Communication Integration And Performance Of Manufacturing Firms In Rwanda

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 Purpose: Without clarity, consistency and continuity in their communications, organizations have difficulties standing out as interesting and distinctive brands in a cluttered marketplace. And without consistency between messages, procedures and behaviors, words and deeds, organizations cannot expect to be recognized as legitimate players in the contemporary globalized world. Performance of manufacturing firms is measured through attributes or metrics that permit know if the strategic goals provide information and direct feedback of the processes involved in the Supply Chain paradigm.

1.1 Introduction

Globally, supply chain integration "under management" was first coined in 1982 as great importance long before. Mostafa, Hamdy and Alawady (2019), in the early 20th century, especially with the creation of the assembly line include the need for large-scale changes, re-engineering, downsizing driven by cost reduction programs, and widespread attention to different countries in the world, Japanese management practices in specific. However, for Nkwabi and Fallon (2020) the term became widely adopted after the publication of the different scientific on Supply chain integration included in 1999. It was highlighted with the development of electronic data interchange (EDI) systems in the 1960s, followed by its development in 1990s by the introduction of enterprise resource planning (ERP) systems then after it has continued to develop into the 21st century with the expansion of Internet-based collaborative systems.

The philosophy of supply chain integration involves internal, supplier, and customer integration. Through internal integration, manufacturing companies eliminate traditional functional silos and integrate the functional departments into a single entity to meet customer requirements at a minimum cost. Internal integration can only be effective when complementarities between the

cross-functional team are possible. It includes procurement, production, logistics, marketing, sales, and distribution. It also acts as a whole to coordinate the information flow, share resources, and work as a team to achieve desired organizational objectives (Djiofack & Niyibizi, 2021).

1.1.1 Network Theory

The e-perspective theory was developed Network theory stresses the mechanisms and processes that individual, groups and firms interacts with the networks (Daft, 1983). The theory holds that a network is comprised of three concepts that include actors, resources and activities. The relationship between the different actors is important in order to understand the network. All actors form their own networks but are dependent on each other. The relationship between the different actors is important in order to understand the network. The relationships are characterized by continuity, multiplicity and specificity. Over time mutual knowledge and trust create a framework for future business among the actors in the network. The actors can be linked to each other through technical, social, cognitive, legal, economic and other ties. Nowadays, the use of internet of Things (IoT) helps organizations connecting objects and devices through internet. The networks of objects (e.g. devices , vehicles, machines, containers) are embedded with sensors and software have the potential to collect and share data over internet (Conner & Prahalad, 1996).

Information and Communication Technology (ICT) plays three central roles in e-perspective theory (Grant, 1991). First, ICT allows firms to increase the volume and complexity of information which needs to be communicated with their trading partners. Second, ICT allows firms to provide real time supply chain information, including inventory level, delivery status, production planning and scheduling. This enables firms to manage and monitor supply chain functions such as purchasing, transportation, storage ,distribution ,sales and return, its supply chain activities. Third, ICT facilitates the alignment of forecasting and scheduling of operations between firms and suppliers, allowing better inter-firms coordination (Daft, 1983). As such, the problems in coordinating supply chain activities which often are hindered by time and spatial distance can be reduced. Information Technology is considered as the heart of every integration system that enables interoperability among partners accessing information across the supply chain

 The use of ICT has facilitated the reduction of coordination costs, which has been extensively documented in the literature. For example, electronic market places, facilitated through ICT, reduce the cost of searching for obtaining information about product offerings and prices. Also, collaboration facilitated by information sharing can lower transaction costs (in particular coordination costs) as firms can thereby reduce supply chain uncertainty and thus the cost of contracting (Conner & Prahalad, 1996). If a supplier is unable to accurately predict the price of its product inputs, it will be reluctant to enter into a contract, which locks it into a fixed price for an extended period of time. Integration of technology and business processes presents a strategic link for creating efficiencies in the development of highly complex products. Purposeful technological infrastructure should be a functional part of an organizational structure, especially as regards to the distribution of technological competence, information and responsibilities among business departments. Integration of individual technological processes and their inputs

and outputs, integration of technology and other business processes, or integration of market demands and technological capacities, all these processes require building up a functional technology infrastructure/network (Grant, 1991).

2.1 Communication Integration

Integrated Marketing Communication (IMC) is not a new concept as it has emerged as early as 1980's. Since then IMC has developed into one of the most influential managerial structures and its importance has grown all around the world (Nkwabi & Fallon, 2020). At first, IMC was understood as simple managerial task, such as to align and coordinate messages through four areas: Sales promotion, DM communications, PR (public relations), and advertising. Main goal of a company is to present consistent and integrated whole, which would coordinate and influence consumers throughout the communication and purchasing activities. In 1991, Schultz defined IMC as "the process of managing all sources of information about a product or a service to which a customer or prospect is exposed and which, behaviorally, moves the customer toward a sale and maintains customer loyalty". After the introduction of IMC, many scholars have written about IMC and adapted the concept to fit their own market situation. Since the introduction of IMC everything has changed: consumers, communication, as well as IMC itself (Ongeri & Osoro, 2021).

This is the reason why there are many different definitions of IMC. After a careful consideration and examination of these definitions a new definition of IMC was constructed to be used as the basis of this thesis (Ongeri & Osoro, 2021). Adapted definition is: IMC is a process of strategic planning in order to determine the most consistent message and expose it to the target audience through the synergy of marketing communication instruments and media. To put this into simpler terms, IMC is a strategic process of using marketing communication instruments and media in such a way that they complement and reinforce each other in order to determine the correct message for target audience. As previously mentioned, consumers have changed and they are demanding that companies find new ways of relating to them, requiring increased interaction and personalization of the messages and forming a part of the creation of content of communication campaigns (Ongeri & Osoro, 2021).

