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Knowledge Management Infrastructure in Organisational Knowledge Management Processes—A Case of Aquantuo LLC

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Abstract

The study uses Aquantuo LLC as a single case study to understand the relationship between Knowledge Management (KM) Infrastructure and Knowledge Management (KM) Processes. This included finding the components of the KM Infrastructure, the effects of KM Infrastructure on its KM Process, factors that influence the decision to acquire its KM Infrastructure, and the effects of KM Infrastructure-Sharing in Aquantuo. The paper followed a quantitative research procedure for the design and analysis of the questionnaire. The findings indicated that Aquantuo's KM Infrastructure consisted of technical and social aspects and that the technical aspect of the KM infrastructure had more impact on Aquantuo's operations than the social KM infrastructure. It was noted from the findings that KM Infrastructure positively facilitated KM Processes. The findings further showed that KMI acquisition in Aquantuo is most impacted by cost compared to organisation goals and competition, among other factors. Finally, the findings indicated that impacts on its operations determined Aquantuo's willingness to share its KM Infrastructure.

Keywords

Case Study, Knowledge Management (KM) Infrastructure, Knowledge Management (KM) Process, KM Infrastructure-Sharing

1. Introduction

Knowledge Management (KM) Infrastructure is concerned with permanent foundations for managing knowledge in an organisation. Knowledge Management Infrastructure entails the following components in an organisational context; organisational structure, common knowledge, physical environment, information technology infrastructure, and organisational culture. Organisations usually regard knowledge to be their most strategic and valuable resource. For example, the more an organisation knows about its technologies, products, and customers, the higher its chances of success. Knowledge is present in most organisational activities. As a result, it has become a primary determinant of organisations' success. Besides, organisations must manage resources effectively to improve performance and attain a competitive advantage.

The high level of competition in all industries has compelled organisations to resort to knowledge management to gain a competitive advantage. KM Infrastructure reflects the organisational designs and modular products that sustain the organisation's knowledge management activities. There are two aspects of KM Infrastructure; Social KM Infrastructure and Technical KM Infrastructure. Social KM Infrastructure includes human resources, structure, and culture (Abualoush et al., 2018). Technical KM Infrastructure comprises components, devices, Information Technology, and physical infrastructure. The aspects of KM Infrastructure show that it offers an infrastructural environment that supports or underpins knowledge management activities. Therefore, the two components of knowledge management infrastructure are significant determinants of organisational success.

Although some literature on knowledge management in Ghana exists, they are mainly concentrated on the KM practice in the public services sector (Ohemeng, 2011), the local governance system (Frimpong, Williams, Akinbobola, Kyeremeh, & Kwarteng, 2018; Boateng & Agyemang, 2015), construction sector (Guribie & Tengan, 2019; Guribie, Tengan, & Kuebutornye, 2018; Hackman, Agyekum, & Smith, 2017), information communication technology, the telecommunication industry (Ofori, Osei, Ato-Mensah, & Affum, 2015; Ofori-Dwumfuo & Kommey, 2013), the industrial and education sector (Agyemang, Ngulube, & Dube, 2019; Boateng & Tang, 2016; Dei & der Walt, 2020; Musa, 2012), and organisational knowledge capital and productivity in Ghana focused on the banking sector (Alhassan & Asare, 2016; Owusu, 2016; Adjei & Dei, 2015). It is evident from the literature that more is needed to know what constitutes Knowledge Management Infrastructure (KMI) among the businesses in Accra and how it facilitates the Knowledge Management Process (KMP). Further, we need to determine whether these enterprises share their KMI with their competitors and the effects of sharing if they do.

1.1. Research Questions

Using the theoretical foundation of Probst (1998) on knowledge management and knowledge management infrastructure as proposed by Becerra-Fernandez and Sabherwal (2010), the paper uses a single case study to provide what constitutes knowledge management infrastructure and how it facilitates managing knowledge in Aquantuo. The following research questions guided the study:

1) RQ1: What are the components of the KM Infrastructure of Aquantuo?

2) RQ2: What are the effects of Aquantuo's KM Infrastructure on its KM Process?

3) RQ3: In Acquiring its KM Infrastructure, what factors mostly influence Aquantuo's decision?

4) RQ4: What are the effects of KM Infrastructure-Sharing in Aquantuo?

1.2. Hypotheses

In order to answer the research questions, the following hypotheses were formulated:

$HP1_0$: The Social KM Infrastructure aspect of Aquantuo's overall KM Infrastructure does not have a higher impact on its KM Process than its Technical KM Infrastructure.

$HP1_1$: The Social KM Infrastructure aspect of Aquantuo's overall KM Infrastructure has a higher impact on its KM Process than its Technical KM Infrastructure.

$HP2_0$: Aquantuo's KM Infrastructure does not facilitate its KM Process.

$HP2_1$: Aquantuo's KM Infrastructure facilitates its KM Process.

$HP3_0$: Cost is not the main factor Aquantuo considers prior to the KM Infrastructure Acquisition.

$HP3_1$: Cost is the main factor Aquantuo considers prior to the KM Infrastructure Acquisition.

$HP4_0$: Aquantuo's willingness to share its KM Infrastructure is not determined by the impacts of such sharing on its operations.

$HP4_1$: Aquantuo's willingness to share its KM Infrastructure is determined by the impacts of such sharing on its operations.

