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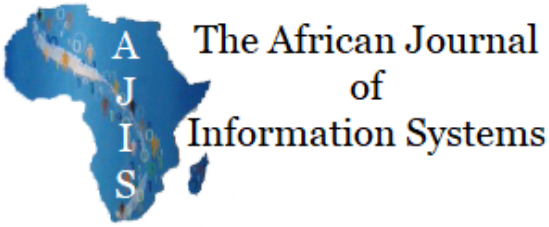

Causes of Challenges in Implementing Computer-Based Knowledge Management Systems in Healthcare Institutions: A Case Study of Private Hospitals in Johannesburg, South Africa

Research Paper

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ABSTRACT

The advent of computer-based knowledge management systems has changed the world, especially in the way businesses operate, making them an integral aspect to modern economies and the drivers of success. Studies show that the implementation of computer-based knowledge management systems is challenging, particularly in healthcare institutions. This paper presents a study that was undertaken to identify the causes of challenges encountered when implementing computer-based knowledge management systems in healthcare institutions. A case was used as this study's research methodology in which three private hospitals based in Johannesburg, South Africa, were utilized. Six participants, two from each private hospital, were purposively selected and interviewed. Researchers collected data in the form of notes and qualitatively analyzed it. The following findings were identified: failure to make organizational culture change to align with computer-based knowledge management systems; no support, commitment and accountability; knowledge gap between medical and knowledge management designers; fast-changing of technology; shortage of skilled human resources; failure to convert tacit and explicit information into systematic knowledge; and failure to comprehend healthcare complexity. The aim of this study is to present a comprehensive synopsis of the causes of challenges encountered when implementing computer-based knowledge management systems in Johannesburg healthcare organizations.

Keywords

Computer-based knowledge management systems, knowledge management systems in South Africa, implementing knowledge management in healthcare, eHealth.

INTRODUCTION

The advent of technology has changed the world and the way in which organizations operate, with business informatics and computer-based knowledge management systems (CKMS) becoming integral to modern economies and drivers of success (Stair & Reynolds, 2013). A well-designed CKMS entails the storage, efficient retrieval, collaboration, resource allocation, knowledge creation and capturing information conversion, and utilization of knowledge (King, Kruger, & Pretorius, 2007; King, Chung, & Haney, 2009).

In the dynamic world of today, the implementation of CKMS in health institutions has become essential to manage internal and external knowledge effectively so as to achieve operational excellence and foster advanced innovation (Chen, 2013). Research and reports from various sources acknowledge that there are many challenges which are encountered when implementing CKMSs in healthcare institutions (Ericsson, 2014; Lenz, Peleg, & Reichert, 2012; Liyanage & Rupasinghe, 2014). Despite the widespread implementation failures of CKMS across the world, there is still limited research that has been conducted to identify the causes of such failures (Sheffield, 2008; Sikorski, Garnik, Ludwiszewski, & Wyrwiński, 2011; Trivedi, 2007).

This paper presents the causes of challenges encountered during the implementation of knowledge management systems in private hospitals in Johannesburg, South Africa. The research question that guided this study is: *What are the causes of the challenges encountered when implementing CKMS in South African healthcare institutions?*

The paper proceeds as follows: Section 2 discusses the literature review, section 3 presents the research methodology, section 4 presents the findings, and section 5 provides the conclusion.

LITERATURE REVIEW

There is limited empirical literature on the causes of challenges encountered during the implementation of CKMS in healthcare, particularly in South Africa. Ndlela and Du Toit (2001) acknowledged the existence of many complex challenges encountered when implementing CKMS in numerous organizations in different sectors of the economy. Njiraine and Roux (2011) attribute the main cause of the non-utilization of CKMS to the fact that most systems are not able to answer the "why" question. Their study highlighted that most CKMSs in South Africa concentrate on the "how, what, where and which" aspects and lack the conversion of facts and information into knowledge.

Du Plessis (2007) posited that KM implementation fails in South African institutions because of the failure to link KMS strategies to business strategies. Organizations struggle to align culture, technology, infrastructure, and measures of both progress and achievements, thereby causing the CKMS project to fail (Du Plessis, 2007). An in-depth analysis of the literature reviewed revealed five distinct categories in which causes of challenges can be clustered, namely, organizational culture, content, processes and technology, and environmental aspects. Each section is discussed separately, starting with organizational culture.

