as manufacturing, sales, and inventory control. Small and medium-sized firms (SMEs) can identify and reduce the variables driving expenses by incorporating performance monitoring systems (Saleheen & Habib, 2023a).

Performance measurement is integrated into the production process to ease the tracking of quality indicators. By keeping updated on key performance indicators (KPIs) related to product defects, defect rates, and customer complaints. SMEs can identify areas for quality improvement and implement corrective actions to improve product quality and customer satisfaction (Ali et al., 2020). SMEs can use integrated measurement tools to optimize inventory levels while lowering carrying costs. Key performance indicators (KPIs) such as stockouts, order fulfillment delays, and inventory turnover can be monitored by small and medium-sized businesses (SMEs) to ensure that inventory levels meet customer demand and, as a result, avoid excess inventory and related storage expenses (Saleheen & Habib, 2023a). By incorporating performance measurement, businesses can monitor the key performance indicators (KPIs) related to customer satisfaction and loyalty (Ali et al., 2020; Saleheen & Habib, 2023a). The organization can monitor the key performance indicators (KPIs) like on-time delivery, product quality, and customer feedback. SMEs can also identify areas for improvement and implement policies to improve the entire customer experience (S. Li et al., 2019).

Several tools and techniques, including the Economic Value Added, Balanced Scorecard (BSC) Model, SCOR Model, Key Performance Indicators (KPI), Management by Objectives (MBO), Total Productivity Management, and Activity-Based Costing, have already been used to assess the performance of the supply chain (Saleheen & Habib, 2023a). Accordingly, the two most useful tools are the Balanced Scorecard (BSC) model and the SCOR model, both of which have acquired universal support (Kamble et al., 2020). Integrating performance evaluation fosters a culture of continuous improvement between SMEs (E. Ali et al., 2023; Takayabu, 2024). Thus, the critical assessment and analysis reveal ten main drawbacks that are
necessary while measuring supply chain performance models to diagnose and evaluate manufacturing organizations. The authors Saleheen & Habib (2023a) and Takayabu (2024) mentioned financial health, Partnerships, Information Sharing, Capacity and Speed. They also added Traceability in Supply Chain Risk Management, Reliability in Internal Operations, Culture to Achieve Performance, Leadership and Corporate Governance, CSR, Technical Innovation, and Service Quality as tool for measurement.

Previous studies (Saleheen & Habib, 2023a; Tanrıverdi et al., 2023; Zhou & Li, 2020) discussed how the organization can measure performance using financial metrics like balance sheets, cash flows, and income statements connected to sales, inventory cost, cost-based, and operational costs. These measures can help the organization to measure operational performance. The management can use these metrics to make decisions on how to maintain long-term relationships with suppliers and customers (Saleheen & Habib, 2023a). Kamble et al. (2020) in a study conducted in auto components manufacturing found that Industry 4.0 enabled SMEs to offer more competitive benefits compared to a traditional manufacturing system. They argued that ten dimensions can be used to measure performance namely cost, quality, flexibility, time, integration, optimized productivity, real-time diagnosis & prognosis, computing, and social and ecological sustainability. Measurement integration can be measured using resilience, reliability, continuous improvement, visibility, and environmental sustainability (Mohamed et al., 2023; Vergara et al., 2023).

In summary, performance measurement integration is essential for manufacturing SMEs to increase output, reduce costs, improve quality, increase customer satisfaction, and support informed decision-making (Saleheen & Habib, 2023a). The use of integrated performance monitoring systems can enhance the marketability and foster sustainable growth of small and medium-sized businesses (SMEs)(Takayabu, 2024). Performance measurement integration is measured in this study by integrating simulation-based metrics, quality of networks, and quality of goods and services in supply chain management. Thus, SMEs may identify opportunities for improvement, obtain insightful knowledge about their operations, and improve overall performance.