Thus, the Internet makes this new relationship between companies and their audiences possible. Since it has 3 characteristics that differentiate it from other conventional channels: interactivity, transparency, memory. Rwagombwa (2019) also distinguished 4 exclusive fundamental elements of the interactive media. He mentioned the two-way nature of the communication system, the level of response control each party has in the communication process, the personalization of the communication relationship, and the use and involvement of data base technology. So, digital communication offers new forms of connecting with audiences, according to the surveyed advertisers. In general, there was a very positive attitude amongst the surveyed companies regarding how the new technologies help them relate to their audiences. So, if we group together the responses generated from the first two positions of the scale that was used, 73.1% of the sample believed that communication technologies offer a broad range of channels and contact points with the consumer (Ongeri & Osoro, 2021).

Realizing that contemporary organizations communicate with everything they say or do, integrated communications has developed from a rather bounded and specialized activity to an organization-wide issue and concern. Consequently, it is timely to take a closer look at integrated communications and its organizational implication (Amoako et al., 2020). Today, it is widely acknowledged that integrated communications has significant to organizational ramifications in the sense that it impacts directly on organizational structures and cultures. Yet, scholars within the field frequently talk about the dearth of research on its organizational dimensions and of the absence of formal models and procedures to implement the ideal in practice. Writings that address the issue of implementation tend to articulate this problem in prescriptive terms as an issue of organizational (re) design and as a question of overcoming structural "barriers" Below we shall present this perspective and discuss its limitations. In addition to inadequate horizontal communication, point out turf battles, ego problems, and managerial parochialism as important barriers to the integration of communications. Even within the field of marketing communications, there are significant barriers to integration. Abate (2018) thus reports a general absence of commitment to integrated communications, often rooted in structural isolation of communications tools and communication managers from each other plus a lack of interdisciplinary communication expertise.

Since advertising, point-of-purchase, sales promotions, public relations, etc., address different audiences, these activities have often developed different operational practices, including media strategies, timing and the use of creative appeal, to the effect that the organization's communication is fragmented, organized in "functional silos" (Amoako et al., 2020). Moreover, since the integration of communications may restrict creativity, communication professionals, like art directors, may sometimes oppose integration in practice even when they subscribe to its underlying idea. Adding to this a general tendency for established practices and perspectives to resist change, managers of marketing and communications are faced with a difficult task of convincing specialists in various sub-fields of the advantages of giving up some of their autonomy for the benefit of the organization as a whole (Abate, 2018).

Oteki, Namusonge, Sakwa and Ngeno (2018), acknowledging the significance of these barriers, scholars of integrated communications increasingly discuss cross-functional organization issues, focusing in particular on the importance of developing and enabling horizontal communication systems. Horizontal processes, itis argued, are necessary to overcome the barriers of specialization and hierarchical structures that prevent managers in different functional "silos" from aligning their activities and approaches toward the market. Only by aligning the processes of strategy development, value creation, channel management, information management and performance management across different functions such marketing, finance, human resources, information technology, and operations can organizations, develop a real customer focus and customer orientation. Beyond a general call for horizontal coordination, however, the nature of such processes is rarely specified in the literature. The cross-functional planning system endorsed for example, is merely prescribed as an ideal organizational design indicating how an integration project should move through the organizational setting (Ominde, Osoro & Monari, 2022).

 The potential value of informal organizational processes, for example local expertise or insight, that might slow down or challenge such a project is not addressed at all. One interesting exceptions, who argues that both the formal and the informal dimensions of horizontal communication are important in securing a healthy communication climate. In addition to official horizontal communication forums, such as cross-functional, cross-divisional and cross-geographic meetings, accentuates the value of generating an informal communication environment that supports innovation, learning and freedom of speech. Yet, the question of whether the integrated communications project is able to co-exist with, let alone facilitate and support, such healthy features remains (Abate, 2018).

2.1.1 Information Sharing

Increasingly, however, information sharing for innovation is at the forefront of developing policies for the demand side. Innovations materialize when there is a demand for innovation and so effective policies to support innovation are coming from the demand side as well as the supply side (Ominde et al., 2022). Using public procurement to meet societal needs can be seen in targeted, demand side innovation policies such as anticipating future investments to address existing or future societal challenges, allowing potential vendors to enter the market with new innovative goods or services. Public procurement has potential to be a catalyst for innovative solutions to pressing challenges. In a digital transformation context, public sector investment decisions are becoming increasingly complex. Digital services must respond to fast changing citizens' expectations requiring crosscutting actions and integrated decisions. "On the supply side, improved Internet access and speed mean that governments have access to ever cheaper and more modular, usually cloud-based, services. But emerging technologies introduce also new uncertainties and new issues that need to be managed by governments (e.g. data ownership and sovereignty, tendering and management of contractual relations, exit strategies, transitioning from legacy systems)" (Rwagombwa, 2019).

The 2015 OECD Survey on Strategic Procurement for Innovation found that comprehensive programs at the national level are the second most used instrument to support strategic procurement for innovation behind policy instruments (Rwagombwa, 2019). One such collaborative project is the PP2 Innovate project which aims to build regional capacities in public procurement of innovative solutions (PPI) by targeting directly public procurers on all administrative levels in central Europe. Innovation information sharing can be defined in many different ways and sharing procedures and the professionals delivering them are being challenged to keep up. The whole public procurement cycle is developing and adapting to the future needs of stakeholders that are seeking out innovative approaches to solve problems. Often procurement of innovation is related to a concrete need or demand. In the 2015 OECD Survey on Strategic Procurement for Innovation the reasons that countries chose to implement procurement for innovation fell into two categories: the need for goods or services that were not yet available to those with the demand, and therefore required a specialized, new good or service, as opposed

to an improved good or service; Improving the performance of existing products or services such as producing total cost savings and/or energy efficiency and risk reduction (Ominde et al., 2022).

In Mexico the Ministry of Economy created a programmer to drive innovation through public procurement (Rwagombwa, 2019). The programmer was designed to promote innovation especially within micro, small and medium sized firms. It was also intended to improve public services through innovative products and s one of the largest obstacles that countries have to overcome when aiming to increase innovation is the tendency to use the award criterion of lowest price. The EU Directive (the Directive) stipulates that contracting authorities should apply award criteria corresponding to the most economically advantageous tender (MEAT). Using this approach weighted criteria within the best price quality ratio (BPQR) can be included for tenders (Ominde et al., 2022).

