

Knowledge Management and Business Performance: Mediating Effect of Innovation

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Abstract The purpose of this study was to examine the mediating effect of innovation in the relationship between knowledge management and business performance of SMEs in Rwanda. A cross-sectional survey and quantitative methodological approach were used to collect data used to carry out mediation test. The study results revealed that innovation had a positive effect on business performance. However, there was no direct effect of knowledge management on business performance, except through the full mediation of innovation. This implies that without innovation, Rwandan SMEs may not achieve an improved business performance. This study contributes to existing body of knowledge management on the improvement of business performance of SMEs through innovation. The results could help business owners to make use of the available knowledge resources by transforming them into new products, new processes and new markets to boost their business performance. This study used a cross sectional research design and was limited to investigate the effect of knowledge management and innovation on business performance. Future researchers could employ a longitudinal method to investigate any possibility for variations in the results. Qualitative studies could equally be used to supplement the quantitative findings. Lastly, this study focused on manufacturing SMEs only. Future research might focus on other types of businesses.

Keywords: *knowledge management, innovation, business performance, SMEs, Rwanda*

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1. Introduction

Small and Medium Enterprises (SMEs) are the backbone of the economic development of any country, in that they provide employment [29,65]; increase wealth and income of people [75] and connect the community to the global economy [42]. Despite their significance, SMEs have been reported to exhibit poor performance as indicated by continuous losses, drop in sales and short-term survival [64]. In the current economic climate of tighter liquidity, rising costs of capital and raw materials, skyrocketing fuel prices and ever-increasing need for competitiveness [2,32], the need for businesses to pay keen attention to performance cannot be over-emphasized.

Numerous studies have come up with probable explanation for SMEs performance. For instance, [64] and [22] linked business performance to access to finance, entrepreneur attributes and SMEs characteristics. Others studies associate business performance with factors such as appropriate human resource management [1,61]; working capital management [63,91]; managerial competencies [74]; the number of years in operation [50]; marketing information and application of information technology [61]. However, knowledge management as a contributing factor to business performance has received little attention in research. Among the few research works carried out in that area one could mention the ones by [5,19,41,44,36].

Knowledge is a strategic resource to any kind of business[37]. Businesses constantly need this knowledge which is understood as information on customers, suppliers, employees, competitors and entrepreneurial environment if those businesses want to stay competitive. Knowledge management (KM) has been conceptualised as the process of acquiring, sharing and applying knowledge to enhance business performance [26]. To emphasize this point, [31,57] recommended that KM be included in the SMEs' daily activities so that they become more successful and stay longer.

It should be noted that with the increase of SMEs in size and type, KM no longer stands out as a sufficient factor that can lead to improved business performance. In [26] opinion, for a business to achieve better performance and remain competitive, knowledge needs to be managed not only effectively but also innovatively. This makes innovation a key factor in business performance. In fact, numerous studies have established a positive relationship between innovation and business performance [40,69,80,82,83,90]. Yet, all these studies have been limited to innovation as an explanatory variable to business performance.

Some other studies have examined the mediating effect of innovation between business performance and variables other than KM. Those variables were among others, organizational learning [51], manufacturing flexibility [16], retailers' strategic orientations [58] and personal mastery [34]. Elsewhere, [56] investigated the mediating

effect of innovation between KM and organizational resilience. Of all those studies, none has investigated the mediating role of innovation between KM and business performance in SMEs.

This study seeks to make a contribution to existing literature on business performance of SMEs, more so in Africa and particularly in Rwanda, where there is not much research on the relationship between KM, innovation and business performance. Rwanda has particularly been chosen as a focus of this study because of the complexity of the operating environment of SMEs. For instance, the current state of technological advancement in Rwandan SMEs is somewhat rudimentary and inadequate information on those SMEs complicates matters [100]. In addition, the available information is not sufficiently exploited because most of SMEs in Rwanda are characterised by the 'me-too' syndrome (i.e. similar businesses), thus scoring low in innovations and poor business performance [62]. Such businesses need to get out of their comfort zone and begin to do things differently if they are to survive in the current harsh economic conditions. One way to bring about difference is to search for new business opportunities, effectively manage available knowledge resources and produce innovative products and services. Based on that background, this study aims to test the mediating effect of innovation in the relationship between KM and business performance in Rwandan SMEs.