2. Literature Review

2.1. Knowledge Management (KM) Processes

According to Probst (1998), an organisation's knowledge management system, its cycle of knowledge and the effectiveness of its knowledge management practices are based upon eight building blocks. Disruptions in the organisation's knowledge cycle and knowledge management process occur when one or more of these building blocks are left unattended. Therefore, according to Probst's (1998) Knowledge Management Framework, an organisation's knowledge management can be conceptualised into three cycles: 1) an inner cycle comprising of the building blocks of acquisition, identification, distribution, development, knowledge use and preservation, 2) and outer cycle which comprises of all the building blocks of the inner cycle and 3) the final cycle or feedback cycle which comprises of the need to measure the various variables underlying attainment of knowledge management goals in the organisation. Thus, with this respect, each of the building blocks of Probst's (1998) Knowledge Management Framework can be outlined as follows.

Knowledge Goals: The factors which determine the direction for activities of knowledge management and the capabilities to be built upon for each level.

Knowledge Identification: The process of assessing and tracking an organisation's internal and external data and competencies.

Knowledge Acquisition: The process of acquiring or collecting the knowledge held by other firms, stakeholders, knowledge management specialists and products, software or resources for knowledge management.

Knowledge Development: The process of producing new knowledge collectively and individually within the organisation.

Knowledge Preservation: This comprises the key technologies and infrastructures for storing knowledge.

Knowledge Distribution: This comprises the key technologies and infrastructures for disseminating knowledge across the organisation.

Knowledge Use: This implies the processes established to prompt employees to utilise, apply or acquire knowledge within the organisation, such as committees, media channels, intranet, knowledge fairs and so on.

Knowledge Measurement comprises the key tools, methods, variables and practices to measure organisational knowledge.

The key principle underlying Probst's (1998) Knowledge Management Framework is the assumption that an organisation's overall knowledge management system must be formulated based on its objectives and goals. Hence, to ensure the effectiveness of knowledge management practices, the organisation must identify and use internal and external knowledge resources compliant with its overall strategic goals and business directions. Consequently, Probst's (1998) Knowledge Management Framework has been postulated to be a beneficial model for determining organisational knowledge management effectiveness due to its ability to structure the knowledge management process in logical phases, for providing effective interventions for improvement as well as a validated framework for the diagnosis of organisational knowledge problems.

2.2. Knowledge Management (KM) Infrastructure

Infrastructure is a framework that supports organisations in achieving the objectives of their existence. Organisations develop or acquire infrastructure to map their objectives, which may influence an organisation to acquire several infrastructure types, such as hard or soft infrastructure. Hard infrastructure is concerned with the physical foundations or tangible components necessary for the functioning of an organisation, and soft infrastructure refers to the intangible foundations or components required in a functioning organisation (Portugal-Perez & Wilson, 2010). An organisational infrastructure may stand alone or be connected to a grid, depending on its use case.

An organisation's infrastructure includes processes, policy, computer systems, people and relationships. These are key to determining their survivability in a highly competitive environment. Knowledge infrastructure in an organisation can be described as a set of organisational norms, procedures, and conventions coupled with information technology tools that allow seamless interaction among users, operators, and components, including standards, access, and quality assurance. The Knowledge Management Infrastructure Definition Task Force (KMIDTF) set up by the University of Kansas categorises infrastructure from the knowledge management perspective as operational and physical infrastructure that supports the data warehouse architecture (Pace et al., 2000). Accordingly, the operational infrastructure provides the policies, procedures, roles, responsibilities and system software that define and guide the data warehouse's use, management and configuration.

An organisation's KM Infrastructure is one of the drivers of knowledge management. According to Lambe (2006), the knowledge and information infrastructure consist of everything that works together to promote the flow of information and knowledge in support of the numerous tasks, actions, and decisions that make up organisational activity.

Human, social, and organisational factors are included in the knowledge infrastructure. The knowledge management infrastructure often includes standards, various tools and resources visible to users, norms and assumptions, a common lexicon, and categories for organising information.

KM Infrastructure reflects the foundations of an organisation. Organisational culture, organisation, IT infrastructure, and physical environment make up the knowledge management infrastructure, according to Becerra-Fernandez and Sabherwal (2010). Becerra-Fernandez & Sabherwal, (2010). Aviv, Hadar, & Levy (2021) caetgorised KM Infrastructure into social and technical infrastructure. Organisational knowledge management depends on social and technical infrastructure components. Human resources, organisational structure, and culture comprise social infrastructure. The organisational know-how-based information technology system supports knowledge production and flow.

Thus, KM Infrastructure combines organisational norms, procedures, conventions, and information technology tools to enable smooth interaction between users, operators, and components, including standards, access, licenses, and quality assurance.

Social KM Infrastructure and Knowledge Management.

2.3. Organisational Culture

Organisational culture is one aspect of social infrastructure crucial in knowledge management. An organisational culture entails the collection of norms and values that the stakeholders in the organisation share. Organisational culture controls the way stakeholders in an organisation interact with one another. It facilitates teamwork and knowledge sharing because it encourages collaboration and interaction required for knowledge flow. Organisational culture allows stakeholders to restructure their knowledge to influence knowledge-sharing and problem-solving. It is an aspect of social infrastructure that increases trust among team members (Becerra-Fernandez & Sabherwal, 2014). A lack of trust in an organisation would increase personal reluctance to share knowledge. As a result, the organisation will likely lose its competitiveness. Organisational culture is important in almost all industries. For example, in the logistics and freight forwarding industry, organisational culture aids knowledge management sharing because it enhances internal communication and improves customer service. This is because organisational culture creates a set of norms that ensure certain organisational objectives are achieved.