The method allows contracting authorities to consider criteria that can include qualitative, environmental and/or social aspects (Rwagombwa 2019). Examples of such aspects could include: quality, technical merit, social and services environmental characteristics, qualification and experience of supplier staff. It also includes after-sales service, and technical assistance and delivery conditions. Encouraging the inclusion of secondary policy objectives as part of the award criteria as opposed to drafting descriptive technical specifications is a way to stimulate the market to offer innovative solutions. By describing the detailed technical solution economic operators are unlikely to submit tenders that substantially exceed the minimum requirements as they will be aware that a cheaper solution – one that is less innovative but still within the minimum requirements may be more likely to succeed. In such cases the competition is restricted to the price to quality ratio and will usually be a small component of the overall weighting (Ominde et al., 2022)

2.1.2 Performance of Manufacturing Firms

Performance of manufacturing firms is measured through attributes or metrics that permit know if the strategic goals provide information and direct feedback of the processes involved in the SC. The attributes are also the basis to identify and evaluate alternatives that will help achieve decision criteria to improve the business processes (Ominde et al., 2022). Performance measurement can be defined as a process of quantifying the efficiency and effectiveness of an action. 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. The modern approaches to performance measurement include; Return on Investments (ROI), Return on Assets and customer satisfaction among others. The balance scorecard developed in the 1992 by Kaplan & Norton proposes uses of four key perspectives to measure performance. These include the financial perspective, customers' perspective, internal business processes perspective and organizational learning perspective (Rwagombwa, 2019).

The organizational performance of a company is referred to how well a firm achieves its market-oriented goals as well as its financial goals. In this context, organizations adopt suitable

strategies and policies for better satisfy customer, innovate and financial performance. For the purpose of this study the performance will be measured through flexibility, speed, quality and cost (Ominde et al., 2022). Flexibility is referred to the degree to which organizations are able to adjust quickly to market changes such as volumes, timetables, and product mix. The speed performance is referred to the time taken for a product or a service to be delivered to the consumer and lesser time spent the grater the performance that is speed. Lastly, quality performance is referred to the degree to which a product or a service corresponds to standards and customer needs (Rwagombwa, 2019). A study conducted in SMEs manufacturing companies in Sweden using structured and unstructured model for supplier for evaluation. The most important supplier development elements are communication, collaboration and trust, top management involvement and long-term commitment. The same study found that Quality, delivery and cost are the most important supplier performance evaluation measures. The organizations therefore choose suppliers with who have the capacity to deliver (Ominde et al., 2022). The study further observed that supplier incentives and awards can work as a tool to influence future behavior of both buyer and supplier organization. By connecting procurement targets to certain supplier competence, organizations achieve higher supplier performance thereby leading to improved firm performance.

3.1 Research Methodology

A research design is a strategy or plan for carrying out the investigation. It is a way of ensuring that a study method is systematic and scientific enough for the outcomes to be applied in real life (Rahi, 2017). This study therefore adopted explanatory research design. Explanatory research design focuses on explaining the aspects of your study. Explanatory research is quantitative in nature and typically tests prior hypotheses by measuring relationships between variables. The data was analyzed using statistical techniques. The study was founded on theoretical foundations from which hypotheses was developed, and logic and evidence was tested using quantitative methodologies (Osoro et al.,2016). The study of monitoring practices on planning, tools, techniques, and their adoptions was conducted in order to determine the influence of information sharing on the linkages between supply chain integration and manufacturing firm performance in Rwandan manufacturing firms. The positivist philosophy method is quantitative and focused on rational, truthful, and valid values. Positivism asserts that reality is stable and can be measured objectively by claiming that events can be isolated and observations can be replicated.

Table 1.1 Factors Loading for Communication Integration

Loading for Communication Integration	Factor Loadings
Our firm's communication integration can reduce the lead time	.719
Software integration can facilitate performance of man. Firms	.756
Automation processes in a firm can lead to better performance	.860
Performance indicators can enhance manufacturing firms' performance	.792
Performance indicators can measure a firms performance	.838

Manufacturing firms to apply key indicators for better performance	.603
Manufacturing firms to embrace management strategies	.681
Manufacturing firms to keep proper records of all transactions in their firms	.854
There are other issues which can affect performance of manufacturing firms	.798
Top management needs communication integration towards firm's performance	.657
Overall Factor Loading	**.754**

Among the ten items that were used to measure Communication Integration, the one that required the respondents to indicate if the Communication Integration in the manufacturing help in reducing automation integration for performance improvement; loaded the highest with a factor loading of 0.860. The item that loaded lowest was that which required the respondents to indicate if time taken to key indicators reduces production capacity with factor loadings of 0.603. However, none of the items was dropped from the variable since all the items loaded more than 0.500. Moreover, the average factor loadings of 0.754 shows, that all the items were valid with reference to convergent validity.

Factor Loading Analysis for Information sharing

The moderating variable of the study was Information sharing which was also measured by ten items. The items were subjected to factor analysis yielded results as shown in Table 1.2 below.

Table 1.2 Factor Loading for Information sharing

Information sharing	Factor Loadings
Our firm has adopted the latest information sharing technology	.786
Our firm has adopted the latest information sharing technology	.826
I am satisfied with the information sharing technology adopted in our firm	.769
I am satisfied with the information sharing technology adopted in our firm	.867
There are minimal complaints concerning the quality of information shared	.637
I am satisfied with the quality of information shared in our firm	.832
Our firm ensures relevant information is shared to the relevant groups	.722
I am satisfied with the type of information shared in our firm	.833
Information sharing influences firm performance	.840
Information sharing moderates supply chain integration and man. firms	.812
Overall Factor Loading	**.719**

Ten items were used to measure the moderating variable of information sharing. Among the ten items, the one that required the respondents to indicate if competent workforce contributes to improved firm performance loaded the highest with a factor loading of 0.867, while the item that loaded the lowest was the one that required the respondents to indicate if quality of information gives manufacturing firm a competitive advantage with factor loadings of 0.627. However, none of the item indicators was dropped from the variable since all the items loaded more than 0.500, a value considered to be good. Moreover, the average factor loadings of 0.719 show that the items were valid in terms of convergent validity.