The remaining section of this paper is structured as follows: section 2 presents the literature review. This is followed by research methodology in section 3. Section 4 presents the results from the survey. This is followed by a discussion of results, conclusion and research implications, respectively.

2. Literature Review

2.1. Knowledge Management and Business Performance

The idea of knowledge management (KM) has become important due to increased awareness of the importance of knowledge for the organization's prosperity and survival. Knowledge has two fundamental characteristics: Tacit knowledge and explicit knowledge [77]. Tacit knowledge involves the process of comprehension which is hard to understand because it cannot easily be captured. It is embedded in the form of capabilities, skills and ideas which individuals carry in their minds [27]. It can be transferred only by means of interactions with other people in the organization through experiences, practice, feelings, and attitudes [23]. Whereas, explicit knowledge refers to information that can be easily articulated or codified, transferred and shared to others [28] in the form of manuals, fact sheets, pictures, charts and diagrams [72].

KM is defined in different ways due to its multidimensional nature [25]. [17] defined KM as the identification and analysis of available and required knowledge in order to achieve organizational objectives. For [25], KM involves knowledge acquisition, knowledge dissemination and the use or responsiveness to knowledge. KM was also defined as a process of acquiring, storing, understanding, sharing, implementing knowledge, and

these actions are taken in the learning process in relation to the culture and strategies of the organizations [49]. Further, [14] considered KM as efforts to explore the tacit and explicit knowledge of individuals, groups and organizations and to convert this treasure into organizational assets that are used by managers to make organizational decisions. From the above review, this study employed knowledge acquisition, knowledge sharing and responsiveness to knowledge as the constructs of KM.

KM is considered as the best strategy that businesses use to improve their competition level [10] since knowledge is a strategic resource that allows them to obtain a higher level of competitiveness and innovation [21]. Therefore, knowledge-based theory (KBT) advocates that competitive advantage of firm comes from intangible assets such as firm-specific knowledge (explicit knowledge), the tacit knowledge of its people and the ability to apply knowledge resources [35]. Further, [11] argued that knowledge leads to performance improvement when it is well managed. KBT suggests that KM practices such as knowledge acquisition, knowledge creation, knowledge sharing, knowledge storage and knowledge implementation play a vital role in achieving superior performance [85,86]. Thus, businesses that strive to remain competitive ought to put more effort on the management of their knowledge resources that are necessary to increase their profits, sales growth and market share.

Moreover, scholars like [84,102] reported that firms that use suitable KM practices enhance their capabilities, resulting into an improved business performance. Prior empirical studies have investigated the relationship between KM and business performance. For instance, [95] findings confirmed that knowledge management orientation played positive role in promoting organizational performance in China. The study of [73] revealed that KM positively influenced the performance of manufacturing firms. Further, the study of [79] showed that among the four dimensions of KM, that is, knowledge acquisition, knowledge transfer, knowledge utilization and knowledge recording, only knowledge utilization has positive relationship with business performance.

In SMEs, [36] found a significant relationship between KM practices and performance where knowledge sharing had higher factor loading compared with other KM practices, and financial performance had higher factor compared with other organizational performance components. Other researchers like [44,55,97] showed that KM influenced positively and significantly the performance of SMEs. Nevertheless, as stated by [31,57] the benefits of KM adoption are not fully exploited by SMEs in developing countries, particularly in Africa. What is questionable though is the extent to which KM influences business performance of SMEs in Rwanda, which this study sought to examine. This review reveals the following hypothesis:

H₁: There is a significant relationship between knowledge management and business performance in SMEs.

2.2. Innovation and Business Performance

Due to intense competition and turbulent business environment, SMEs have to monitor their competitive

position compared to competitors through innovation. This justifies why innovation has become a vital factor that contributes to business performance and existing literature emphasized its importance. According to [30,43], innovation has a significant influence on organization's performance, survival and competitiveness. Similarly, [52] argued that innovations provide firms with a strategic orientation to achieve sustainable competitive advantage.

