Breaking Silos to Foster Knowledge Sharing in Universities: A Systems Thinking Perspective

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Abstract: Universities operate in an environment characterized by rapid change, globalization and other unpredictable complex factors. These institutions play a critical role in the socio-economic development of society. Knowledge has been identified as a strategic resource for private and public organizations to gain competitive advantage. Furthermore, universities are under pressure to respond to the needs of their diverse stakeholders. Hence, it is critical to create a conducive environment to foster Knowledge Sharing beyond functional boundaries in these institutions. However, functional silo mentality has been identified as a major factor that encumbers Knowledge Sharing in organizations, including universities of technology. The purpose of the study was to explore the applicability of the Systems Thinking concept in the context of fostering Knowledge Sharing in Universities of Technology. Previous research investigated this phenomenon from a different perspective, whilst this study provides a University of Technology context. The study adopted a qualitative research methodology underpinned by a constructivism philosophical worldview. Qualitative data was collected from the employees of two universities of technology through semi-structured interviews. Participants in the study were purposively selected. NVivo software was used for data analysis. The study provides theoretical perspectives and practical insights for applying Systems Thinking to foster Knowledge Sharing beyond functional boundaries in organizations and Universities of Technology. Overall, the results of the study indicated that participants were positive that adopting Systems Thinking would be a strategic choice to institutionalize Knowledge Sharing in universities of technology. One of the limitations of this study was that data was collected from only two selected public universities of technology. This provides an opportunity for future research to consider collecting data from more than two universities of technology to investigate this phenomenon.

Keywords: Knowledge sharing, Universities of technology, Systems thinking, Functional silos, Higher education

1. Introduction

Higher education institutions (HEIs) play a critical role in the socio-economic development of society (Menon and Suresh 2021). However, unpredictable and complex factors have an impact on the operations of the HEIs (Wang and Rashid 2022). Given the rapidly changing environment in which universities operate, it is therefore critical to continuously explore strategic options to gain competitiveness. Universities operate in a globalized environment, and they compete for funding, strategic partners and student enrollments, hence they have adopted corporate strategies to remain competitive (Parker 2024). This includes exploring the effective sharing of organizational knowledge. According to Mazorodze and Mkhize (2022), Knowledge Sharing is important for HEIs. Hence, this study investigates the applicability of Systems Thinking as a strategic approach to eradicating silo mentality and fostering Knowledge Sharing in universities of technology. Chowdhury (2023) defines Systems Thinking as the ability to understand the interrelationships between the interconnected and interacting elements of a system. These elements should work together to achieve a common goal. In the context of this study, interconnected elements are departments and faculties and other relevant structures in the university environment. Knowledge Sharing is generally a combination of exploiting and sharing existing knowledge to create new knowledge which must be applied to enhance organizational operations. According to Yoon and Park (2022), a Knowledge Sharing culture motivates employees to share and apply each other's knowledge to improve efficiency in organizations. Knowledge Sharing is part of Knowledge Management. However, the focus of this study is on Knowledge Sharing, not other aspects of Knowledge Management. This was informed by the objectives of this study.

Mahdi, Nassar and Almsafir (2019), describe knowledge as a strategic resource for organizations to gain a competitive advantage. Knowledge is divided into two categories, namely tacit and explicit (Karim 2023).This study focuses on Systems Thinking and Knowledge Sharing in universities of technology. Holistic understanding of organizational elements and their interactions is critical (Al-Kurdi, Eli-Haddadel and Eldabi 2020) as this understanding is key to fostering Knowledge Sharing in an organization. A holistic understanding of the university operations is critical as Stowell (2021) argues that an organization should be viewed as a system. Knowledge Sharing is one of the drivers for competitiveness and responsiveness (Annansingh, et al 2018). Interestingly, this study also highlights the importance of breaking down functional silos to facilitate Knowledge Sharing in universities of technology. Moreover, this study identifies the lack of an overarching and institutionalized philosophy to promote knowledge sharing in universities as a problem. This creates functional

silos and hinders Knowledge Sharing in universities. Bento, Tagliabue and Lorenzo (2020) attest that the lack of Systems Thinking creates functional silos in an organization. Furthermore, Rossouw and Goldman (2023) succinctly state that creating a collaborative environment in HEIs remains a challenge. Jones et al (2024) are also of the view that silo mentality hinders Knowledge Sharing and collaboration in an organization. According to Al-Kurdi (2023), few studies have been conducted to address Knowledge Sharing in universities. Lin, Eichelberger and Leong (2020) argue that to remain competitive in a rapidly changing environment, HEIs require new approaches.