2.4.5 Performance of Manufacturing

One firm’s performance measure is quality which is measured in several ways including parts per million, customer defects per supplier, and field failure rates by purchase item and by supplier (S. Li et al., 2019; Zhou & Li, 2020). A study on the role of logistics in manufacturing firms’ performance in some states in Northern Nigeria. Using a cross-sectional examination of members of the Manufacturers Association of Nigeria (MAN), with a sample of 144 firms, using regression analysis through PLS-SEM show that the performance of manufacturing firms may come from the relationship between inbound and outbound logistics. A Study was conducted in Ghanaian manufacturing breweries using the services of a third-party logistics provider (DHL) to assess the importance of outbound Logistics on the performance Management in Manufacturing Companies in Guinea and Ghana. A structured questionnaire was used, and the results showed that the relationship between outbound logistics and performance was not significant. The implications of these findings show that managers of manufacturing firms cannot entirely rely on the contributions of logistics to enhance performance (Mat Isa & Mohammad Al Dweiri, 2020).

Performance measurements such as on-time delivery, cycle time reduction, responsiveness to schedule changes, mix changes and design or service changes, and achieving new products can be used to explain the performance of manufacturing companies (Zhou & Li, 2020). The main objective was to shed some light on performance measurement. The issues relevant to current practices using multiple regression analysis, cluster analysis, and gap analysis show that performance can be measured by responsiveness, time /and delivery (Saleheen & Habib, 2023a). In this context, performance is measured as the amount of time in weeks or months from concept to first shipment or delivery of final product to the market with the objective of continuous reduction of time to the market (Kamble et al., 2020).

The present goals and objectives are mainly in terms of profitability, liquidity, growth, and stock market performance (Müller& Birkel, 2020). Performance measurement practices have been defined as the main components of creating a performance measurement framework that is practical and sustainable and that will provide worthwhile management information about an organization. These practices include metrics, approaches, tools systems, and processes used in performance measurement. Metrics include; management of the organization processes, clear roles and responsibilities, continuous learning, and model success.
Approaches include; financial and non-financial approaches. The tools include safety stock, information technology integration, self-evaluation, and feedback. By ensuring performance measurement people can change rather complex processes into simplified conceptual information for easy communication and action (Zhou & Li, 2020).

Manufacturing firms in Rwanda have over time moved from the use of traditional performance metrics namely profits, production output, efficiency, on-time delivery, and inventory turnover to the use of modern approaches to performance measurement (Müller & Birkel, 2020). The modern approaches to performance measurement include; balance score card, quality management, Return on Investments (ROI), Return on Assets, and customer satisfaction among others. They are; the financial perspective, customers’ perspective, internal business processes perspective, and organizational learning perspective. Other performance measures include quality and cost with common price performance looking at actual purchase cost against the planned purchase price and cost looking at cost changes and cost avoidance. A cost change is the increase or decrease in cost resulting from a change in purchasing strategy while cost avoidance represents the difference between a price paid and a potentially higher price that might have occurred if a purchase had not been obtained at a lower price (Nkwabi & Fallon, 2020).

3.0 RESEARCH METHODOLOGY

The research design of this study adopted an explanatory approach, aiming to explain the aspects of the study through quantitative analysis. Explanatory research design, known for its focus on testing hypotheses and measuring relationships between variables, was deemed suitable for this study's objective of understanding the link between supply chain integration and manufacturing firm performance. The research philosophy leaned towards positivism, emphasizing the use of quantitative methodologies to test hypotheses and establish causal relationships. The target population consisted of 682 manufacturing firms across various sectors, with supply chain managers/officers as the unit of analysis. Sampling was conducted using a probability stratified random sampling technique to ensure representativeness. Data collection involved the use of semi-structured questionnaires, blending closed-ended and open-ended questions to capture a comprehensive understanding of the variables. A pilot test was conducted to refine the questionnaire, ensuring clarity and relevance. Validity and reliability of the research instrument were assessed through expert opinion and statistical analysis. Data analysis employed descriptive and inferential statistical techniques, including regression and correlation analysis, to test hypotheses and determine relationships between variables. The study also examined the moderating effect of information sharing on the relationship between supply chain integration and firm performance using hierarchical multiple regression analysis.