Previous researchers have tested the association between innovation and business performance and found a significant positive relationship. For instance, [46] study revealed that business performance was depending on the number of innovations, the nature of those innovations and the firm resources invested in innovation. While the study of [9] found that product and process innovation led to superior performance where performance was measured by sales, market share and profitability, product innovation was found to have stronger predictor power in performance than process innovation.

The positive and significant relationship between innovation and business performance was also found in SMEs within different business sectors. A recent study conducted by [40] examined the relationship between innovation and performance of wooden furniture manufacturing SMEs in Indonesia. The study found a positive and significant effect between innovation and firm performance. Similarly, the research of [80] concluded that firms with inclination to innovations were able to face changes in the competitive environments and obtain superior performance in South Korea SMEs whereas [90] study found that innovation culture and strategy represented key drivers to the performance of manufacturing SMEs in Australia. Further, [82] study revealed a positive impact of product and process innovation on firm performance in manufacturing sector in Malaysia but no relationship between market innovation and firm performance was found. The study of [83] in ICT companies in Malaysia confirmed the same results. In Kenya, [69] study revealed that innovation influenced the growth of garment SMEs. The study also showed that the tendency of owners to engage in new ideas and creative processes result into new products and process which have great influence on the performance of SMEs.

Furthermore, [70] conducted a literature survey to investigate the relationship between innovation and business performance of SMEs. After an extensive review of worldwide studies on innovation and SMEs performance, he concluded that very few empirical studies are observable in Africa and no such study was found in Tanzania. Thus, he recommended further research to explore this relationship. In the same spirit, the researchers are motivated to investigate this relationship in Rwandan context where there is dearth of research in this area and it is hypothesized as follows:

H₂: There is a significant relationship between innovation and business performance in SMEs.

2.3. Knowledge Management and Innovation

Basing on the knowledge-based theory, [13,24] associated knowledge resources to innovation and argued that these resources determine the capacity of the firm to innovate. Similarly, [98] stated that innovation is the

transformation of knowledge into new products and services. Hence, the influence of KM through acquisition, sharing and application on innovation was acknowledged in the literature as discussed below. Knowledge acquisition is the process of acquiring knowledge that is available somewhere and it refers to the use of existing knowledge or capturing new knowledge [54]. Internally, the company can acquire knowledge using explicit knowledge from existing documents or the tacit knowledge of its people into its repositories. Externally, [99] noted that a business can acquire knowledge by employing individuals with the required knowledge and by purchasing knowledge assets such as patents and research documents. Besides, a close relationship with customers will allow business managers to have a direct and faster knowledge flow and this will help them to improve their ability to capture customers' knowledge, competitors' actions and behavior, market trends and other developments [99].

When there is acquisition of new knowledge within the company, the capacity of employees increases and they become able to transform that new knowledge and generate the new one [18]. Consequently, the stocks of knowledge increase and the business takes advantage of new opportunities by applying and exploiting acquired knowledge to produce innovative results [43]. Scholars confirmed the relationship between knowledge acquisition and innovation. For instance, [103] found out that information acquired from alliance partners affects knowledge creation of the organization, which in turn leads to innovation. [87] confirmed a positive and significant relationship between knowledge acquisition and technological innovation (process and product innovation). [56] study also revealed a positive and significant relationship between knowledge acquisition and organizational innovation.

Knowledge sharing is the exchange of employee knowledge, experiences and skills across the whole organization [54]. When members of the organization share and exchange knowledge, the level of participation increases, and this knowledge contributes to the development of innovative ideas [18]. Thus, a positive association can be assumed between knowledge sharing and innovation. Lastly, knowledge application (responsiveness to knowledge) is very necessary. It is the utilization of acquired knowledge to make useful decisions regarding the business [3]. Therefore, knowledge application can enhance the innovative activities.