Organizational Culture

Organizational culture is established on the basis of similar assumptions, values, norms, behaviors, objectives, and other characteristics (Corfield & Paton, 2016). The use of the word culture in this paper refers to organizational culture. A change of organizational culture is associated with human capital (Frost, 2014). This implies changing the way in which employees interact, perform duties, associate, and share knowledge. Chen (2013) stresses that the greatest challenge faced in adopting KMS in the healthcare industry is the difficulty in changing the existing culture. CKMS brings with it a new culture which is often seen as a "radical change" or "hostile takeover" and the destruction of the existing culture (Firestone & McElroy, 2003).

Studies by Corfield and Paton (2016), Joint Commission (2008), Liyanage and Rupasinghe (2014), Nevhutalu (2013) and Ruxwana, Herselman and Conradie (2010) identify a lack of adequate medical staff training and understanding of information technology (IT) as the main reasons why it is taking so long for the healthcare sector to adopt CKMS successfully; in short, without training and IT knowledge, it is not possible to change the old culture. Organizations need to address staff training, motivation, and incentives so as get their staffs to buy into the changes. The CKMS project thus should be brought in as a business solution to support them (Liyanage & Rupasinghe, 2014; Challa, 2013)

Abouzahra (2011) conducted a study on causes of failures of ICT healthcare projects in Singapore and identified the failure to integrate the various groups of stakeholders and the failure to meet the user groups' requirements as the major reasons why different teams were reluctant to change and shift to the new working culture. In addition, the healthcare culture is still striving to embrace and support a knowledge sharing culture, which is in line with the goals and objectives of CKMS (Chen, 2013).

In African society, there are misconceptions about the role of technology in enabling business processes, due to existing flaws in the organizational KM process and a disregard for the importance of the human factor (Smuts, Van der Merwe, Loock, & Kotze, 2009). Kruger and Johnson (2010), and Finestone and Snyman (2006) conducted studies of South African-based organizations and found that the cultural diversity of South African society in terms of race, age, ethnicity, and gender present major challenges when adopting KMS. Kruger and Johnson (2010) further note that misconceptions result in disagreements which impact the usage and adoption of KMS, with many institutions arguing that CKMS is an IT project and must be managed by IT section, and many organizations still regard IT or CKMS as a separate entity in an enterprise.

Aitken, Altmann, and Rosen (2014) and Zakaria, Yusof and Zakaria (2010) argue that in some instances, healthcare professionals fear that CKMS will create 'robotic doctors,' foreseeing this as being detrimental to the public, as the system may be open to abuse. Studies by Aitken et al. (2014), Trivedi (2007), and Zakaria et al. (2010) show that many healthcare professionals fear that CKMS may take over their roles, which is why they do not want to share their knowledge and experience, and they further perceive CKMS to be a technology that diminishes the doctor and patient relationship (Trivedi, 2007).

El Morr and Subercaze (2010) find that users perceived CKMS as cumbersome to use. Nicolini, Powell, Conville, and Martinez-Solano (2008) recognize professional divisions as a barrier to innovation and knowledge circulation in healthcare, with the existence of professional boundaries still being visible. It is inherent that the existence of divisions only prolongs the old culture and practices against the implementation of CKMS (Powell et al., 2008). Pagliari (2007) finds that there is a natural inclination on the part of healthcare professionals to remain "unpolluted" by clinging to notions, practices, and methods that have evolved over many generations and which have become fundamental to the field.

Hence, by not adopting CKMS, tradition and culture are kept alive, thereby thwarting CKMS implementation.

Content

Content refers to the condition and availability of the organizational material and includes data, information, and experience. The studies by Botha, Botha, and Herselman (2014) and Department of Health (2012) acknowledge the existence of the complexity of healthcare content, in terms of the lack of standardization, too much heterogeneity, and poor data quality.

Adenuga et al. (2015) note that one of the greatest challenges is the refusal to exchange information using ICT platforms between laboratories and hospitals, as medical practitioners fear for the security of medical content in the electronic world. Zakaria et al. (2010) find that ICT professionals who were the drivers of knowledge management projects lacked in-depth knowledge and experience regarding the flows of healthcare data and knowledge. The exclusion of medical professional in CKMS content design and presentation resulted in poor and disconnected flows of information and knowledge, which rendered the CKMS project unusable.