4.0 DISCUSSION OF FINDINGS

4.1 Response Rate

The target sample population was 252 respondents which was composed of procurement officers, finance officers, production managers and general managers. Out of this targeted sample population, twenty-five (25) respondents participated in the pilot study; thus, excluded for the final analysis. Two hundred and twenty-seven (227) respondents were given the questionnaires and filled out through the tablets where 213 respondents fully participated and gave their views. The overall response rate therefore stood at 94% (percent). This response rate was deemed satisfactory as suggested by Sekaram and Bougie (2018) who recommends for at least 75% (percent) as a rule of thumb for minimum responses. The response rate was as presented in Table 4.1 below:

<table>
<thead>
<tr>
<th>Circulated</th>
<th>Frequency</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>Filled and returned</td>
<td>213</td>
<td>94%</td>
</tr>
<tr>
<td>Not returned</td>
<td>14</td>
<td>6%</td>
</tr>
<tr>
<td>Total</td>
<td>227</td>
<td>100%</td>
</tr>
</tbody>
</table>

The table 4.1 shows that out of 227 questionnaires that were distributed to the respondents, 213 questionnaires were completed and returned. After thorough scrutiny and screening 4 of the questionnaires were dropped for incomplete responses. This implied that only 213 questionnaires were considered for data
analysis. Thus constituting 94% of the study population. As a result, this was considered sufficient for analysis and for making inferences.

4.2 Descriptive Statistics

The descriptive results of the study were presented through the utilization of mean averages along with standard deviations in the research analysis. The participants were instructed to provide ratings indicating the extent to which they agreed with the statements pertaining to the study variables. A set of statements using a 5-point Likert scale was devised, and the outcomes are now being presented.

4.2.1 Performance Measurement Integration Descriptive Findings

The study sought to establish the influence of measurement integration on performance of manufacturing firms in Rwanda. This objective was measured using the following indicators: simulation base, quality of network and quality of goods/services in the opinion statements given. Respondents were required to indicate the extent to which measurement integration influenced performance of manufacturing firms in Rwanda. This was on a Likert scale of not at all, small extent, moderate, large extent and very large extent. Therefore, in this study the scale of not at all and small extent meant disagree while large and very large extent meant agreed. The results were expressed as frequencies, percentages, mean and standard deviation as shown in Table 4.18 below.

Table 4.2: Descriptive Analysis of Performance Measurement Integration

<table>
<thead>
<tr>
<th>Statement of Supply Chain Integration</th>
<th>1%</th>
<th>2%</th>
<th>3%</th>
<th>4%</th>
<th>5%</th>
<th>Mean</th>
<th>Std Dev</th>
</tr>
</thead>
<tbody>
<tr>
<td>Integration fostered various forms of integration including virtual integration, process integration, collaborative planning and information sharing</td>
<td>0(0)</td>
<td>7(3.4)</td>
<td>66(31)</td>
<td>95(44.8)</td>
<td>44(20.7)</td>
<td>3.85</td>
<td>.792</td>
</tr>
<tr>
<td>Supply chain has effective communication among all supply chain members enhancing the various relationships that exist between departments within one organization or the relationship between various organizations.</td>
<td>0(0)</td>
<td>7(3.4)</td>
<td>29(13.8)</td>
<td>118(55.2)</td>
<td>59(27.6)</td>
<td>4.17</td>
<td>.742</td>
</tr>
<tr>
<td>Shipments of the items needed by the firm can be simply organized through the internet or a networked computer system.</td>
<td>0(0)</td>
<td>0(0)</td>
<td>43(20.3)</td>
<td>82(38.3)</td>
<td>88 (41.4)</td>
<td>4.23</td>
<td>.763</td>
</tr>
<tr>
<td>Information exchange between partners in the manufacturing process through supply chain has definitive impact on organization performance and efficiency of their supply chains.</td>
<td>0(0)</td>
<td>0(0)</td>
<td>2(1)</td>
<td>119(55.9)</td>
<td>94(44.1)</td>
<td>4.34</td>
<td>.498</td>
</tr>
<tr>
<td>Sharing of information makes it possible for manufacturing firms to make better-informed decisions on basis of making orders, capacity allocations, and material planning.</td>
<td>0(0)</td>
<td>0(0)</td>
<td>15(6.9)</td>
<td>111(52.1)</td>
<td>87(41.0)</td>
<td>4.34</td>
<td>.604</td>
</tr>
<tr>
<td>Manufacturing firms have strategic suppliers for various critical products and services especially for catering for emergencies</td>
<td>0(0)</td>
<td>0(0)</td>
<td>59(27.6)</td>
<td>110(51.7)</td>
<td>44 (20.7)</td>
<td>3.93</td>
<td>.693</td>
</tr>
<tr>
<td>Integration has enabled partners’ input to be considered as pertains to</td>
<td>0(0)</td>
<td>0(0)</td>
<td>15(6.9)</td>
<td>110(51.7)</td>
<td>88(41.4)</td>
<td>4.04</td>
<td>.604</td>
</tr>
</tbody>
</table>
product or services attributes considered during emergencies