2.4. Human Resource and Knowledge Management

Knowledge management and human resource management are people-centred concepts that focus on creating, sharing, and using knowledge. Human resource is a critical aspect of knowledge management because it is impossible to manage knowledge in a vacuum. People are needed for knowledge to be shared. Some human resource strategies that promote knowledge sharing in an organisation are institutionalised learning and proactive HR strategies. HRM aids in knowledge management by creating a platform for sharing experiences, opinions, and ideas (Choe, 2016). Examples of HRM strategies that are appropriate for managing knowledge are; education and training, selection, and recruitment. Numerous HRM activities are essential in enhancing knowledge transfer and building absorptive capacity during acquisitions. Knowledge-sharing practices should be adopted in human resource management to enable organisational stakeholders to know what they can do to contribute to the knowledge flow in the organisation (Kane, 2017). Examples of knowledge-sharing practices that organisations can include performance management, recruitment and selection, and training. Knowledge-sharing techniques should be incorporated into organisational culture and strategic business objectives in logistics services.

In the logistics and freight forwarding industry, the human resource department is the best suited to take care of knowledge management initiatives because the activities occurring there are independent of knowledge management initiatives. They also use riders and other machinery to help them make deliveries to their clients. Therefore, human resource management has to be aligned with knowledge management strategies at functional and strategic levels (Sytnik, 2016). The purpose of such alignments is to provide explorative and decentralised learning within the organisation.

2.5. Organisational Structure and Knowledge Management

An organisational structure is an example of a knowledge management infrastructure that plays a crucial role in knowledge management. Organisational structure influences an entity's internal network and the nature of the prevailing relationships. Organisational structure also shows the actions the various departments in an organisation have taken to achieve the organisation's objectives

(Rot & Sobinska, 2018). An organisation's structure relates to the formal mechanism by which the management can identify the lines of communication and authority between subordinates and superiors. Knowledge is an organisation's most important strategic resource (Naqshbandi & Jasimuddin, 2018). Organisational structure and knowledge management are connected because the latter is an organisational framework that incorporates all organisation sectors. Organisational structure influences knowledge management by determining how an organisation's power, responsibilities, and roles are coordinated, controlled, and delegated. Organisational structure also determines the extent of information flow among the employees.

Since knowledge is essential to organisations, businesses must adopt an organisational structure that enables them to transfer as much knowledge as possible. The prevailing organisational model may prevent the organisation from utilising knowledge management infrastructure. An organisational structure should not stifle the organisation's performance (Liebowitz, 2019). It should allow knowledge flow so the employees can undertake actions resulting in organisational structure. The organisational structure allows an organisation to structure itself in a way that will enable innovation without the current workforce feeling overstretched.

2.6. Technical KM Infrastructure and Knowledge Management

The technical infrastructure provides knowledge stockholders, and users access to critical tools (hardware systems and software) needed to facilitate knowledge management processes in achieving organisation focus. Technology is one aspect of knowledge management infrastructure that plays a significant role in knowledge management. The main purpose of technology in knowledge management is to increase efficiency and reduce costs. Technology eases the process through which an organisation collects and analyses information. Technology capability relates to an organisation's informational technology structure. The structure comprises software, hardware, and external and internal systems (Razzaq et al., 2019). Technology is a crucial tool for knowledge management as it influences the knowledge management model in the organisation. The first way in which technology relates to knowledge management is that appropriate technology facilitates the effectiveness of knowledge effectiveness. The dual role of technology is that it streamlines the organisational structure and enables the organisation to achieve a high level of knowledge management effectiveness. Technology can be divided into the following three categories; knowledge transfer tools, knowledge codification tools, and knowledge generation tools (Nowacki & Bachnik, 2016). The classifications are premised on the relationship between technology and knowledge management. Technology can be regarded as a knowledge management tool that can be used to provide services to different target audiences.

Developments in information technology have increased the effectiveness of knowledge management processes. Servers and computer technology play a very crucial role in knowledge management. Innovations in modern computers and servers' storage capacity have led to the ability of devices to store a large amount of information and data. The information and data are enough to produce more realistic and accurate knowledge (Roldán et al., 2018). The storage capacities that technological developments have created have also resulted in knowledge preservation. This means that the organisation can store all information until it is needed. Modern computers and servers are also characterised by high accuracy and speed. The processors and computers can record and relay information in real time.

Network technologies and communications are examples of useful technical infrastructures in knowledge management. The developments of digital network technologies and communications have made knowledge easily available to people worldwide. The internet is among the crucial products of networking technology and communications. The Internet influences knowledge management as it makes learning and information easily available. Internet technologies allow knowledge management, allowing an organisation's stakeholders to collect pertinent information and data (Intezari et al., 2017). The Internet of Things (IoT) is a derivation from the Internet that allows connection not to be limited only to humans. Presently, different devices can be connected to the internet and share information. IoT allows knowledge management by collecting data directly from instruments and equipment. IoT facilitates knowledge management in the telecommunication industry by creating useful and accurate knowledge.