The transformation of raw healthcare data into contextually relevant knowledge was identified as the most prevalent challenge during the implementation of KMSs (Jennex, 2005; Bloice & Burnett, 2016). The challenge in creating healthcare content lies in the difficulty involved in converting the tacit knowledge in the heads of professionals into systematic knowledge (Groff & Jones, 2012). In a healthcare organization, most of the critical knowledge is in the form of experience, which complicates the interpretation, transformation, and presentation of such knowledge into systematic knowledge (Groff & Jones, 2012; Herbst & Vom Brocke, 2013). A significant challenge noted by Groff and Jones (2012) was that healthcare professionals interpreted explicit knowledge in different ways, thus resulting in disagreements on certain experiences and sections of information, and creating additional challenges when project teams tried to contextualize this information into the CKMS.

Processes

Processes refer to procedures that are used to collect, manage, and disseminate information. As with culture, organizational procedures evolve as the institution adjusts to the environment (Stair & Reynolds, 2013). Findings by Abouzahra (2011), Ericsson (2014), and Kaye et al. (2010) indicate that many CKMS service providers rush into implementing CKMS in healthcare institutions without adequate knowledge of the fundamental processes involved, thus resulting in failure.

Medical institutions have various processes and procedures that are poorly documented and therefore standardizing their processes becomes both challenging and complex (El Morr & Subercaze, 2010; Leon, Schneider, & Daviaud, 2012). Healthcare professionals tend to resist all forms of ICT innovations which they perceive as disrupting their crucial processes, particularly those aligned to tacit knowledge (Nicolini et al., 2008). Therefore, the processes are not being addressed and defined properly in the CKMSs being implemented.

Technology

Technology is the purposeful application of features in the design, production, and utilization of services and goods in institutions which enable the improvement and enhancement of human activities (Stair & Reynolds, 2013). The successful use of technological innovations and artefacts depends on the correct alignment of ICT, business strategies and understanding ICT's positive contribution to business (Lewis,

Hodge, Gamage, & Whittaker, 2012; Stair & Reynolds, 2013). However, the rapid change in technology is not giving industries sufficient time to review and align their processes (Joint Commission, 2008; Kaye et al., 2010). Failure to integrate both ICT and healthcare professionals increases the possibility of CKMS implementation failing (Frost, 2014).

Organizational aspects

External causes of challenges are those that health institutions do not have control over. These challenges are found to be complex and require collaboration by other stakeholders and service providers. Stakeholders of healthcare projects appear to be unwilling to implement new technological innovations because they are uncertain about the return on investment (Adenuga et al., 2015; Alkraiji, Osama, & Fawzi, 2014).

Sikorski et al. (2011) conducted a study on knowledge management challenges encountered in the collaborative design of a virtual call center and identified the following challenges relating to knowledge exchange, namely, lack of timelines, absence of trusted relationships, lack of ability to adopt users' procedures and processes, lack of knowledge traceability and heritage, and lack of proper knowledge preservation. Fiechter, Kuderna, and Kern (2010) conducted a study to determine the existence of variables influencing knowledge obstacles in knowledge intense domains. They found that most users are professionally "blinded," lack awareness of the benefits of CKMS, and engage in micropolitics, thereby missing the "bigger picture."

Badimo and Buckley (2014) conducted a study in South Africa on how to improve knowledge management practices in healthcare institutions and indicate that the absence of clear privacy policies and legislation are the main causes of security fears. In addition, Adenuga et al. (2015) support the finding by Adebesin, Kotzé, Van Greunen, and Foster (2013), who conducted a study to determine the barriers and challenges involved in adopting e-health standards in Africa, and established that there were no agreed standards of implementing KMS in the healthcare industry.

In South Africa, there is no consistent supply of electricity, and this makes it difficult to convince medical practitioners to move away from their traditional paper patient records to an electronic system (Coleman, 2014; Nevhutalu, 2013). In addition, the bandwidth required to sustain online healthcare systems is still very expensive in South Africa (Coleman, 2014; Department of Health, 2012), telecommunication network infrastructure and coverage are still not available in many areas, while mobile signals are also not stable in a sizable number of communities in Johannesburg.