| Manufacturing actions involve large numbers of domestic and global actors working in the same topographical settings targeting the same objectives thus coordination is needed for smooth flow of operations | 0(0) | 7(3.4) | 29(13.8) | 66(31) | 110(51.7) | 4.31 | .836 |
| Coordination and information sharing among the manufacturing actors during inter-agency production response influences collective decision-making and manufacturing actions. | 0(0) | 0(0) | 72(33.9) | 110(51.7) | 30(14.1) | 3.81 | .634 |

Key: 1-Not at all; 2-Small Extent; 3-Moderate Extent, 4-Large Extent and 5- Very Large Extent

Majority of the respondents (65.5%) agreed that integration design fostered various forms of integration ranging from virtual integration, process integration, collaborative planning and information sharing. On the contrary, 31% indicated moderate as 3.4% disagreed that information sharing fosters integration. A large number of respondents (82.8%) agreed that their manufacturing process through supply chains had effective communication among all supply chain members. This help enhancing the various relationships that existed between departments within one organization or the relationship between various organizations involved in manufacturing operations. Of the respondents, 13.8% indicated moderate while 3.4% disagreed that there was effective communications among manufacturing process through supply chain members. Shipments of the components that manufacturing firms needed could be easily arranged through the internet or a networked computer system as indicated by 79.7% of the respondents while 20.3% indicated moderate. Indeed, Muazu (2019) agrees that substantial developments have been made to the information technology and communication infrastructure to foster enhanced coordination and cooperation between manufacturing actors. All the same, gaps remain concerning the generation, analysis and transmission of proper information before, during and after productions accredited to the nature of manufacturing process through just in time response, which can be ideally conceptualized as a complex system.

Respondents (100%) upheld that the exchange of information among actors in the manufacturing process through supply chain has a huge impact on organizational performance and efficiency of their supply chains. Informational exchange by manufacturing firms facilitates informed decision making in respect to ordering, capacity allocations and material planning, due to better visibility of demand, supply and inventory as indicated by 93.1% of the respondents. From the response, 6.9% indicated moderate indicating the role of information sharing in manufacturing process through supply chains. Majority of the respondents (72.4%) indicated that manufacturing firms have strategic suppliers for various critical products and services especially for catering for emergencies. 27.6% moderately agreed to this idea of framework contracting. Further, majority of the manufacturing firms (93.1%) enabled partners’ input to be considered as pertains to product or services attributes considered during emergencies courtesy of supply chain integration. Of the respondents, 6.9% indicated moderate. Respondents (82.7%) indicated that manufacturing actions involve large numbers of domestic and global actors working in the same topographical settings targeting the same objectives raising the need for quality of network for smooth flow of operations. The findings revealed that poor coordination and information sharing, among the manufacturing actors during inter-agency production response, negatively influences collective decision-making and manufacturing actions.

In general, supply chain integration is fostered in various forms in manufacturing firms ranging from virtual integration, process integration, collaborative planning and information sharing. The findings of this study indicate that manufacturing firms have effective communication among all the supply chain partners. Sharing of information among supply chain members has a significant impact on the performance of manufacturing firms and amounts to efficiency of supply chains. This is because sharing information allows manufacturing firms to make informed decisions in the event of emergencies or productions. The findings
confirm Omide et al. (2022), they argument that sharing information among supply chain partners has a leveraging power on organizational performance. This results from elimination of possible inconsistencies arising from the exchanged information ultimately leading to the attainment of a standardized platform for information sharing. Maria and Ellen (2017) arrived at a similar conclusion that information is one of the elements that connect all manufacturing supply chain actors. In addition, having quality information by supply chain actor’s amounts to better planning and judgment thereby enhancing the response to beneficiaries.