Video and image technologies are technical infrastructures that promote knowledge management in an organisation. Camera technology is an example of a technology that has significantly developed in the past and made it an important source for collecting information. Camera technologies contribute to knowledge management by creating a platform for recognising details and identifying patterns (Bimol et al., 2017). Software packages and scanner technologies have improved knowledge management by enabling people to recognise numbers and letters. Other technologies, such as 3-D printing, have assisted in knowledge management, enabling knowledge to be synthesised more effectively. 3-D technology allows stakeholders to share products and information more clearly. The use of video technologies and 3-D technologies means that knowledge management is heavily dependent on technology.

Other systems that form part of the technical infrastructure include groupware systems and document and content management systems that allow the transfer of codified knowledge among stakeholders. In addition, artificial intelligence, simulation, and semantics networks allow knowledge engineers to see how knowledge relates and interconnect.

2.7. Sharing of Knowledge Infrastructure

Knowledge sharing is a knowledge management process that makes knowledge available and accessible to knowledge stockholders and directly to users who could use it to help the organisation reach its goals. This kind of process can take place formally or informally. In most informal modes, the main infrastructure is social infrastructure. Knowledge infrastructure sharing depicts a situation where some aspects of either social or technical infrastructure are shared within the same enterprise or among competing enterprises. This subsequently results in cost reduction for operations and deployment of critical knowledge infrastructure and remaining efficient and lean.

The motivations for knowledge infrastructure sharing differ from one industry to industry. For example, a report by Urbi (2018) indicates that Ride-Hailing Drivers prefer multiple platforms to maximise profits. In the television and media industry, a large portion of the resources of their knowledge infrastructure is outsourced, and the desire to keep in-house social infrastructure continues to decline (Gupta, 2008). For example, content for television is outsourced to movie production houses and freelance content producers. Nevertheless, some organisations share social infrastructure to remain lean and profitable. Similarly, reasons may be attributed to technical knowledge infrastructure sharing.

3. Research Methodology

This paper employed a single case study strategy to explore the study's objective. The organisation being used for the case is Aquantuo LLC. Aquantuo LLC provides customised e-commerce, shipping and logistics solutions from the US, UK, Canada and China to Africa for individuals and small and large businesses. Aquantuo depends heavily on knowledge infrastructure in its day to operations. The firm allowed the case study as it believed that the findings would aid its managers in improving the performance of their KM infrastructure and KM process and further provide the data collection method that its executives can use in making future decisions. Quantitative data were collected using a structured questionnaire as the main data source. The quantitative research method has the advantage of collecting data from a larger sample population, which can increase the generalizability of the results. The questionnaire was self-administered and was distributed using both paper and web-based approached. The design of questionnaire was based on the understanding of knowledge management infrastructure as proposed by Becerra-Fernandez and Sabherwal (2010).

In this study, the quantitative data collection and analysis method was used as it could mitigate some of the threats to the validity and increase the generalizability of the results. The questionnaire was constructed to evaluate the KM infrastructure components based on the conceptual model, as shown in **Figure 1**. The questionnaires were distributed to employees and executives of Aquantuo.

The research population includes all 55 managers and employees at Aquantuo. The statistical sample for the study was achieved based on the sampling formula by Krejcie & Morgan (1970) with a degree accuracy of 0.05% of 48 employees. Krejcie and Morgan Table for determining sample size is constructed using the following formula,

$$S = X^2NP(1-P)/\left(d^2(N-1)+X^2P(1-P)\right),$$

where S = sample size required, X^2 = the table value of chi-square for 1 degree of freedom at the desired confidence level (3.841), N = the population size, N = 55, P = the population proportion (assumed to be 0.50 since this would provide the maximum sample size), and d = the degree of accuracy expressed as a proportion (.05).

Inputting the figures into the formula results in the following

$$S = 3.841*55*0.50(1-0.5)/(0.05)^2*(55-1)+3.841*(1-0.5)$$
$$= 52.813/(0.1375+0.96025) = 52.813/1.09775 = 48.11$$

The research questionnaire was measured through a five-point Likert scale (rarely = 1, very low = 2, low = 3, high = 4, and very agree = 5). The reliability of the questionnaires was examined using Cronbach's alpha coefficient to determine before the hypotheses were tested. The correlation coefficient for all the variables was greater than 0.7. Table 1 indicates the coefficient of Cronbach's alpha. Figure 1 illustrates the appropriate internal validity and compatibility of research structures.

Table 1. The coefficient of Cronbach's alpha for the variables.

Variable	No of Items	Cronbach's alpha
Social KMI	11	0.861
Technical KMI	6	0.840
KM Process	9	0.865
KMI	17	0.860
KMI Sharing	2	0.862

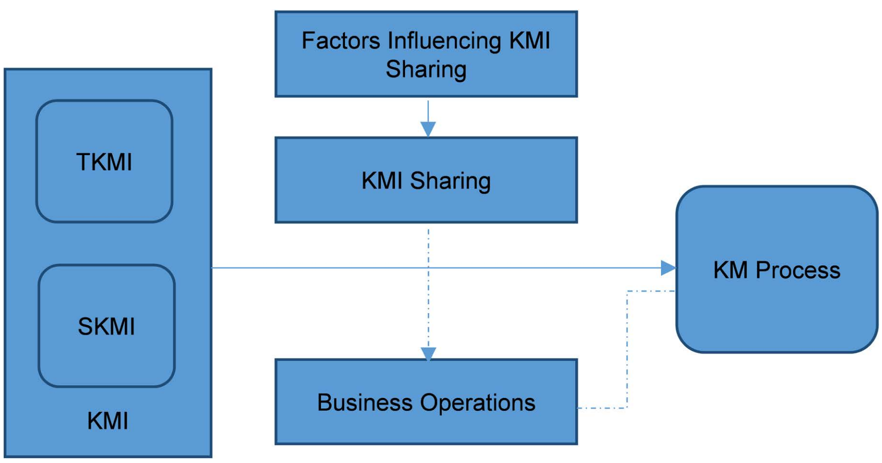

Figure 1. Conceptual model of the study.