Empirical previous studies have found a positive and significant relationship between KM and innovation. For instance, [101] study revealed that the way knowledge is managed determines the success of innovation in businesses. Further, [7] confirmed that effective KM process through knowledge creation, storage, distribution and application contributes to innovation in the firm. Whereas [87] study revealed a positive relationship between the effectiveness of acquisition, sharing and application of knowledge and product innovation.

In context of SMEs, limited empirical studies have examined this association. [4] found a positive and significant relationship between KM and innovation in high-technology SMEs industry. This is supported by the study of [78] who revealed that KM process supports

innovation in SMEs. [38] found similar results in Mexican SMEs. However, [60, 31] noted that researches about KM application in SMEs, particularly in developing countries are few. That is why [89] suggested more research to enrich the empirical studies on the relationship between KM and innovation in SMEs. Due to the scarcity of research, there is a need to investigate this relationship in Rwandan SMEs, as a developing country. Hence, the following hypothesis was formulated:

H₃: Knowledge management and innovation are positively related in Rwandan SMEs.

2.4. Knowledge Management, Innovation and Business Performance

It is noted that there is a gap in the innovation field, especially in the determination of the critical factors that have a direct effect on innovation to improve business performance [16]. That is why [26] recommended managers with the desire to increase their business performance to pursue innovation in order to remain competitive since they are operating in a changing environment. In this regard, scholars confirmed that the achievement of superior business performance requires that effective KM leads to innovation. For instance, basing on knowledge-based theory, [53] stated that when knowledge is effectively managed in different levels of the organization, it leads to the capabilities that are unique which in turn contribute to better performance through innovation. Besides, when a company devises a strategy and sets policies that protect the application of knowledge [93], that company can obtain high standard of knowledge and innovation [8], which result in improved performance [20]. Further, the study of [68] found that KM practices (i.e. knowledge acquisition, knowledge dissemination and responsiveness to knowledge) have positive relationship with business performance. [68] also noted that KM contributes to increased sales through new product development, adaptations and improvements in innovation. The study by [67] found that knowledge management processes have an indirect significant impact on business performance through innovation in banking industry

whereas [6] confirmed the same results in telecommunication and information technology industry.

This review generates the following hypothesis:

H₄: Innovation mediates the relationship between knowledge management and business performance in SMEs.

3. Research Method

3.1. Research Design

The study used a quantitative cross-sectional design with a face-to-face administered survey questionnaire for data collection. The questionnaire was designed on the basis of measurement scales from earlier research and submitted to 10 experts including 3 academicians, 3 researchers, 2 practitioners and 2 policy makers for content analysis. Twenty items found irrelevant were deleted while other 25 were paraphrased subsequent to the suggestions made by experts in order to fit the study context. Then, the back-translation method [66] was used to translate the draft questionnaire in Kinyarwanda (mother tongue) because the majority of respondents were not fluent in English. The instrument was subjected to a pilot study conducted on a sample of 80 SMEs and was found reliable and valid.

3.2. Study Sample

The target sample size comprised 250 manufacturing SMEs located in Kigali City Province basing on the population of 377 firms [71]. It is noted that a sample size of 195 SMEs was calculated using Yamane (1967) formula quoted in [56]. However, this size was adjusted to 250 to take into account non-response bias. The SMEs were selected using simple random sampling methods. To avoid one person response bias, the owner-manager and manager or assistant owner (two persons) were selected in each SME. 234 out of the 250 participated in this study, giving a response rate of 94%. The high response rate is attributed to the face-to-face approach employed. Table 1 presents the characteristics of the participants.

Table 1. Sample characteristics

Business size (no of employees)	F	%
From 10-30	212	90.6
From 31-50	12	5.1
From 51-70	4	1.7
Above 70	6	2.6
Business age		
From 3-5 years	91	39
From 6-10 years	100	42.8
Above 10 years	43	18.2
Industry type		
Carpentry	77	32.9
Welding	55	23.5
Manufacture of leather products	11	4.7
Food processing	31	13.2
Pottery and construction materials	20	8.5
Manufacture of household materials	20	8.5
Miscellaneous products	20	8.5

Table 1 shows that in terms of business size, the majority of SMEs surveyed employed between 10 and 30 workers. Regarding the business age, the majority (42.8%) of the businesses were in the bracket of 6-10 years. This study considered three years and above as the minimum age of the business to be selected because this time was enough for a business owner/ manager to know if his/her business is performing well or not. In examining the industry type, it is noted that the majority of SMEs surveyed were in carpentry (32.9%).