The findings also indicate that manufacturing firms embrace framework contracting where they have standby strategic suppliers for various critical products and services to cater for emergencies. Embracing integration design enables manufacturing firms to consider the partners’ input as pertains to the attributes of products and services needed in case of emergencies. This aligns with the findings of Victoria, Muazu (2019) that preserving a good liaison with suppliers, practical and competent internal affairs, constant progress and keeping up with technology to facilitate swiftness in executing manufacturing firm’s duties, inter-organizational integrations and effortlessness in internal processes are some of the practices rampant among manufacturing firms in Rwanda. Further, Amsterdam (2020) identified poor information integration as one of the supply chain management challenges encountered by manufacturing firms in Rwanda.

4.2.2 Qualitative Analysis

Thematically, recurrent themes were drawn from qualitative responses received from the supply chain managers. As many potential themes as possible were manually coded for purposes of establishing patterns. Examination of supply chain managers’ views on measurement integration was sought using two items in the research instrument. The first question sought to identify the various actors involved in the flow of goods, services and information to alleviate suffering people. The second question sought to identify the connections existing between manufacturing firms and various supply chain members in the effort of delivering emergency assistance.

Six actors involved in the process of alleviating suffering of vulnerable people emerged. From the views of supply chain managers, the commonly identified manufacturing process through supply chain actors included donors, logistics providers, military and police, governments, media and public opinions. Respondents identified the important role and connections of the various supply chain actors in the flow of goods, services and information as indicated. All the participants identified logistics providers to be imperative and that their responsibilities in manufacturing strategy included activities such as assembly of goods, transport, warehousing and distribution of the supplies. Host logistics or regional logistics providers could affect the operational effectiveness of the manufacturing distribution logistics operations. Therefore, the logistics providers have a crucial responsibility in delivery of aid to the victims in a production.

Donors emerged important actors since its essential to raise enough financial resources for major crisis containment, which makes financing a significant field for manufacturing firms. Donors can be specific countries or individuals, foundations and the private sector play part by funding manufacturing distribution logistics operations. Furthermore, national and local governments usually in terms of coordination often influence the activities of the manufacturing firms. Host government influences the participation of other nations. Ongeri and Osoro (2021) asserted that national and county governments hold a primary role in keeping their citizens safe from avoidable productions and taking charge of production response activities. However, while some act in apt commitment and production containment, others lack the necessary capacity or use their efforts in a partisan way. Inspired by this, Muazu (2019) added that governments hold the main power with the control they have over political and economic conditions and directly affect supply chain processes with their decisions.

The media has a key role in production relief operations and their function is mainly related to donations. The media creates widespread knowledge of the status of the production hence resulting in manufacturing firms getting donations. Manufacturing firms therefore rely on the media to reach out to donors and receive donations to fund the relief operations. Manufacturing firms also use their connection to the media to bring to the light the things they believe need more attention. They are also able to appeal to donors to provide more support. Lastly, the military and police involvement can lead to controversy on basis of practical, political and ethical issues. Nevertheless, the military and police can be helpful in complicated relief
circumstances as they can provide support in terms of communication, security, logistics and planning. Concisely, the findings of this study indicate that manufacturing strategy is not a one-man show and all the parties involved are potential influencers of the manufacturing process through supply chain activities. The participation of many different actors leads to complexity of relief activities thus calling for measurement integration and proper coordination of manufacturing activities. Contrariwise, the findings of this study indicated that there is poor coordination and poor information sharing among the manufacturing actors in Rwanda during inter-agency production response thus negatively influencing collective decision-making and actions. The vitality of coordination in crisis response is unquestioned and lack of it could lead to many deficiencies such as wrongful distributions of first responder resources, counter-productive ordering of sequential relief processes and slow evacuations, which lead to escalation of the emergency and surges in numbers of victims.