3.1.2 Testing for Normality

Tests of normality were used to determine whether the data was collected from the same population. For Rwagombwa (2019), the Q-Q plots can be used to test for linearity. Accordingly Oteki et al (2018), the plots should lie along a straight line for data to be considered normal. The results for normality are shown in the sections below.

The first independent variable of communication integration yielded the Q-Q plot in Figure 4.2 below.
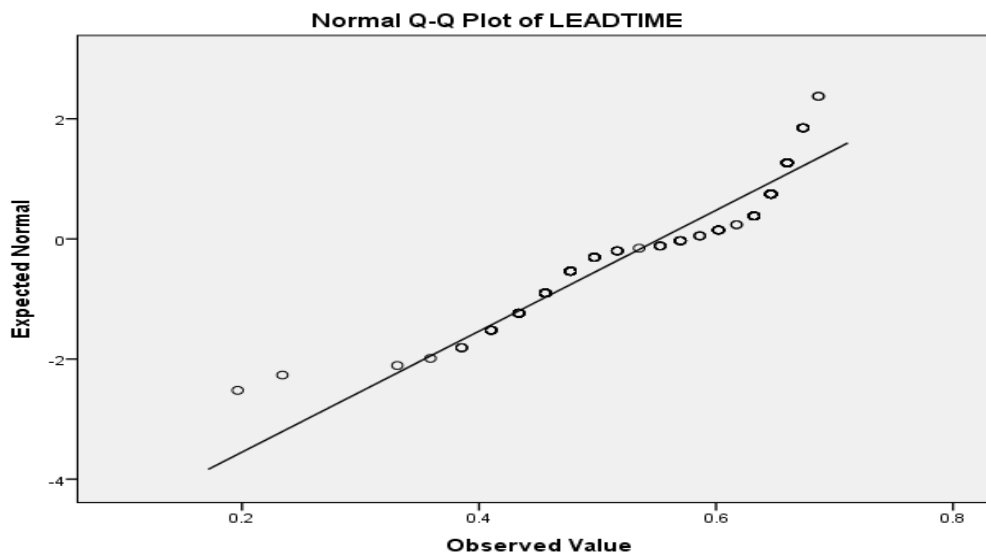

Normal Q-Q Plot of LEADTIME

Fig.1.1 Normality

3.1.3 Descriptive Statistics for communication integration

The objective of this study was to determine the effect of communication integration on performance of manufacturing firms in Rwanda. The descriptive results for the objective are shown in Table 1.3 that follows below; When the respondents were asked to show their level of agreement on procure to pay in their manufacturing firms in Rwanda; 18.2% (39) of the respondents gave strongly disagree, while 7.6% (16) of the respondents gave disagree, further 11.5% (24) of the respondents gave Neutral, Majority 52.4% (112) of the respondents gave agreed and the remaining 8.3% (18) of the respondents gave strongly agree. With a mean of 4.35 and standard deviation of 0.881. The respondents were also requested to show their level of agree on software integration to facilitate the performance of manufacturing firms in Rwanda. Majority 39.5% (84) of the respondents gave agreed, while 22.4% (48) of the respondents gave neutral, also 13.8% (29) of the respondents gave disagreed, further 2.9% (6) of the respondents

gave strongly disagreed and the remaining 1.4% (3) of the respondents gave strongly agreed. With a mean of 4.27 and standard deviation of 0.854. Also the respondents were asked to show their level of agreement of the automation process in their firms. Majority 29.5% (63) of the respondents agreed, while 28.6% (61) of the respondents gave neutral, a few 25.2% (54) of the respondents, further 10.5% (22) of the respondents disagreed and finally the remaining 6.2% (13) of the respondents gave strongly disagreed. With a mean of 4.01 and standard deviation of 1.153 respectively. The respondents were also requested to show their level of agreement that they use performance indicators, majority 40% (85) of the respondents agreed, while 30% (64) of the respondents strongly agreed, further 14.8% (32) of the respondents gave neutral , also 12.3% (26) of the respondents gave disagree and the remaining 2.9% (6) of the respondents gave strongly disagreed. With a mean of 4.14 and standard deviation of 1.107.

Moreover respondents were also asked to indicate if their firm's drive indicators does not result to delay in the communication integration to the firms, which had a mean of 3.86 and a standard deviation of 1.082. Majority 41.9% (82) of the respondents indicated agreement with the statement while 29.1% (62) of the respondents strongly disagreed. Another 18.1% (39) of the respondents were undecided, and another 7.6% (16) of the respondents disagreed. This is an indication that a large number of the respondents agreed with the assertion that firm's communication integration does not result to delay in the firms manufacturing process to the clients. These findings are in tandem with of Oteki et al. (2018) who concluded that communication integration embracing their functionality

On whether reliability of the contract strategies ensured communication integration, the mean score was at 4.38 and standard deviation was 0.998; where most of the respondents agreed with the statement; precisely majority 43.3% (92) of the respondents agreed with the assertion whereas 22.9% (49) of the respondents strongly agreed. Only 3.3% (7) of the respondents of them were neutral and none of them neither disagreed nor strongly disagreed with a frequency of 4.8% (10) of the respondents. This supports the findings of the studies carried out by Rwagombwa (2019).. Moreover statement on use of communication integration to reduce delays, delivery frequency affected by IT infrastructural development and whether there is control of contract management by relevant people concerned management all scored a mean of 4.12, 4.21 and standard deviation of 4.45 respectively. This is an indication that a greater number of the respondents were in agreement with the statements above that measure communication integration. The statement that had a mean of 4.21, has a corresponding larger value of standard deviation of 1.017, indicating high variability among the data.