3.3. Measures

The study variables were measured using items developed and tested by previous scholars. More still, they were anchored on a six-point likert scale. Specifically, knowledge management was measured in terms of knowledge acquisition, knowledge sharing and responsiveness to knowledge [25,56,96]. Innovation was measured in terms of product innovation, process innovation and market innovation [56,94]. Business performance was examined in terms of profits, sales growth and market share [81,88]. The CFA results are in Appendix 1a, 1b and 1c.

3.4. Data Management

Data were recorded, checked, cleaned using SPSS (statistical package for social scientists). As this study used face-to-face administered questionnaire, no missing values were observed. The 8 identified outliers were due to data entry errors and were replaced with correct values. Then, 468 units of inquiry were aggregated into 234 SMEs. The assumptions of parametric tests were run. Specifically, regarding normality test, the bell-shaped histogram confirmed that data were normally distributed. [33] also noted that if the assumption of linearity between IV and the DV is met, the plot of residuals against predicted score will also be linear. Therefore, the normal Q-Q plot results revealed a fairly straight line showing that the data were linear. To test homogeneity, a scatter plot was drawn plotting the residuals against the dependent variable. The results of the scatter plots showed

that the points were dispersed around zero and there was no other clear trend in the distribution, implying that homogeneity assumption was met. Multicollinearity exists if there is a high correlation between independent variables when regressed against each other. It was tested using tolerance value and Variance Inflation Factor (VIF) [76]. The results revealed tolerance values ranging from .665 and above which were supported by VIF values below 10. Thus, there is non-multicollinearity among the study variables. Descriptive statistics were produced, correlations and regressions were performed, and the mediation of innovation was tested using mediation principles of [12] and the Medgraph of [47].

4. Empirical Results

4.1. Correlations

A zero order correlation was conducted to test whether or not associations existed between the study variables as hypothesized from the literature review. The correlation results indicated a positive and significant relationship between knowledge management and innovation ($r = .385$, $p < .05$), innovation and business performance ($r = .434$; $p < .05$); knowledge management and business performance ($r = .214$, $p < .01$) respectively (see Appendix 2).

4.2. Mediation Tests

Tests for mediation were conducted to establish the nature of mediation and the extent to which innovation influences the relationship between knowledge management and business performance. To do this, the [12] conditions were tested. That is, first, the independent variable must affect the presumed mediator; second, variations in the mediator significantly account for variance in the dependent variable; third, the independent variable must be shown to affect the dependent variable; and lastly, the effect of the independent variable on the dependent variable significantly reduces when the mediator is included in the third equation. Table 2 presents the results of the mediation conditions.

Table 2. Regression analysis results for the mediation effect of innovation

Predictor variable	Dependent variable								
	Innovation			Business performance					
	Model 1			Model 2			Model 3		
	B	SE	β	B	SE	β	B	SE	B
Intercept	2.393	.226		3.529	.207		2.674	.233	
Knowledge management	.378**	.06	.385	.182**	.055	.214	.047	.055	.055
Innovation							.357**	.056	.413

n= 234, **p<.01.

Table 2 provides evidence of significant relationships between *knowledge management* (predictor) and *innovation* (mediator) ($\beta = .385$, $p < .01$), this finding supports hypothesis H₃ that knowledge management and innovation are positively related in SMEs. Also, a significant relationship was found between *knowledge management* and *business performance* (criterion variable) ($\beta = .214$, $p < .01$) as presented in model 1 and model 2 respectively; thus, supporting H₁. This also indicates that there was a relationship to mediate. Model 3 which is a regression of business performance on both knowledge management and innovation showed a significant effect of

innovation on business performance ($\beta = .413$, $p < .01$), lending support to H₂. Table 2 shows that the effect of knowledge management on business performance reduced (from model 2) and became insignificant ($\beta = .055$, $p > .01$). Overall, the regression results support the conditions for mediation to be realized. It can be concluded that innovation mediates the relationship between knowledge management and business performance.