The findings of this study corroborate with Ongeri and Osoro (2021) that manufacturing actions mostly involve large numbers of domestic and global actors, who for many times work in the same topographical settings targeting the same objectives. Nevertheless, coordination and collaboration among them has never reached the desired limits. Clarke and Campbell (2018) confirmed that failure of manufacturing process through supply chain actors to coordinate could result to gaps in coverage and to duplications and inefficiencies in any given emergency response. The increase in number and diversity of manufacturing actors contributes in making coordination appear complicated.

The findings of this study go hand in hand with Muazu (2019) that manufacturing activities are criticized due to their failure to coordinate and collaborate during manufacturing distribution logistics operations. Comes et al. (2020), noted that coordination and cohesiveness is difficult to achieve because of variations in structures and systems among manufacturing strategy players. Buba, Das, Ghadai and Baijai (2019), calls for more coordination among manufacturing firms in the wake of increased complexity of productions. The old adage that a supply chain is as strong as its weakest link as espoused by; Onger and Osoro (2021); is clearly manifested by the findings of this study strengthening the need for supply chain integration. Thus, in the manufacturing context, the manufacturing process through supply chain is as an integrated as its least responsive, response, efficient and cooperative chain actor.

4.3 Inferential Analysis

Test of Hypothesis 4: Measurement integration and Performance of Manufacturing firms in Rwanda

A correlation analysis for the construct measurement integration was conducted to find out how measurement integration correlated with performance of manufacturing firms. Table 4.3 shows that the Pearson correlation coefficient was 0.649. These findings indicate that there is a positive linear relationship between measurement integration and performance of manufacturing firms in Rwanda.

<table>
<thead>
<tr>
<th>Variable</th>
<th>Performance of Manufacturing firms</th>
<th>Measurement Integration</th>
</tr>
</thead>
<tbody>
<tr>
<td>Performance of Manufacturing firms</td>
<td>Pearson Correlation 1 0.649*</td>
<td>0.00</td>
</tr>
<tr>
<td></td>
<td>Sig. (2-tailed)</td>
<td></td>
</tr>
<tr>
<td></td>
<td>N 213</td>
<td>213</td>
</tr>
<tr>
<td>Measurement integration</td>
<td>Pearson Correlation 0.649**</td>
<td>1</td>
</tr>
<tr>
<td></td>
<td>Sig. (2-tailed)</td>
<td>0.000</td>
</tr>
<tr>
<td></td>
<td>N 213</td>
<td>213</td>
</tr>
</tbody>
</table>

* Correlation is significant at the 0.05 level (2-tailed).
** Correlation is significant at the 0.01 level (2-tailed).

The researcher conducted regression analysis to establish the influence of measurement integration on the performance of manufacturing firms. The hypothesis to test for this specific objective was:

H04: Measurement integration does not significantly influence the performance of manufacturing firms in Rwanda.

The histogram in figure 4.1 indicates that the data was normally distributed. The residual describes the error in the fit of the model to the ith observation yi and are used to provide information about the adequacy of the
fitted model. This is in agreement with the study findings of Muazu (2019), analysis of the residual is frequently helpful in checking the assumption that errors are normally distributed with constant variance, and in determining whether additional terms in the model would be useful.

![Histogram](https://example.com/histogram.png)

**Figure 4.9: Histogram Measurement integration on performance of manufacturing firms**

The linear regression model shows $R^2=0.499$ which means that about 49.9 percent of the change in the performance of manufacturing firms in Rwanda can be explained by measurement integration. The result is shown in Table 4.4 below.

**Table 4.4: Model Summary of Performance Measurement Integration**

<table>
<thead>
<tr>
<th>Model</th>
<th>R</th>
<th>R Square</th>
<th>Adjusted R Square</th>
<th>Std. Error of the Estimate</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>.639$^{a}$</td>
<td>.499</td>
<td>.398</td>
<td>.73092</td>
</tr>
</tbody>
</table>

*a. Predictors: (Constant), Supply Chain Integration
b. Dependent Variable: Performance of Manufacturing firms*

The ANOVA result in Table 4.5 indicates that the significance of the F-statistic is less than 0.05 ($F=13.406, p<0.05$). This implies that measurement integration has a significant influence on performance of manufacturing firms in Rwanda.