However the statement that required the respondents to indicate whether their firm's communication integration policies are implemented and reduce manufacturing cost registered a mean of 3.97 with a standard deviation of 0.885. On this assertion 27.2% (59) of the respondents strongly agreed, while 2.4% (5) of the respondents strongly disagreed. Majority 42.4% (90) of the respondents agreed while 19% (40) of the respondents of them exuded indecisiveness, and 10% (21) of the respondents disagreed. This is an indication that many respondents strongly agreed on the assertion that their companies communication integration policies were implemented and contributed to the cost reduction in manufacturing, had the highest frequency, while those who strongly disagreed had the lowest frequency, position echoed by Onger and Osoro (2021), in a study of the state of communication integration in Rwanda. The overall mean score for communication integration management thus therefore was 4.17, indicating that many

respondents, 44.06% of the respondents were in agreement that communication integration was indeed affecting the supply chain

Table 1.3 Descriptive Statistics on Communication Integration

Statement	1	2	3	4	5	Mean	Std. Dev.
Our firm's communication structured to reduce the procure to pay period.	18.2% N (39)	7.6% N(16)	11.5% N (24)	52.4% N (112)	8.3% N (18)	4.36	0.889
Our firm has software integration To facilitate manufacturing firms	2.9% N (6)	13.8% N (29)	22.4% N (48)	39.5% N (84)	1.4% N (3)	4.27	0.854
The firms have automated their systems to facilitate performance	6.2% N (13)	10.5% N (22)	28.6% N (61)	29.5% N (63)	25.2% N (54)	4.01	1.153
Our firm has adopted performance indicators to enhance good work	2.9% N (6)	12.3% N (26)	14.8% N (32)	40% N (85)	30% N (64)	4.14	1.107
Our firm's contract performance is key in communication integration	3.3% N (7)	7.6% N (16)	18.1% N (39)	41.9% N (89)	29.1% N (62)	3.86	1.082
Our upholds contract strategies to enhance firm performance	3.3% N (7)	4.8% N (10)	25.7% N (55)	43.3% N (92)	22.9% N (49	4.28	0.997
Contract communication integration Manufacturing performance	2.9% N (6)	6.6% N (14)	12.9% N (27)	42.4% N (90)	35.2% N (75)	4.12	0.129
Good communication integration is better to improve firm results	4.8% N (10)	12.9% N (27)	23.8% N (51)	39.5% N (84)	19% N (40)	4.21	1.017
Record Keeping will show communication integration	2.4% N (5)	10% N (21)	20% N (43)	42.4% N (90)	25.2% N (54)	3.97	0.885
There is communication integration management by the top management in our firm.	2.9% N (6)	10% N (21)	19% N (40)	41.4% N (88)	27.7% N (59)	4.45	0.868

Key: N = 213   Strongly Disagree = 1, Disagree = 2, Neutral = 3, Agree = 4, Strongly Agree = 5

Performance of manufacturing firms in Rwanda. Only 0.09% of the respondents strongly disagreed with this assertion. The range stood at 36.7% (78) of the respondents. The overall standard deviation on statements on communication integration was 0.979.

To engage the respondents further on the effect of communication integration in the performance of manufacturing firms in Rwanda, semi-structured questions were directed to the respondents.

3..1.4 Descriptive Statistics for Information Sharing

The moderating variable for this study was to investigate the effect of Information Sharing on the relationship between supplier relationship management and performance of manufacturing firms in Rwanda. The table 4.25 below shows that among the ten items that tested Information Sharing; the one that asked the respondents to indicate whether; there are competent managers in their company who implement agility in the manufacturing, had the highest of mean of 4.63 with a standard deviation of 0.957. From this statement majority 52.4% (112) of the respondents agreed with the statement, while on the contrary 0% of the respondent disagreed. This statement had the highest range of majority 52.4 %, (112) of the respondents indicating that majority of the respondents agreed, probably because most manufacturing firms are headed by experienced and competent managers. The findings echoes those of Mukasekuru (2018), who alluded that competency and flexibility are synonymous with performance. On the other hand the statement that required the respondents to confirm if their firm had an effective and quality infrastructure due to proper information recorded the lowest mean score of 3.61 and a standard deviation of 0.844. Precisely 52.4% (112) of the respondents agreed with the statement while 0% of them disagreed. Another 29% (62) of the respondents indicated neutrality on the issue. This statement had a median response of 10% (21) of the respondents, indicating disagreement. This is true and echoes the findings of Mukasekuru (2018), who says weak regulatory frameworks, poor extension support, obsolete technology and ageing machinery are the main problems facing the manufacturing industry, in Rwanda.

The respondents were further required to indicate; if their firm had adopted the latest information sharing technology ensuring increased efficiency in manufacturing capacity; this had a mean of 4.36, and the standard deviation 0.783. Specifically majority 65.7% (140) of the respondents strongly agreed; while 0.4% (1) of the respondents strongly disagreed with the statement. This shows that a large number of the respondents were strongly agreeing with the assertion that manufacturing firms had competent managers a view supported Muazu (2019).The response range on this statement was 65.7%, an indication that larger number of the respondents had competent managers in their firms; this however contradicts the findings of Luthra and Mangla (2018)), who opines that manufacturing firms in Rwanda are bedeviled with corporate inefficiencies.

When asked to indicate whether their company had integrated the use of Information sharing in our organization is done through use of emails and telephone calls; a few 14.3% (30) of the respondents were undecided, while majority 45.7% (97) of the respondents agreed and another 13.3% (28) of the respondents disagreed with the statement. The median response was 14.3% (30) of the respondents, an indication of neutrality among the respondents. It recorded a mean of

4.15 with a standard deviation of 0.744, and mode response being 45.7% (97) of the respondents. This was an indication that many of the respondents strongly agreed over integrated use of IT, in their leadership strategies. A view that contradicts the findings of Harisa et al. (2019), who asserted that there is still limited adoption of IT, strategies among the corporate leaders in many organizations. This shows that even though other corporate firms have adopted Information sharing in our organization is done through use of emails and telephone calls to manufacturing firms is still low.