2. Literature Review

In an environment characterized by disruptive and rapid change, the development of effective strategies is critical for HEIs to survive (Rossouw and Goldman 2023). Hence, Menon, Suresh and Raman (2022) emphasise that the ability of HEIs to adapt is critical to respond to the needs of the stakeholders and environmental changes. The development of operational strategies should foster the effective use of organizational resources including strategic resources like knowledge in HEIs.

2.1 Institutionalizing Systems Thinking to Promote Knowledge Sharing in Universities of Technology

Systems Thinking is regarded as a discipline founded on understanding the interrelationships and interactions of various system elements (Kordova, Frank and Miller 2018). This philosophy has received the attention of researchers, practitioners and leaders, mainly in the private sector context. Systems Thinking originates from General Systems Theory. As HEIs continue to explore effective strategies to gain competitiveness, effective Knowledge Sharing cannot be ignored. Factors that encumber Knowledge Sharing in universities, such as functional silos, need be eradicated. It is in this context that the study was conducted to explore the applicability of Systems Thinking as a solution to promoting Knowledge Sharing and eradicating silo mentality in universities. Systems Thinking serves as a catalyst to empower organizational members with the ability to appreciate the interconnectedness of various sections of the organization. In an organization where organizational members appreciate the interconnectedness of various departments, it becomes easier for them to work towards a common goal. Where people understand that they have a shared purpose, it becomes easier to share knowledge. In Systems Thinking, the organization is viewed as a system. Accordingly, Vemuri and Bellinger (2017) describe an organization as a family of individuals who are interrelated and interacting to achieve a common goal. In other words, a university is a system operating as part of a bigger system, namely the Higher Education sector. Rossouw and Goldman (2023) highlight a need to continuously evaluate processes and practices if HEIs are to remain relevant and competitive.

In a rapidly changing higher education environment, effective sharing of knowledge in universities is critical. Furthermore, an institutionalized and internalized philosophy to promote knowledge sharing is key to gaining competitive advantage. This study is informed by two theories, namely General Systems Theory and Social Exchange Theory. Tsai and Cheng (2012) attest that Social Exchange Theory covers Knowledge Sharing robustly. This argument is also highlighted in a study by Zahao and Detlor (2023), that Social Exchange Theory is considered relevant and useful to understand people's willingness to share knowledge. Systems Thinking on the other hand originates from General Systems Theory. According to Bashan and Kordova (2021), Ludwig Bertalanffy is regarded as a pioneer of Systems Thinking.

2.2 Applying Systems Thinking to Eradicate Silo Mentality in Universities of Technology

Nisula and Pekkola (2018) state that eradicating functional silos requires members of the organization to change their attitude and, to a certain extent, bring about change in the organizational structure. Systems Thinking is an alternative to the traditional reductionist approach where the focus is on individual elements of the system, instead of the system as a whole (Vemuri and Bellinger (2017). According to Bento, Tagliabue and Lorenzo (2020) organizational silos are a threat to cross-functional collaboration in organizations. Reductionist thinking promotes silos in an organization. Systems Thinking is the ability to appreciate interconnectedness, interdependency and interactions of a system's elements (Erzurumlu et al 2023). The ability to view the university from a systems perspective is critical to improve its operations. Similarly, using a Reductionist perspective to understand the university environment is not advisable because such an approach fails to understand complexity. Kordova, Frank and Miller (2018) state that the traditional approach informed by reductionism fails to deal with complex challenges. Understanding university operations from a holistic perspective is important. In the context of Knowledge Sharing, interrelationships, interactions and collaboration are critical to achieving organizational goals. Systems Thinking serves as a catalyst to view the organization holistically. Organizations exist to achieve their strategic goals, and the ability to adapt in a rapidly

changing environment is a key requisite (Abukalusa and Oosthuizen 2023). Benefits for Knowledge Sharing include among others increasing productivity, and organizational effectiveness (Alves and Pinheiro 2022).