**Table 4.5: ANOVA of Performance Measurement Integration**

<table>
<thead>
<tr>
<th>Model</th>
<th>Sum of Squares</th>
<th>Df</th>
<th>Mean Square</th>
<th>F</th>
<th>Sig.</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Regression</td>
<td>1</td>
<td>7.990</td>
<td>13.406</td>
<td>.000$^{d}$</td>
</tr>
<tr>
<td></td>
<td>Residual</td>
<td>212</td>
<td>.596</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Total</td>
<td>213</td>
<td>1769.520</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

*a. Dependent Variable: Performance of Manufacturing firms
b. Predictors: (Constant), Measurement Integration*

The result in Table 4.6 gives the coefficients and t-statistic obtained from the model. The constant term $\beta_0 = 5.597$, indicates that if measurement integration is held constant, then there will be a positive performance of manufacturing firms in Rwanda by 5.597. The regression coefficient for measurement integration was positive and significant ($\beta_1 = 0.268$, $p<0.05$), with a t-value of 2.424. This implies that a unit increase in measurement integration is predicted to lead to 0.268 increase in the performance of manufacturing firms in Rwanda.

**Table 4.6: Coefficients of Performance Measurement Integration**

<table>
<thead>
<tr>
<th>Model</th>
<th>Unstandardized Coefficients</th>
<th>Standardized Coefficients</th>
<th>T</th>
<th>Sig.</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>B</td>
<td>Std. Error</td>
<td>Beta</td>
<td></td>
</tr>
<tr>
<td>1 (Constant)</td>
<td>5.597</td>
<td>.464</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Measurement Integration</td>
<td>.268</td>
<td>.071</td>
<td>.639</td>
<td>2.424</td>
</tr>
</tbody>
</table>

*a. Dependent Variable: Performance of Manufacturing firms*

Performance of Manufacturing firms= 5.597 + 0.268 Performance Measurement Integration
From the results in Table 4.52 to Table 4.55 above, the null hypothesis that measurement integration does not significantly influence the performance of manufacturing firms in Rwanda, is rejected. This result revealed that measurement integration had significant positive influence on the performance of manufacturing firms in Rwanda. The study mirrors the findings by Muazu (2019), that the effectiveness of supply chains based on the extent of integration between supply chain actors is predicted by the level of information and operational interaction between the various actors along the supply chain. This is in agreement with the study findings of Muazu (2019), he argued that peak states of coordination, cooperation and collaboration among the actors in relief activities are essential for efficient logistics processes in procurement of goods, transportation and warehousing. The absence of the three factors during the making of decisions could lead to distasteful decisions, which can have a negative impact on the recipients’ wellbeing. To reach the peak of sourcing officers’ performance, various relief actors ought to strive for increased coordination, cooperation and collaboration in the course of relief operations. Ongeri and Osoro (2021) asserts that insufficient coordination and cooperation among manufacturing actors occasionally amounts to surplus amounts in some places and deficiency in others. They argued that the competitive nature of manufacturing firm signify immense obstructions for performance enhancements in production and relief

The findings of this study confirm. This is in agreement with the study findings of Muazu (2019), argument that production response attracts diverse stakeholders or role players. The different role players come with divergent expectations, equipment and mission, which sometimes create discord amongst them. The discord amongst the different role players impedes the effectiveness of manufacturing process through supply chains thus the importance of supply chain integration. Ongeri and Osoro (2021) further noted that the success of production response depends heavily on the information available and the coordination of activities by diverse role players. This is in agreement with the study findings of Muazu (2019), who affirmed the importance of measurement integration as it entails designing coordinated flows of information and materials that help firms create smooth processes throughout the extended supply chain. Smooth information and material flows blur boundaries between supply chain partners, and enable manufacturing firms to reduce uncertainty in the supply chain thereby enhancing their performance. The findings of the study also mirror Caldecott (2017) that during the relief operations in productions the performance of the manufacturing strategy supply chain is affected awkward due to lack of coordination approaches and less joint and holistic supply chain strategies between operation management and human actors that are performing in the scene. On the contrary, this is in line with the findings of Müller and Birkel (2020), who established that collaboration between manufacturing firms is not an easy task because of many barriers, as each manufacturing process has their own structure, IT system, management style and different rules of procedure.