Further analysis using [58] Medgraph was performed to establish the significance level of the mediation effect. The mediation results are presented in the Figure 1 below:

Type of mediation	Significant	
Sobel z-value	4.481054	$p = 0.000007$
95% Symmetrical Confidence interval		
Lower	0.07592	
Higher	0.19397	
Unstandardized indirect effect		
a*b	0.13495	
se	0.03011	
Effective Size measures		
<u>Standardised Coefficients</u>		
Total:	0.214	
Direct:	0.047	
Indirect:	0.159	
Indirect to Total ratio	0.743	

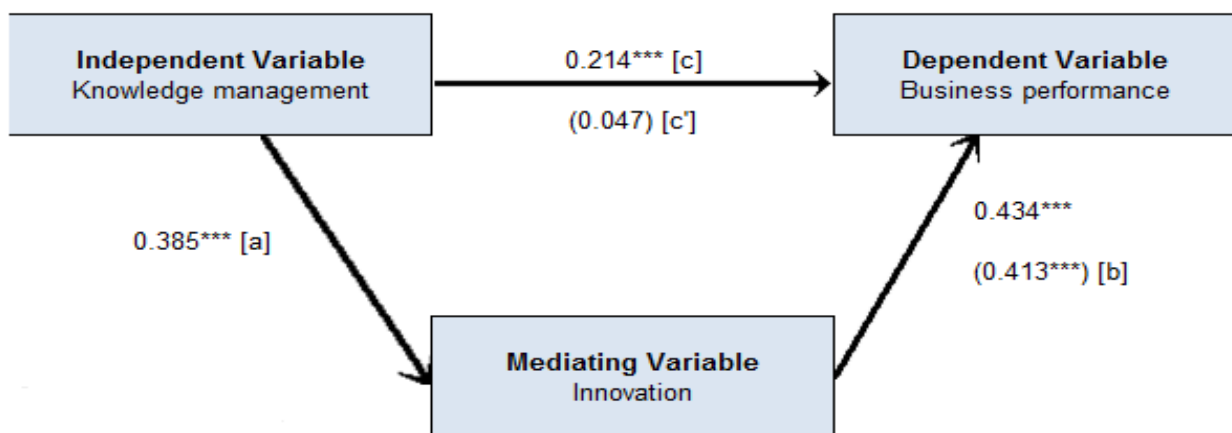


Figure 1. Sobel test results and mediation path

The results in Figure 1 above indicate a statistically significant mediation effect of innovation in the relationship between knowledge management and business performance ($z = 4.48, p < .01$). The significant z value provides evidence of support for hypothesis H_4 that innovation mediates the relationship between knowledge management and business performance. Further, the results showed the index ratio of 74.3% with full mediation effect of innovation, suggesting that without innovation, knowledge management cannot influence business performance in SMEs. This statement is not far from [39, 102] who stated that in case of full mediation, the predictor variable loses its power to influence the dependant variable except through a mediator. Despite a full mediation, the index of mediation indicated that business performance received 74.3% of the indirect effect from knowledge management through innovation, leaving 25.7% unaccounted for. Therefore, it can be presumed that the balance of 25.7% may be accounted for by other mediating factors not considered in this study which necessitate further investigation.