Respondents were further to show if, there is effective I am satisfied with the information sharing technology adopted in our in the firm, this construct had a mean of 3.84 and a standard deviation of 1.079; indicating increased levels of variability among the responses given by respondents. On this statement majority 52.4% (112) of the respondents agreed with the statement, while 0% of them disagreed; giving a high response range of majority 52.4%, (112) of the respondents an indication that most of the respondents agreed with the statement, this likely to be as result of implementation of I am satisfied with the information sharing technology adopted in our firms. This position that is supported by Luthra and Mangla (2018); who concluded that downward or upward effective communication in firm, is a ticket for firm's competitiveness.

On the statement that required the respondents to indicate whether their firm had a satisfied with the information sharing technology adopted in our system, had a mean of 3.89, with a standard deviation of 0.799. This had a low median of 1.9% (4) of the respondents, and indication of neutrality among fewer respondents. However majority 52.4% (112) of the respondents agreed, while 45.7% (97) of the respondents strongly agreed that their company used high quality IT infrastructure. This indicated that many respondents agreed with the assertion that high quality a satisfied with the information sharing technology adopted in manufacturing firms, a view that is confirmed by Harsasi and Minrohayati. (2017).

Another statement asked the respondents to state if their firm had maintained minimal complaints concerning the quality of information shared. This had a mean score of 4.25 and a standard deviation of 0.841, and indication that respondents strongly agreed with statement. On this statement, majority 55.8% (119) of the respondents agreed, while 42.9% (91) of the respondents strongly agreed with the statement. On the contrary 0% of the respondents strongly disagreed and disagreed, with a high response range of majority 55.8% (119) of the respondents, showing minimal complaints concerning the quality of information shared. A position that is echoed with, Njoki, et al. (2021), whose findings show that contract management is dependent on the management team.

On the statement, 'Our firm has employed effective quality of information shared in our firm' scored a mean of 3.98 and a standard deviation of 1.267; showing variability in the responses of respondents. Consequently majority 50.5% 108) of the respondents strongly agreed that their firm employed effective communication for agility while another 38.1% (81) of them agreed with the statement. However a few 1.9% (4) of the respondents disagreed with this statement. The median response was 9.5% (20) of the respondents, while the mode response was 50.5% (108) of the respondents, thus indicating that most respondents agreed and strongly agreed with the statement. This assertion is also supported by Harsasi and Minrohayati (2017)

Another statement, required the, respondents to indicate whether their firm has adopted the use of relevant information is shared to the relevant groups, this had a mean of 4.21 with a standard deviation of 1.385, and indication of high level of dispersion on responses. Specifically 41.5%

(88) of the respondents strongly agreed while 26.7% (57) of the respondents agreed that their firm used IT for efficiency in production. Some 8.7 % (19) of the respondents disagreed with the statement. This was an indicator that many respondents strongly agreed, that use of information shared in our organization, a view that is also supported by the findings Betti and Basso (2019), who concluded that IT integration in Manufacturing brought efficiency in organizations. Eventually the respondents were required to indicate whether their firm experiencedI am satisfied with the type of information shared in our firm. This statement scored a mean of 4.12 and a standard deviation of 0.995, where a larger percentage of the respondents 44% agreed with the statement, while 27% of the respondents of them indicated their strong agreement and another 6.2% disagreed with the assertion that their firmsI am satisfied with the type of information shared in our firm. These results echoes the findings of De Assis and Sagawa (2018), who asserted that I am satisfied with the type of information shared in our firms in Rwanda. This was an indication that majority of the respondents agreed with the statement that their firm had faced corporate leadership challenges.

Finally the overall mean score for moderating variable information sharing was 4.10, with a standard deviation of 0.841, this was an indication that most respondents who participated, in this study agreed 44.6% (95) of the respondents and strongly agreed (27%) (56) of the respondents, that information sharing had a moderating effect on the relationship between supplier relationship management and performance of manufacturing firms. This is in line with the findings of Bag, Gupta and Luo (2020), who concluded that, firm's operating information sharing financial policies are inseparable, if profitability is to be realized. The descriptive results for the moderating variable are shown in Table 1. 4;

Table 1.4: Descriptive statistics for information Sharing

Statement	1	2	3	4	5	Mean	Std. Dev.
Information sharing in our is good and is done through use of emails	0.4% N (1)	4.3% N (9)	18.6% N (39)	65.7% N (138)	11% N (23)	4.36	0.783
Our firm has adopted the latest information sharing technology	0% N (0)	1.4% N (3)	23.3% N (49)	29.1% N (49)	46.2% N (97)	4.63	0.957
Information sharing in our firm is done through use of emails and telephone calls	0% N (0)	10% N (21)	29% N (61)	52.4% N (110)	8.6% N (18)	3.61	0.884
I am satisfied with the information sharing technology adopted in our firm	0% N (0)	13.3% N (28)	14.3% N (30)	26.7% N (56)	45.7% N (96)	4.15	0.954
our firm ensures the information shared is of high quality	0% N (0)	8.1% N (17)	18.1% N (38)	52.4% N (110)	21.4% N (45)	3.84	1.079
There are minimal complaints	0%	0%	1.9%	52.4%	45.7%	3.89	0.799

concerning the quality of information shared	N (0)	N (0)	N (4)	N (110)	N (96)		
I am satisfied with the quality of information shared in our firm	0% N (0)	0% N (0)	1.3% N (3)	42.9% N (90)	55.8% N (117)	4.25	0.841
Our firm ensures relevant information is shared to the relevant groups	0% N (0)	1.9% N (4)	9.5% N (20)	38.1% N (80)	50.5% N (106)	3.98	1.267
I am satisfied with the type of information shared in our firm	0.4% N (1)	8.7% N (18)	22.7% N (48)	26.7% N (56)	41.5% N (87)	4.21	1.385
Information sharing influences firm's performance.	0% N (0)	6.2% N (13)	22.8% N (48)	44% N (92)	27% N (57)	4.12	0.995