5.0 SUMMARY, CONCLUSIONS AND RECOMMENDATIONS

5.1 Summary of Findings
The objective sought to establish the influence of performance measurement integration on performance of manufacturing firms in Rwanda. Through an explanatory research design and positivist approach, quantitative data was collected from 213 respondents representing various manufacturing sectors. Results indicated a positive correlation between measurement integration and firm performance, with 49.9% of performance variance explained by integration. Findings revealed effective communication and information sharing among supply chain actors, influencing decision-making and efficiency. Notably, framework contracting with strategic suppliers for emergencies was common. Qualitative analysis highlighted the roles of logistics providers, donors, governments, media, and security forces in relief operations. Poor coordination and information sharing were identified as challenges. Recommendations include enhancing IT infrastructure, embracing emerging technologies, multi-stakeholder collaboration, and legislative frameworks for production preparedness. The study underscores the importance of coordination, integration, and technology in optimizing manufacturing firm performance and disaster response in Rwanda.

5.2 Conclusion of the Study
In conclusion, this study employed an explanatory research design with a positivist research philosophy to investigate the relationship between performance measurement integration and manufacturing firm performance. Through quantitative analysis, the study found significant positive correlations between
performance measurement integration and the performance of manufacturing firms in Rwanda. The descriptive analysis revealed that manufacturing firms embraced various forms of performance measurement integration, including Key Performance Indicators (KPIs), Balanced Scorecard, Performance Dashboards and Benchmarking. Establishing a set of KPIs aligned with organizational goals and objectives allows for the consistent measurement and monitoring of performance across different departments and functions within the manufacturing firm. Additionally, the qualitative analysis highlighted the complexity of relief activities involving multiple actors in the manufacturing process through supply chain, emphasizing the need for coordination and integration. The inferential analysis confirmed the hypothesis that measurement integration significantly influences manufacturing firm performance. Overall, the study underscores the importance of performance measurement integration in enhancing performance and calls for improved coordination among manufacturing actors to optimize production response and efficiency.

5.3 Recommendations

According to the study results, it is recommendable for manufacturing companies in Rwanda to give priority to enhancing measurement integration by utilizing information technology and computerized systems. This involves the implementation of measures to guarantee the accessibility, timeliness, and precision of data in a manner that effectively conveys essential information throughout the supply chain. The sharing of information plays a crucial role in enhancing the integration of measurements, hence lowering the necessity for buffer inventory and facilitating informed decision-making. By using cutting-edge technologies such as big data analytics, IoT, cloud computing, and blockchain, Performance measurement integration can be significantly improved. These technologies provide instantaneous monitoring, greater prediction, optimized procedures, and heightened protection. In order to build production preparedness plans and legislation, it is important to employ a multi-stakeholder approach that includes representatives from many sectors. The use of this approach guarantees a synchronized reaction to critical situations and expedites the provision of prompt and effective services to impacted communities. Promoting public awareness and fostering donor response are crucial factors in ensuring the effectiveness of emergency management. In general, the use of technology and the fostering of collaboration will enhance the capabilities of manufacturing enterprises, enabling them to successfully address both obstacles and opportunities.

5.4 Areas for Further Study

The study was confined to four logistics management practices of inventory management, order management, transportation management, and packaging management plus the relevant theories. However, logistics management practices are more than the aforementioned four. The study recommends future research to focus on other practices of logistics management including; warehousing and distribution, just to mention a few. Similar research can also be done in the private manufacturing firms based on the existing structures. Future research can also explore the potential for collaborative initiatives between the sugar manufacturing industry and other sectors, such as technology, agriculture, or renewable energy, to leverage synergies and promote cross-industry innovations.

REFERENCES