3.1. Examination of Research Hypotheses

The normality of the study's acquired data was evaluated. According to Hair Jr., Black, Babin, Anderson (2010) and Tabachnick & Fidell (2013) the normality test is an important assumption in a multivariate analysis that examines the data flow for an individual construct and its relationship to a normal distribution. Therefore, Shapiro-Wilk Test examined the distribution of the data to test normality. This was used to determine whether to use parametric or nonparametric tests for testing the research hypothesis.

$$\begin{cases} \text{H0}, & \text{The distribution of the variablesare normal} \\ \text{H1}, & \text{The variables arenot normally distributed} \end{cases}$$

According to the test results using Shapiro-Wilk testing, the normality of the variables was confirmed; thus, the null hypothesis was maintained.

3.2. Data Analysis Method

SPSS 29 was used to analyse the quantitative data collected. According to the research hypothesis, one of the objectives was to investigate the impact of Aquantuo's knowledge management infrastructure on its knowledge management processes. It was determined that the linear regression method was the best statistical method for this investigation. According to Gallo (2015), regression analysis is a way of mathematically sorting out which of those variables has an impact. Regression analysis aided the paper in determining which of the two aspects of the Knowledge management infrastructure of Aquantuo matters most and impacts its knowledge management processes.

The factors used in the analysis were Social KM Infrastructure, Technical KM Infrastructure, KMI and KM Process.

The next objective was determining the correlation between Aquantuo's KM Infrastructure and KM Process. This was done using the Pearson Correlation coefficient to determine the correlation's magnitude and direction. This helped the study identify the effects of Aquantuo's KMI on its KM process and test HP2, which denotes that KM Infrastructure positively facilitates KM Processes.

The third objective of the paper was to determine the factors that influence KM Infrastructure acquisition in Aquantuo and test HP3, which states that cost is the most influential factor when acquiring KM Infrastructure rather than organisational goals, privacy and security of information systems or competition. Again, the task was to determine which factor had the most impact when acquiring KMI. The study used linear regression analysis to test this hypothesis. The dependent factor was KM Infrastructure, and the independent factors included cost, organisational goals, competition, and privacy and security of information systems.

Lastly, the paper sought to determine the effects of KM Infrastructure sharing on the organisation's operations. The paper tested the hypothesis (HP4) that

Aquantuo's willingness to share its KM Infrastructure is determined by KM Infrastructure sharing impacts on its operations. In this hypothesis, the dependent variable was KM Infrastructure Sharing, and the predictors include Operational and Deployment Costs (O and D Costs), Efficiency, and Resource Availability. Regression analysis is used to test the effects of these factors on KMI Sharing.

The level of significance (alpha-level) chosen was 0.05, and the probability value (p-value) obtained from the statistical hypotheses test was considered to be the basis for rejecting the null hypotheses (Creswell, 2009). If the p-value was less than or equal to the alpha level, the null hypothesis would have been rejected, and the alternative hypothesis supported. If the p-value were higher than the alpha level, the alternative hypothesis would not be supported; the null hypothesis would have been accepted.

4. Results and Analysis

The data were analysed to answer the research questions and test the hypotheses.

HP1 Testing Components of Aqunatuo's KM Infrastructure And KM Process

HP1 denoted the following:

$HP1_0$: The Social KM Infrastructure aspect of Aquantuo's overall KM Infrastructure does not have a higher impact on its KM Process than its Technical KM Infrastructure.

$HP1_1$: The Social KM Infrastructure aspect of Aquantuo's overall KM Infrastructure has a higher impact on its KM Process than its Technical KM Infrastructure.

HP1 aided the study in determining the components of Aquantuo's KM infrastructure and the subsequent effects of the components on the KM process. According to the data collected, it is seen that components of a Aquantuo's KM infrastructure consisted of Human resources, organisational culture, customers, IT and security policies, among others. It was noted that telecommunication connectivity and internet access rank high among the various components.

The results in **Table 2** show the components that made up Aquantuo's KM Infrastructure.

It was noted from the results that the components of Aquantuo could broadly be put under social or technical KM Infrastructure. This is shown in **Table 3**.

According to the result shown in **Table 4**, Social KM Infrastructure constituted 64% of Aquantuo's KM Infrastructure, whereas Technical KM Infrastructure took 36%, being the smaller portion.

However, it is further observed from the results in **Table 4** that Technical KM Infrastructure has a mean of 4.23 and Social KM Infrastructure has a mean of 3.86. Although Social KM Infrastructure constituted a higher proportion of Aquantuo's KM Infrastructure than its Technical KM Infrastructure, the differences in mean indicated otherwise that Technical KM Infrastructure is much more critical as it was highly used, and its impact is largely felt within Aquantuo than the Social KM Infrastructure components.