Key: N = 213   Strongly Disagree =1, Disagree = 2, Neutral = 3, Agree = 4, Strongly Agree = 5

4.1 Auto-correlation Test

Auto-correlation is a characteristic of data which shows the degree of similarity between the values of the same variables over successive time intervals. It occurs when there are series of numbers and a pattern existing such that values in the series can be predicted based on the preceding values in the series (Ongeri and Osoro, 2021) Also known as serial correlation, auto-correlation implies the correlation among the values of the same variables but at different times or periods and arises whenever the same variable is observed over time. According to Rwagombwa (2019), autocorrelation refers to the degree of correlation of the same variables between two successive time intervals. It measures how the lagged version of the value of a variable is related to the original version of it in a time series. The Durbin-Watson statistic is commonly used to test for autocorrelation. It can be applied to a data set by statistical software. The outcome of the Durbin-Watson test ranges from 0 to 4. An outcome closely around 2 means a very low level of autocorrelation. An outcome closer to 0 suggests a stronger positive autocorrelation, and an outcome closer to 4 suggests a stronger negative autocorrelation (Durbin and Watson, 1971).

Durbin-Watson test is frequently employed to detect the presence of residual serial correlation from least squares regression analyses. However, the Durbin-Watson statistic is only suitable for ordered time or spatial series Rwagombwa (2019). If the variables comprise cross-sectional data coming from random sampling, the test will be ineffective because the value of Durbin-Watson's statistic depends on the sequence of data points. In this study, the researcher did not execute auto-correlation analysis test because the nature of the data collected for pilot testing was cross-sectional data in nature. Since the pilot study was only done once and not over successive time periods. Autocorrelation test would only be significant when dealing with time series data; and not cross-sectional data. Time series data refers to a sequence of values for only one variable recorded over time. It is a sequence of measurements of the same variable(s) made over time. Usually the measurements are made at evenly spaced times, for example weekly, monthly or

yearly etc. The data helps in determining lags for a specified number. Therefore auto correlation function   (ACF),   is   only   applicable   to   time   series   data.

One of the basic assumptions for regression analysis is that the residuals of the model should be independent, that is, the residuals should not be auto correlated. Durbin Watson test was conducted to check for auto correlation. A value toward 0 indicates positive autocorrelation, a value near 2 signifies non-autocorrelation and a value toward 4 indicates negative autocorrelation. The rule of thumb is that Durbin-Watson statistic values in the range of 1.5 to 2.5 are relatively normal. Values beyond this range could be cause for concern. This is in agreement with the findings of Ongeri and Osoro (2021), values under 1 or more than 3 are a cause for concern. The results in Table 4.35 shows that the Durbin-Watson d =1.976, which is in the normal range hence it was assumed that there was no auto-correlation in the multiple linear regression data.

Table 1.5 Durbin-Watson Test for Autocorrelation

Model	Durbin-Watson
1	1.976

4.1.1 Multicollinearity Test

Multicollinearity is a case of multiple regression whereby the predictor variables are themselves highly correlated. Multicollinearity poses serious effects on the least squares estimates of the regression coefficients, the most significant of which is resulting to the acceptance of the null hypothesis more readily (Muazu,2019). Multicollinearity diagnostics was conducted using Variance Inflation Factor (VIF) and Tolerance statistics. The VIF is the reciprocal of the tolerance statistics. The variance inflation factor (VIF) for each term in the model measures the combined effect of the dependences among the repressors on the variance of that term. One or more large VIF indicate multicollinearity. Tolerance is inverse of the coefficient of determination (R^2). Tolerance is estimated by 1 - R^2. Other factors equal, researchers crave soaring levels of tolerance, as low tolerance levels could severely affect results that involve multiple regression analysis. A VIF of above 5 is usually regarded as evidence of Multicollinearity. While a tolerance statistic of less than 0.20 is also taken as a cause for multicollinearity concern. The results in Table 1.6 show the test results for multicollinearity using tolerance and VIF. With tolerance values being more than 0.2 and VIF values below 5, it was concluded that there was no multicollinearity problem in this study. This is in line with the findings of Ongeri and Osoro (2021).

Table 1.6: Test of Multicollinearity Statistics

Variable	Tolerance	VIF
Communication integration	.813	1.239
Customer integration	.748	1.346
Collaboration integration	.619	1.635
Supply Chain Integration	.697	1.501
Information sharing	.673	1.485

4.2 Heteroscedasticity Test

Another assumption of multiple regressions is that the residuals are homoscedastic. Heteroscedasticity in regression analysis occurs when the variance of the residuals (errors) vary across the observations. The study employed Breusch-Pagan to test the null hypothesis that the

errors have equal variance (errors are homoscedastic) versus the alternative hypothesis that the errors are heteroscedastic. Breusch-pagan test gives a chi-square value and a significance value, whereby a p-value < 0.05 indicates that there is heteroscedasticity while a p-value greater than 0.05 indicates heteroscedasticity does not exist. Table 4.37 shows the results obtained from running the tests. From the table, the Breusch-Pagan test p-value was 0.481, which was greater than 0.05 indicating that heteroscedasticity does not exist thus the assumption of homoscedasticity of the residuals had not been violated. This is in line with the findings of Ongeri and Osoro (2021).

Table 1.7: Heteroscedasticity Test Results

Test	Chi-square value	Sig.
Breusch-Pagan	3.483	.482

H0: Communication integration does not significantly influence the performance of manufacturing firms in Rwanda.