2.3 Promoting Knowledge Sharing to Enhance Organizational Capabilities in Universities of Technology

De Witt and Koh (2020) describe knowledge as one of the most critical assets in an organization. Hence organizational knowledge is always regarded as a strategic resource to achieve organizational goals (Mosala-Bryant and Hoskins 2017). Continuously improving every aspect of the business holistically is critical to outperform and outsmart competitors. This applies to universities as well. Hence, Mosala-Bryant and Hoskins (2017) state that the effective sharing of knowledge becomes a contributing factor to improving organizational operations and achieving organizational goals. This requires a conducive environment in organizations. The effective sharing of knowledge is important for the organization to gain a competitive advantage. Al-Kurdi, Eli-Haddadel and Eldabi (2020) assert that organizations are realizing the importance of Knowledge Sharing. Organizational effectiveness relates to the effective use of organizational resources and capabilities to achieve its strategic goals (Xie and Lin 2023). In the context of this study, organizational knowledge needs to be shared effectively to enhance organizational effectiveness in universities of technology.

3. Research Methodology

A qualitative research approach was adopted to achieve the objectives of the study. Lim (2024) describes qualitative research as an indispensable approach to understanding complex and multifaceted social phenomena involving human experiences and perspectives. Hence, the qualitive research approach was appropriate to achieve the objectives of this study. According to Creswell and Creswell (2023), qualitative research is underpinned by a constructivism philosophical worldview. All participants were asked the same set of questions and leading questions were avoided. The researcher's personal views in this study did not influence the interpretation of the findings. Bangu, Provost and Carduff (2023) accentuate that qualitative research relies on non-statistical data. Participants in this study were employees of two selected public universities of technology. These were identified as the only universities of technology in a specific geographical area.

3.1 Sampling

A total of 15 participants were purposively selected for data collection purposes. Nyimbili and Nyimbili (2024) emphasize that the purposive sampling procedure ensures that a sample is selected without bias to increase the trustworthiness of the research findings. According to Adeoye-Olatunde and Olenik (2021), purposive sampling is a non-probability sampling method commonly used in qualitative research.

3.2 Data Collection

Data collection is a process of gathering specific types of data (Spickard 2017). Qualitative data was collected through semi-structured face-to-face interviews with 15 employees of the two selected Universities of Technology. This method of data collection allows the researcher to explore or probe pertinent ideas that may arise during the interview (Adeoye-Olatunde and Olenik 2021). Interviews were conducted in participants' individual offices. Participants allowed the researcher sufficient time to ask all the questions and probe further where it was necessary.

3.3 Data Analysis

Data analysis is the process that involves analyzing, interpreting and summarizing collected data to produce meaningful results (Tashakkori, Johnson and Teddlie 2021). NVivo was used to analyze data. This computer software package provides researchers with a user-friendly interface, simple data management features and extensive statistical functionalities (Tumiran 2023). The analysis of data assisted with the identification of themes which are presented and discussed later in this paper.

3.4 Profile of Participants

Participants were mostly in positions of authority and were operating at strategic levels in their institutions. Their input into the study was important as they understood the processes and practices in their institutions. Participants were asked to state their occupation at their respective institutions. Presented in Table 1 below is the profile of the participants.

Table 1 Profile of participants

Participant	Position
Participant 1	Deputy Dean
Participant 2	Associate Professor
Participant 3	Associate Professor
Participant 4	Director
Participant 5	Director: Special Projects
Participant 6	Director: Academic Development
Participant 7	Manager
Participant 8	Student Development Officer
Participant 9	Writing Centre Co-ordinator
Participant 10	HoD: HR (Academic Department)
Participant 11	HoD: Photography (Academic Department)
Participant 12	Quality Specialist
Participant 13	Deputy Dean: Faculty of Management Sciences
Participant 14	Health and Safety Officer
Participant 15	Assistant Registrar

The characteristics of the participants reflected diversity in terms of the functional roles in a university context.

4. Results and Discussion

To achieve the objectives of the study, data was collected using semi-structured face-to-face interviews. According to Lim (2024), when using qualitative research, researchers capture useful insights for policy formulation and solutions with an understanding of the relevant factors of a phenomenon. The findings of the study highlight the importance of institutionalizing Systems Thinking philosophy to promote Knowledge Sharing within and beyond functional boundaries in universities of technology. Participants indicated that applying Systems Thinking would create a conducive environment for cross-functional collaboration to facilitate Knowledge Sharing in universities of technology. Functional silos were identified as a major factor that encumbers Knowledge Sharing in universities. Bento, Tagliabue and Lorenzo (2020) mention that organizational silos hinder Knowledge Sharing.