Table 2. Components of Aquantuo's KM Infrastructure.

KMI Components	Sample Size	Minimum	Maximum	Mean
Human Resource	46	1	5	3.7
Training and Development	46	1	5	3.57
Organizational Culture	46	1	5	3.59
Organisational Structure	46	1	5	3.78
External Environment	45	1	5	3.62
Organisational Goals	48	1	5	3.65
Customers	48	2	4	3.63
Supply Chain	48	3	4	3.98
External Partners	48	4	5	4.33
General Rules and Polices	48	4	5	4.33
Organizational Memory	48	4	5	4.33
IT and Security Policies	48	4	5	4.67
Computers Systems	48	5	5	5
Telecommunications Connectivity	48	5	5	5
Internet Access	48	4	5	4.67
Core and related Technologies	48	4	5	4.67
IT Support Systems	48	5	5	5

Table 3. Aspects of Aquantuo's KM infrastructure.

Aspects of KM Infrastructure	
Social KM Infrastructure (SKMI)	Technical KM Infrastructure (TKMI)
Human Resource	IT and Security Policies
Training and Development	Computers Systems
Organizational Culture	Telecommunications Connectivity
Organisational Structure	Internet Access
External Environment	Core and related Technologies
Organisational Goals	IT Support Systems
Customers	
Supply Chain	
External Partners	
General Rules and Polices	
Organizational Memory	

Table 4. Descriptives if Aspects of Aquantuo's KM infrastructure.

Aspects of KMI	Means	Mean Std Error	Std Deviation	Proportion
Social KMI	3.86	0.098	0.680	64%
Technical KMI	4.23	0.100	0.692	36%

As the descriptive statistics showed that Aquantuo's KM Infrastructure has a higher proportion of Social KM Infrastructure, there was the need to determine in terms of impact whether it had a higher impact on the knowledge management processes.

HP1 states that the Social KM Infrastructure aspect of Aquantuo's overall KM Infrastructure has a higher impact on its KM Process than its Technical KM Infrastructure. The dependent variable in this HP1 was KM Process, and the independent variables or factors were Technical KM Infrastructure and Social KM Infrastructure. Table 5 showed the results of using regression analysis in SPSS 29.

The variance inflation factor (VIF) and tolerance are two closely related statistics for diagnosing collinearity in regression. The VIF and tolerance values, respectively, were 2.194 and 0.456 for the independent variables. According to Pallant (2007) and Tabachnick & Fidell (2013), multicollinearity is the relationship between two or more variables, and it is a challenge when the variables relate to one another as high as 0.9 or more This suggests that the highly correlated variables contain needless information that must be reduced, as not all are required for the analysis as they tend to increase the size of the standard error and error term of the regression coefficient. This renders the statistical significance of the coefficients weak. The value for VIF, which was less than the critical value of 10 and the tolerance value, which was also greater than 0.1, suggested that the problem of multicollinearity did not exist among the independent variables.

Table 5 shows that a Technical KM Infrastructure had a t-value of 2.681 and a p-value of 0.010 at an alpha value of 0.05. Since the p-value was less than the alpha at a 5% level of significance, we concluded that Technical KM Infrastructure positively impacted the KM Process. It was seen from the Unstandardized Coefficients (B) that a unit change in Technical KMI resulted in a 0.367 change in the KM Process if Social KM Infrastructure was held constant. It is also observed from the results in Table 5 that Social KM Infrastructure has a t-value f 1.227 and a p-value of 0.226 at an alpha level of 0.05 significance. Since the p-value was greater than alpha at 5% level of significance, we failed to reject the null hypothesis $HP1_0$. The results showed that Technical KM Infrastructure had a higher impact on Aquantuo's KM Process than its Social KM Infrastructure.

HP2 Testing: KM Infrastructure and Aquantuo's KM Process

HP2 helped the study to determine the effects of Aquantuo's KM Infrastructure on its KM Process. HP2 denoted the following:

$HP2_0$: Aquantuo's KM Infrastructure does not facilitate its KM Process.

$HP2_1$: Aquantuo's KM Infrastructure facilitates its KM Process.

Table 5. HP1 testing coefficients.

Model	Unstandardized Coefficients		Standardized Coefficients	t	Sig (t).	Collinearity Statistics	
	B	Std. Error	Beta			Tolerance	VIF
(Constant)	2.041	0.411		4.964	<0.001		
Technical KMI	0.367	0.137	0.459	2.681	0.010	0.456	2.194
Social KMI	0.171	0.139	0.210	1.227	0.226	0.456	2.194

[a]Dependent Variable: KMProcess.

The result from Table 6 confirmed that the overall regression model was significant for the data, and this was captured by the ANOVA (F-statistic) value of 14.860 and its associated probability value of 0.001 $F(2, 45) = 14.860$, $p < 0.001$, which was found to be significant at 5% level. Therefore, we rejected the null hypothesis and concluded that KM Infrastructure had a statistically significant effect on the KM Process and that KM Infrastructure positively facilitated KM Process.