The histogram in figure 4.6 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. According to 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.
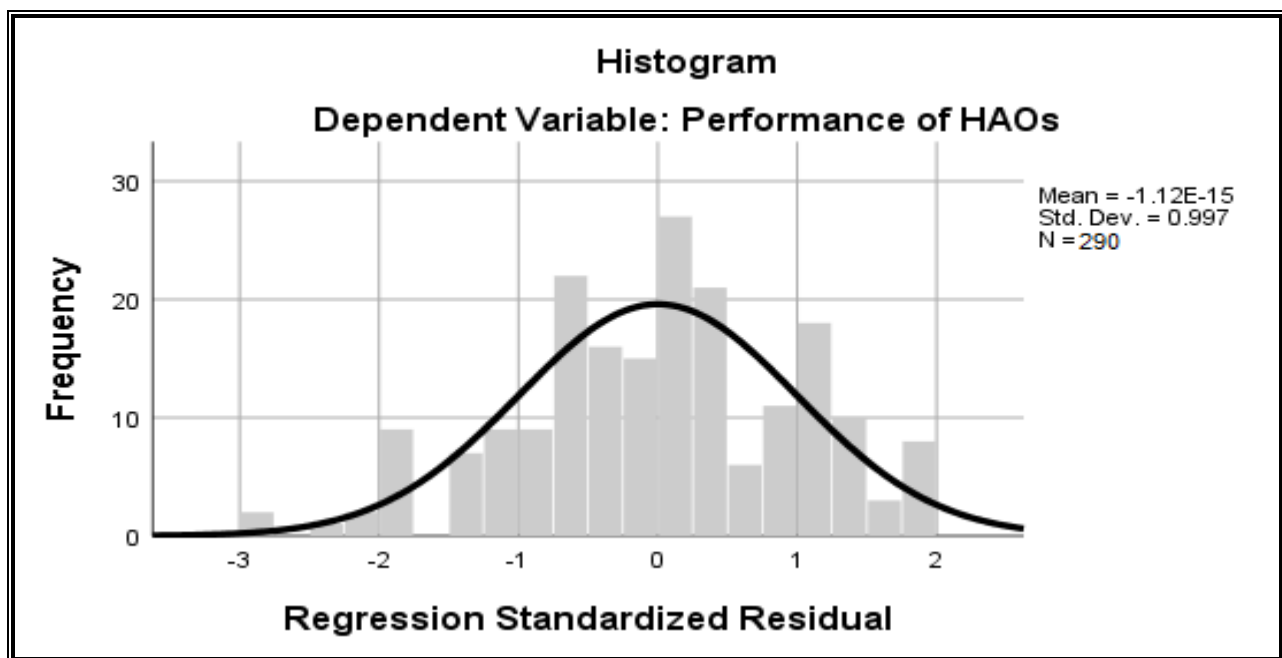

Figure 1.2 : Histogram communication integration on performance of manufacturing firms

The linear regression model shows $R^2=0.585$ which means that about 58.5 percent of the total variance in the performance of manufacturing firms in Rwanda can be explained by communication integration. The result is shown in Table 1.9 below.

Table 1.9: Model Summary of Communication integration

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.765[a]	.585	.579	.74484

a. Predictors: (Constant), Communication integration

b. Dependent Variable: Performance of Manufacturing firms

Presented in Table 1.10 are the coefficients and t-statistics of the resulting model. The constant term $\beta_0 = 5.77$, implies that if communication integration is held constant, then there will be a positive performance of manufacturing firms in Rwanda by 5.77. The regression coefficient for communication integration was positive and significant ($\beta_1 = 0.224$, p<0.05), with a t-value of 3.556. This implies that for every unit increase in communication integration, performance of manufacturing firms is predicted to increase by 0.224 units.

Table 1.10: Coefficients of Communication integration

Model		Unstandardized Coefficients		Standardized Coefficients	T	Sig.
		B	Std. Error	Beta		
1	(Constant)	5.781	0.487		12.101	0.000
	Communication integration	0.234	0.073	0.765	3.556	0.000

a. Dependent Variable: Performance of Manufacturing firms

Performance of Manufacturing firms = 5.781 + 0.234 Communication integration

From the results above, the null hypothesis that communication integration does not significantly influence the performance of manufacturing firms in Rwanda, is rejected. The results revealed that communication integration contributes positively towards performance of manufacturing firms in Rwanda. The findings are in harmony with Omunde et al. (2022) argument that manufacturing firms' operation in unstable environments necessitate strategies that enhance their responsiveness to the needs of vulnerable people. This calls for supply chain readiness, swift disposition of the needed resources, and capacity to cope proficiently in different settings. Sharing the same view are the extant researches Kang, Lee, Hwang, Wei and Huo (2021), which argued that the operational performance of manufacturing process through supply chains relies on their ability to respond swiftly to the needs of vulnerable populations and undertake dynamic operations. For this to be possible, manufacturing process through supply chains must

be responsive, amenable and efficient. This is further supported by Ongeri and Osoro (2021) findings that proper supply chain response to the manufacturing needs in case of productions is considered to be mitigation and satisfying the initial and vital needs of the survivors. Thus, it ought to be done in the shortest time using the least amount of the resources to reduce the terrible effects of the production

Summary

Communication integration was to examine its effect on performance of manufacturing firms in Rwanda. This objective was measured using outgoing set of data, incoming set of data and sharing ideas in the opinion statements given. The findings in the study revealed that integration design of supply chains enables manufacturing process through supply chains to be integration by achieving the elements of flexibility, alignment and reduction in supply chain vulnerability. Manufacturing process through supply chains are prone to vulnerabilities and disruptions emanating internally or externally to the organizations. The adoption of integration design in supply chains give manufacturing firms the capacity to survive, adapt and sustain in the event of turbulences. Integration design enables manufacturing process through supply chains to recover from inevitable risky events in an effective way.

Narratives from supply chain managers revealed the various challenges faced by manufacturing process through supply chains in implementing integration design as insufficient resources, poor coordination, demand uncertainty, indifference in development approaches and community poverty and illiteracy. From the examination of the views of supply chain managers, insufficient resources emerged as a major constraint of the manufacturing process through supply chains in Rwanda. Manufacturing firms train in accessing sufficient, necessary and reliable financing for their charitable work. Manufacturing firms have limited resource mobilization skills and are less focused in raising funds locally opting to wait for global donors to approach them. Donors are highly looked upon, hence creating the need to constantly impose changes to match donor expectations. This makes manufacturing firm susceptible to donor demands making it hard to measure their effectiveness.

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