In addition, the study reveals that Systems Thinking is applicable to universities and adopting Systems Thinking would be a strategic option to enhance Knowledge Sharing and eradicate functional silos in universities of technology. Overall, the study reveals a link between Systems Thinking, Knowledge Sharing and organizational effectiveness. Participants were of the view that through effective Knowledge Sharing , universities would enhance their organizational effectiveness. Stowell (2021) states that all systems must adapt to survive. In other words, the effective sharing of knowledge is key for the organization to gain a competitive advantage.

Based on the analysis of data, the following themes emerged:

Theme 1: Cross-Functional Collaboration and Knowledge Sharing in universities

According to Ishrat and Rahman (2020) organizational silos encumber cross-functional collaboration. Stowell (2021) argues that an organization should be viewed as a system. Participants stated that there was "*a silo mentality culture in universities*". Similarly, a study by Phaladi (2024) identifies silo mentality as one of the factors that hinder knowledge-based competitiveness in organizations. Such a culture hampers Knowledge Sharing in organizations as various departments focus on their own functional boundaries and ignore the broader strategic objectives of the organization, they are part of. The findings of the study resonate with the argument presented by Annansingh et al (2018), that Knowledge Sharing in HEIs is characterised by knowledge silos. Ishrat and Rahman (2020) highlight the importance of cross-functional collaboration to foster Knowledge Sharing in organizations.

One participant indicated that *"people were still operating in silos in his department"*. Explaining why departments and faculties were operating in silos, another participant was of the view that it was because departments and faculties did not want to "*lose their identities"*.

According to Mazorodze and Mkhize (2022), Knowledge Sharing is critical in HEIs. However, functional silos are still prevalent and as a result, there is no cross-functional collaboration. The overall findings confirm that there was silo-mentality in universities, particularly at the departmental and faculty levels. Erzurumlu et al (2023) point out that Systems Thinking is about the ability to appreciate how things are connected to each other in the whole entity and this key to promoting Knowledge Sharing.

In line with the responses from participants, Siriram (2020) argues that Systems Thinking was critical to stimulating a culture of looking at the organisation from multiple perspectives. Overall responses from the participants revealed that "*there was a lack of appreciating interrelationships among different divisions in the institution"*. Key to effective Knowledge Sharing is cross-functional collaboration in an organization. Consequently, cross-functional collaboration becomes key to enhancing organizational effectiveness. This facilitates Knowledge Sharing beyond functional boundaries to achieve organizational goals. It is however concerning, as pointed out by Kahn and Agnew (2017), that academic silos are prevalent in HEIs. Systems Thinking plays a role in creating a conducive environment that promotes cross-functional collaboration in the organization. This is critical to enhance organizational capabilities.

Theme 2: Systems Thinking and Knowledge Sharing in universities of technology

Universities are under pressure and should therefore operate as business organizations to remain competitive in a rapidly changing environment (Kok and Mc Donald 2017). It has been pointed out by Karim (2023) that knowledge continues to be a critical factor for HEIs to be competitive and sustainable. It was in this context that the current study was conducted. The purpose was to explore the applicability of Systems Thinking as a strategic option to promote knowledge sharing in the universities of technology. Participants indicated that *"adopting Systems Thinking would be a strategic decision to promote Knowledge Sharing in the university*".

Responses relating to opportunities for the application of Systems Thinking included:

"It will promote cross-functional collaboration". "There will also be flexibility in terms of operations and practices in the universities". One the participants mentioned the point that "*Systems Thinking will help the institution to operate efficiently to achieve its strategic goals.*"

Overall, participants were optimistic about the implementation of Systems Thinking philosophy in the universities.

Another comment was that "*Systems Thinking will promote a sense of shared purpose in universities".* Ishrat and Rahman (2020) stress that knowledge in an organization should be shared to improve organizational effectiveness. Systems Thinking is described by Ramovha (2022) as a concept that focuses on the holistic understanding of interactions and interrelationships of a system's elements. This happens to achieve a common goal.