Table 7 described the regression model established for HP2. The model showed a Pearson correlation coefficient (r), R = 0.631, which described the strength and direction of linear relationship among the variables. This also indicated a strong positive correlation between Social KM Infrastructure, Technical KM Infrastructure and KM Process. The adjusted R-square indicated the goodness of fit for the model for the data (Frost, 2019). It permitted the generalizability of the model to the parent population. The results indicated that 37.1% of the changes in the KM Process were explained by Social KMI and Technical KMI the error term captured 62.9%.

HP3 Testing: Factors that influence KM Infrastructure Acquisiton at Aquantuo.

HP3 denoted the following:

$HP3_0$: Cost is not the main factor Aquantuo considers prior to the KM Infrastructure Acquisition.

$HP3_1$: Cost is the main factor Aquantuo considers prior to the KM Infrastructure Acquisition.

HP3 aided the study in determining factors that most influenced decisions before acquiring KM Infrastructure at Aquantuo. It was noted from the regression model in Table 8 that the Pearson Correlation coefficient of 0.959 showed that there was a very strong positive relationship among the predictors. The R-Square value of 0.919 indicated that the changes in the independent variables Organizational Goals, Privacy and Security of information and information technology systems, Cost of KM Infrastructure, and Competition environments explained 91.9% of the changes in the dependent variable. The error term accounted for just 8.1% of the unexplained changes in the factors that influenced the acquisition and deployment of KM Infrastructure.

Table 6. Analysis of variance (ANOVA[a]).

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	5.710	2	2.855	14.860	<0.001[b]
	Residual	8.646	45	0.192		
	Total	14.356	47			

[a]Dependent Variable: KMProcess; [b]Predictors: (Constant), Social KMI, Technical KMI.

Table 7. Model summary[b].

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate	R Square Change	F Change	Sig. F Change
1	0.631[a]	0.398	0.371	0.438	0.398	14.86	<0.001

[a]Predictors: (Constant), Social KMI, Technical KMI; [b]Dependent Variable: KMProcess.

Table 8. Model summary[b].

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate	R Square Change	F Change	Sig. F Change	Durbin-Watson
1	0.959[a]	0.919	0.912	0.134	0.919	122.375	<0.001	2.668

[a]Predictors: (Constant), Organizational goals, Privacy, Security of information and information technology systems, Cost of KMI, Competition environments; [b]Dependent Variable: KMI.

Results in Table 8 also showed that the independent variables statistically significantly predicted the dependent variable, $F(4, 43) = 122.375$, $p < 0.05$ at 5% significance. This showed that the regression model was a good fit for the data. This indicated that there was a statistically significant effect of the predictors on the KM Infrastructure acquisition and deployment by Aquantuo.

We noted from Table 9 that cost greatly impacted KM Infrastructure acquisition rather than organisational goals and the other predictors. A unit change in the Cost of KM Infrastructure resulted in a 0.329-unit impact on KM Infrastructure. The cost directly and positively correlated with how KM Infrastructure was implemented. Similarly, we noted from Table 9 that all the predictors directly impacted KM Infrastructure acquisition, as all the p-values were less than the alpha level of 0.05 at 5% significance. However, among all the predictors, the cost had the biggest impact, with a t-value of 13.048 and a p-value less than alpha. We rejected the null hypothesis and established that cost was more significant to Aquantuo's acquisition of KM Infrastructure.

HP4 Testing: KM Infrastructure sharing and Aquantuo's operations.

HP4 denoted the following:

$HP4_0$: Aquantuo's willingness to share its KM Infrastructure is not determined by the impacts on its operations.

$HP4_1$: Aquantuo's willingness to share its KM Infrastructure is determined by the impacts on its operations.

HP4 aided the study in determining the effects of KM Infrastructure sharing on operations of Aquantuo.

The hypothesis explored the factors influencing Aquantuo's willingness to share KM Infrastructure with its competitors.

It was noted from the results in Table 10 that the independent variables Resource Availability, Operational and Deployment Cost (O and D Cost), and Organisational Efficiency significantly predicted the dependent variable KM Infrasrtucture-Sharing, $F(3, 42) = 8.155$, p-value < 0.001 at alpha equals 5% level of significance. This showed that the model provided a good fit for the data as p-value was less than alpha.

The results in Table 11, however, showed that independent variables could only account for 36.8% of the changes in the dependent variables, although there was a high correlation among variables, as indicated by Pearson Correlation Coefficient, r = 0.607. The error term and other determinants accounted for as much as 63.2% of the change in the dependent variable. Although it was observed that there was a moderately high correlation among the predictors (r = 0.607), it is recommended that future research incorporating mixed methods should be adopted to understand those other determinants that influenced Aquantuo's willingness to share its KM Infrastructure with other industry players.

Table 9. HP3 coefficients[a] for regression analysis.

Model[a]	Unstandardized Coefficients		Standardized Coefficients	t	Sig.	Tolerance	VIF
	B	Std. Error	Beta				
(Constant)	1.861	0.125		14.874	<0.001		
Cost of KMI	0.329	0.025	0.67	13.048	<0.001	0.712	1.404
Privacy, Security of information and information systems	0.124	0.031	0.202	4.069	<0.001	0.762	1.313
Competition environments	0.087	0.03	0.163	2.943	0.005	0.608	1.644
Organizational Goals	0.07	0.02	0.181	3.468	0.001	0.689	1.451

Dependent Variable: KMI.

Table 10. ANOVA[a].