5. Discussion of Results

The results on hypothesis 1 indicate that when KM and business performance are only considered, the relationship is positive and significant. But when innovation is introduced as per the hypothesized model, the relationship

between KM and business performance ceases to be significant. This implies that the acquired knowledge through different means (short courses, conferences, exhibitions, qualified staff), the way this knowledge is shared among all the employees and utilized cannot directly cause significant variations in profits, sales growth and market share of SMEs in Rwanda. The lack of significance in the relationship between KM and business performance was also confirmed in the study by [92]. This situation can be explained by the fact that some managers of SMEs prevent outflow of knowledge from the company and thus block knowledge sharing [15] and do not have systematic KM [45] that leads to business performance. This is in contradiction with previous studies which have consistently established significant and positive relationship between KM and business performance of SMEs. For instance, [5,41,95] found that companies with more KM have a higher performance. Similarly, [36] found a significant relationship between KM and business performance, particularly between knowledge sharing and financial performance.

The results on hypothesis 2 imply that there is a significant relationship between innovation and business performance. This provides empirical evidence that improved business performance is the result of innovative activities. This is true because when a company introduces new or improved products, processes and markets with updated technology, this attracts more customers. As consequence, the sales and market share will increase and

the profits will be enhanced as well. This study finding is consistent with the findings from the study by [6] who confirmed a positive and significant effect of innovation on business performance of telecommunication and information technology industry in Jordan. The similar results were found by [82] who confirmed a positive impact of product and process innovation on firm performance in manufacturing sector in Malaysia. Further, the studies of [48] revealed a positive relationship between innovativeness and performance of family firm.

The results on hypothesis 3 show that KM and innovation are positively related. This was expected because knowledge acquisition, sharing and application/responsiveness to knowledge are linked to innovation. Acquisition of new knowledge increases the capacity of employees to generate new one. When acquired new knowledge is shared among the employees it contributes to the development of innovative ideas and these ideas are utilized for the purpose of introducing new/improved things compared to the existing ones. This indicates that when business improves the way of managing its knowledge resources can lead to certain innovations in terms of product, process and market. This finding is consistent with [87] as well as [59] results which confirmed the positive and significant relationship between effective KM (acquisition, sharing and application of knowledge) and innovation. Similarly, [78,92] revealed that KM process supports innovation in SMEs.

Finally, hypothesis 4 results indicate that innovation fully mediates the relationship between KM and business performance. This implies that KM on its own cannot lead to better business performance in Rwandan SMEs except through innovation. Therefore, to achieve a superior business performance in terms of profits, sales and market share, owner-managers have to improve product, process and market innovation by managing effectively knowledge acquisition, sharing and application. This supports the current performance trend in the country. As earlier mentioned, it is frequently reported that SMEs performance has continued to decline over time. Anecdotal evidence shows that when an individual observes and assumes a particular business is the 'in thing', he/she quickly rushes to start up a similar business without engaging a thorough research on the business environment and owner-manager factors. The whole process of managing knowledge resources has been undermined, and innovations are below the expected levels. Besides, research and development is yet an infant concept in the country. If SMEs performance is to be improved, innovation factors cannot and should not be ignored. The study findings on the mediating role of innovation corroborate the study by [6,67,92] who found that KM has an indirect influence on business performance through innovation.

6. Conclusion and Implications

Following the foregone discussion, it can be concluded that innovation is pertinent to enhance business performance. Furthermore, KM remains a fundamental factor for innovation since knowledge resources determine the capacity to innovate. The findings therefore contribute

to the existing literature on KM and business performance by providing empirical evidence that innovation is a powerful mediator in the relationship between KM and business performance. The practical implications of this study are that owner- businesses/managers of manufacturing SMEs need to pay keen interest in translating their available knowledge resources into the development of new products, new processes and new markets to improve their business performance. This can be achieved by utilizing well qualified staff, by motivating and empowering employees through short courses and by enabling them to attend seminars, conferences and exhibitions to obtain knowledge. Besides, knowledge sharing culture within an enterprise ought to be strengthened. Finally, the acquired new knowledge must be effectively used to generate innovative products which will result in increased business performance.

For policy makers (ministries in charge of SMEs and government agencies), the findings of this study will help them to formulate sound policies and support programmes which are necessary to enhance the performance of SMEs in Rwanda. This study provides also important information on SMEs in Rwanda, particularly for academic researchers working in Rwandan higher learning institutions and other researchers involved in the Rwandan business sector. As this study used a cross-sectional research design combined with a quantitative research approach, future researchers should employ a longitudinal method to compare any variations in the results. Alternatively, qualitative studies could be conducted to supplement the quantitative findings because through methodological triangulation, it may be possible to gain a better understanding of the mediating effect of innovation on KM and business performance. Lastly, this study focused on manufacturing SMEs. Other studies might include other types of business.