Theme 3: Knowledge Sharing and Organizational Effectiveness

Knowledge is a strategic resource (De Witt and Koh 2020). Hence, it is critical to create a conducive environment where members share knowledge for the benefit of their organization. An organization is a system that is managed using policies and operational procedures to achieve a particular goal (Stowell 2021). Participants indicated that "*Knowledge Sharing was critical to gain competitiveness*"

According to Bento, Tagliabue and Lorenzo (2020), organizational silos encumber internal cooperation in an organization. Systems Thinking provides useful lens to appreciate the interconnectedness of a system's elements (Lin, Eichelberger and Leong 2020). Responses from the participants were positive. Another participant described Systems Thinking as a "*management approach that promotes multiple perspectives in dealing with complex challenges*". Furthermore, participants felt that:

> *"Systems Thinking will help to eradicate functional boundaries". "It will also help staff at every level of the institution to work towards a common goal".*

Overall, participants agreed that the implementation of Systems Thinking would help universities to deal with complex challenges using multiple perspectives. Rossouw and Goldman (2023) state that new ways of thinking were critical for HEIs to remain relevant. More importantly, Karim (2023) highlights the importance of creating

a conducive environment in HEIs for staff to share their knowledge. Mazorodze and Mkhize (2022) emphasise that HEIs are required to explore effective ways to promote Knowledge Sharing. Hence, Menon and Suresh (2021) argue that understanding interconnections in HEIs serves as a catalyst for agility.

5. Research Contribution

The aim of the study was to investigate the applicability and extent to which Systems Thinking fosters Knowledge Sharing and the eradication of functional silos in universities of technology. This study provides practitioners, researchers and policymakers with theoretical and practical insights to promote Knowledge Sharing through the application of a Systems Thinking philosophy in universities of technology. Additionally, the study highlights the importance of applying Systems Thinking to eradicate functional silos that encumber effective Knowledge Sharing in universities of technology. According to Al-Kurdi, Eli-Haddadel and Eldabi (2020), Knowledge Sharing is central to enhancing innovative capabilities in universities. This study is significant as Feiz, Soltani and Farsizadeh (2019) argue that few research studies have been conducted on Knowledge Sharing in universities. Therefore, this study is necessary to address that gap. Hence this study contributes to the existing body of knowledge by capturing Knowledge Sharing in the context of Systems Thinking in universities of technology. Lim (2024) highlights that the qualitative research approach provides crucial insights to develop theories and formulate policy and solutions that are effective and socially relevant.

6. Study Limitations and Future Research

This study has limitations which provide an opportunity for future research. Only two Universities of Technology participated in the study. Future research should consider investigating this phenomenon in more than two public universities of technology. Furthermore, the study focused on Knowledge Sharing and Systems Thinking in public university context not private universities.

7. Conclusion

The findings of this study highlight the lack of an institutionalized Systems Thinking philosophy in the universities of technology. In addition, the study reveals the prevalence of functional silos as one of the factors that encumbers Knowledge Sharing. This points to a lack of understanding that a university is a system with interconnected parts in the form of departments, faculties and other divisions that should work together to achieve the strategic goals of the institution. The study indicates that institutionalizing Systems Thinking in universities of technology will serve as an overarching philosophy to promote Knowledge Sharing within and beyond functional boundaries. More importantly, universities of technology are required to respond to the needs of their stakeholders. Participants felt that Systems Thinking would be a strategic choice to eradicate functional silos and promote Knowledge Sharing in universities which will enhance organizational effectiveness. Accordingly, Feiz, Soltani and Farsizadeh (2019) accentuate the point that Knowledge Sharing enhances creativity and innovation in organizations. Remaining relevant has been identified by Rossouw and Goldman (2023) as a critical factor for universities, as they continuously improve their operations to advance society. In this regard, Knowledge Sharing becomes critical. Jones et al (2021) aver that for universities to meet new challenges, they need to evolve. The adopted research approach in this study was appropriate to explore the applicability of Systems Thinking to promote Knowledge Sharing in universities of technology. Hence the study objectives were achieved. Lim (2024) describes qualitative research appropriate to understanding social phenomena, particularly in the context of organizations operating in a rapidly changing environment.

Ethical Requirements: This study was conducted in accordance with the rules and guidelines relating to research ethics of the institution. Participation in the study was voluntary, and confidentiality was ensured. Signing a consent form before participating in the study was one of the ethical requirements. Bougie and Sekaran (2020) state that ethical conduct in research applies to researchers, the participants who are the source of the required data and organizations that fund research.

AI Declaration: AI tools were not used to write this paper.

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