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	16.925	3	5.642	8.155	<0.001[b]
	Residual	29.054	42	0.692		
	Total	45.978	45			

[a]Dependent Variable: KMI Sharing; [b]Predictors: (Constant), Resource Availability, O and D Cost, Organisational Efficiency.

Table 11. Model summary[b].

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate	R Square Change	F Change	Sig. F Change	Durbin-Watson
1	0.607[a]	0.368	0.323	0.83172	0.368	8.155	<0.001	2.300

[a]Predictors: (Constant), Resource Availability, O and D Cost, Organisational Efficiency; [b]Dependent Variable: KMI Sharing.

5. Discussion and Conclusion

The current research aimed to determine what constitutes knowledge management infrastructure and how it facilitates the knowledge management process in Aquantuo, the effects of Aquantuo's KM Infrastructure on its KM Process, the factors that mostly influence KM Infrastructure acquisition in Aquantuo and the impact of KM Infrastructure sharing on its operations.

The results found that KM infrastructure impacted the KM Process in Aquantuo. Furthermore, the results of the data analysis revealed the components of Aquantuo's KM Infrastructure which largely consisted of human resources and related organisational culture and structure, customers and supply chain system, information technology systems, policies and support, telecommunication connectivity and internet access. Therefore, the study was able to group the KM infrastructure into two aspects, as noted by Masa'deh (2016) and Kushwaha & Rao (2015), namely, the technical and social infrastructure. We noted from the study that the components of Aquantuo's KM Infrastructure largely agreed with the study by Masa'deh (2016), who points out that KMI consists of an infrastructural environment, information technology and non-information technology systems. It was further pointed out that the larger portion of Aquantuo's KM Infrastructure was the social KM Infrastructure, constituting more than 60% of the total components of the KMI.

We noted from the results that KM Infrastructure significantly affected the KM Process in Aquantuo, which followed the Probst (1998) Knowledge Management framework. The KM Infrastructure served as an enabler of the KM Process within Aquantuo.

It was further noted from the data analysis that cost was a concern when it came to Aquantuo acquiring KM Infrastructure. Moreover, we finally noted that Aquantuo's motivation for sharing its KMI resulted from the benefits it derived from the sharing. Therefore, we recommend that future studies on this topic employ mixed methods for data collection, starting with qualitative and then quantitative methods. This will aid the organisation in determining the variables that need to be considered in designing the study.

HP1: The social aspect of Aquantuo's Knowledge Management Infrastructure has a higher impact on its knowledge management process than the technical. The evidence supported the null hypothesis that the social aspect of Aquantuo's Knowledge Management Infrastructure does not impact its knowledge management processes more than the technical infrastructure. Although the social infrastructure has a larger number of components than the technical infrastructure as a whole, the impact of the technical aspect of the knowledge management infrastructure was much higher, producing a 0.367 unit change in the Knowledge Management Process for every unit change in technical infrastructure. This, however, supported the study by Masa'deh (Masa'deh, 2016) that organisations which implement both aspects of the KM infrastructure tend to be more successful. This was because information technology, a component of technical KM infrastructure, played a crucial role in the knowledge management processes.

HP2: KM Infrastructure facilitates Knowledge Management Processes. The results of the analysis indicated a statistically significant impact of KM infrastructure on Aquantuo's KM processes. There was a high degree of correlation between KM infrastructure and KM Process. There was enough evidence to reject the null hypothesis that KM infrastructure does not facilitate KM processes in Aquantuo. The findings agreed with Sun (2010), Theriou, Maditinos, & Theriou (2011). that KM Infrastructure created an environment that pushes the KM processes to interact with each other and facilitates the knowledge applications in a problem-solving environment.

HP3: Aquantuo considers cost rather than its organisational goals or competition as the main factor before the KMI acquisition. The results indicated that cost was a statistically significant factor that impacted the decision of Aquantuo before the KM Infrastructure purchase. Although there were other factors, such as Privacy, Security of information and information systems, competition and organisational goals, the results suggested that Aquantuo was cost-sensitive when acquiring and deploying KM Infrastructure. The result further suggested that Aquantuo ranked cost high and least considered organisational goals. This may require further investigation to understand the reasoning. The results also showed that these four factors statistically significantly affected the acquisition and deployment of KM Infrastructure, as the variables had a 0.959 correlation coefficient. Therefore, the results failed to confirm the null hypothesis. As such, we concluded that Aquantuo considered cost a major concern in KM Infrastructure acquisition and deployment.

HP4: Aquantuo's willingness to share its KM Infrastructure was determined by the benefits it derived from its operations. The benefits included in the research were grouped according to Resource Availability, Operational and Deployment Costs and Organisational Efficiency. Whereas it was evident that the KM Infrastructure sharing was affected by these predictors, we noted from the results that these predictors were *not* enough to account for Aquantuo's willingness to share. The predictors accounted for only 36.8% of the willingness to share, indicating that other mediating factors must be studied. Nemati-Anaraki (2015) noted that KM Infrastructure is essential to knowledge sharing. However, we noted that the results were consistent with previous studies conducted by Sether (2016), which mentioned that cost savings and resource availability (anytime, anywhere access) are benefits of IT infrastructure sharing, particularly for cloud computing.

Conflicts of Interest

The authors declare no conflicts of interest regarding the publication of this paper.

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