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Appendix 1: CFA-Measurement models

Appendix 1a. CFA – Knowledge management

Item code	Item label	Standardised regression estimates	C.R (t)
	Knowledge acquisition		
kac1	Our employees are encouraged to attend short courses, training seminars and conferences to acquire new knowledge	.711	
kac2	Our employees are motivated to participate in exhibition sessions to acquire new knowledge	.696	8.772
kac 3	We employ people who have the knowledge we need	.496	5.096
kac5	We acquire new knowledge through teamwork	.617	7.967
	Knowledge sharing		
ksh5	Our employees exchange their knowledge and experiences while working (on the job).	.660	
ksh6	Knowledgeable staffs share the new knowledge with other staffs through meetings in our company.	.706	7.597
	Responsiveness to knowledge		
rkn3	We are quick to respond to concerns raised by employees regarding new knowledge	.498	5.960
rkn4	We respond in time to changes in technology.	.750	10.318
rkn5	We investigate future customer needs and we respond in time.	.746	
Achieved Fit indices			
CMIN/DF	RMSEA	GFI	CFI
2.177 (52.257/24)	.071	.952	.951
			TLI
			.927
			NFI
			.915
Composite construct reliability: .822			

Appendix 1b: CFA – Innovation

Item code	Item label	Standardised regression estimates	C.R (t)
	Product innovation		
prdi2	Our company makes minor improvements to existing products to satisfy our customers	.766	
prdi3	The employees of our company have commitment to the new product innovations	.624	5.028
prdi7	We are still able to come up with new products to remain competitive	.497	4.822
	Process innovation		
prci1	Our company seeks out new ways to improve existing production process	.501	
prci3	We upgrade our technology to improve our production process	.517	3.787
	Market innovation		
min5	We commercialize products that are new to our customers on our new markets.	.930	
min 6	We utilize new business opportunities in our new markets	.644	4.037
Achieved Fit indices			
CMIN/DF	RMSEA	GFI	CFI
2.392 (26.313/11)	.067	.968	.938
			TLI
			.901
			NFI
			.902
Composite construct reliability: .740			

Appendix 1c. CFA –Business performance

Item code	Item label	Standardized regression estimates	C.R (t)		
	Profits				
prof1	Over the 3 last years the net profits of our company increased	.545			
prof2	The net profit of our company has been increasing for the 3 last years.	.531	6.23		
prof3	Our company is growing due to the net profit reinvested	.518			
	Sales growth				
sagr1	Over the 3 last years, the sales growth of our products increased	.646			
sagr2	Our sales volume increased in the 3 last years	.666	9.661		
sagr3	Our customers have increased on their purchasing volumes over the 3 last years.	.637	9.219		
sagr5	We are still able to achieve our sales expectations	.506	7.250		
sagr6	The number of existing customers that our company serves increased in the 3 last years	.629	9.106		
sagr7	The daily sales of our company are increasing	.614			
	Market share				
mash1	Our market share increased in the 3 last years	.598			
mash2	Over the 3 last years our company had significant market share growth	.638	8.487		
mash3	The volume of our customers 'purchases increased over the 3 last years.	.662	8.774		
mash4	The frequency of our customers 'purchases increased in the 3 last years.	.586			
Achieved Fit indices					
CMIN/DF	RMSEA	GFI	CFI	TLI	NFI
1.60 (103.967/65)	.051	.937	.949	.939	.901
Composite construct reliability:.856					

Appendix 2. Means, standard deviations and zero order correlations

Variables	Mean values	Standard deviation	Knowledge management	Innovation	Business performance
Knowledge management	3.77	.36	1		
Innovation	3.82	.35	.385**	1	
Business performance	4.22	.30	.214**	.434**	1

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