Smuts et al. (2008) pinpointed that the greatest challenge in relation to KMS is the fact that knowledge is gained through experience and practice. However, those individuals with knowledge are not the designers of CKMS and this tends to result in disagreements and resentments surfacing during the implementation process. In addition, those who possess this knowledge have their own ways of delivering, collaborating, presenting, and sharing it.

METHODOLOGY

The aim of this paper is to present the challenges encountered when implementing CKMS in Johannesburg private hospitals. The guiding research question is: *What are the causes of the challenges encountered when implementing CKMS in South African healthcare institutions?*

An interpretive paradigm was used to get the understanding of reality derived from the meanings and understandings which arise through socializing and experience (Krauss, 2005; Zainal, 2007). This study was conducted as a case study which enabled the researchers to conduct an intensive investigation of the

phenomenon. This section discusses the research techniques that were used: sampling, ethics consideration, data capturing, and analysis.

Population and sampling

This study was conducted in three private hospitals, as the public hospitals had not adopted any form of CKMS at the time this study was conducted (Department of Health, 2012). The three hospitals selected are all using CKMS and the participants understood and are using CKMS. Purposive sampling was applied to select participants who were using CKMS or who had participated in the implementation of CKMS. The study sample was made up of six participants, purposively selected and consisted of a doctor and a nurse from each of the selected three hospitals.

The researchers communicated with hospital administrators to select the most experienced practitioners, namely, a medical doctor and nurse. The primary requirement in selecting each doctor and nurse was that they have more than fours years experience so that they could understand the transition from a manual system to KM system. The hospital administrators selected the participants for the researchers and scheduled the interviews. Because the study had a limited time, it thus was not possible to increase the number of participants.

Ethics consideration

All of the participants expressed their understanding regarding the nature of the research and their willingness to participate in the study. The researchers used pseudonyms to identify the participants in the notes taken during the interviews. The hospitals and participants remain anonymous.

Data capturing

Interviews were conducted at the workplaces of the participants. The interviews were conducted in the English language. An interview question guide was designed with a set of open-ended questions which allowed follow up questions. Questions were formulated based on the five pertinent categories, namely: organizational culture, content, processes, technology, and external causes of challenges. The questions were designed so as to elicit responses on these aspects: experiences, opinions, and knowledge.

Participants were free to explain and answer the questions in the manner they preferred. The researchers explained what a CKMS is in detail to ascertain that participants understood the difference between operational applications, such as Microsoft Office Suite, financial applications, among others, and a CKMS. The researchers chose to educate users in this way to eliminate any generalizations about computer applications that the participants may have used.

Data analysis and interpretation

The data collected was analyzed as follows:

- Clustering related data: The collected data was in the form of unstructured text. Identical or similar responses were placed in clusters to determine their occurrences and patterns. Soft clustering was used to group the responses, and those that did not fall within the categories were analysed individually. Participants were asked the same questions, although with different follow up sub-questions; therefore, there was no need for coding. The process was conducted as shown below:
    - Organizing the data
    - Identifying the ideal framework or form of revealing the data

- Sort and present the data into the identified framework
- Identify themes and data patterns
- Search data to answer the research question
- Perform the interpretive reporting

FINDINGS

In this section, we discuss the results based on the collected data; only main aspects were selected for discussion. This section includes the validation of the findings and contribution. The participants are denoted by letters "D" for doctors and "N" for nurse. Key findings are as follows:

- Culture: Culture plays an important role during the implementation of a CKMS. The findings of both this study and other studies showed that healthcare institutions often fail to comprehend the concept of culture change. The main culture aspects that result in challenges include commitment towards CKMS, knowledge sharing culture, medical practitioners' perceptions about CKMS, complexity, and resistance to CKMS adoption. One participant asked rhetorically:

  "… what is the problem with the way we interact with doctors? That is the way things have been working all the years. I do not like computers, they freeze, crush, hang and, sometimes, give the wrong information, I just find it difficult to trust CKMS …"

- Support: The study extrapolated that there was no continued support from both top management and the relevant stakeholders. Alkhaldi et al. (2014) made the same finding when they discovered that employees do not comprehend the importance of a system if management does not lead the way. This finding was further supported by Milton (2005) who indicated that the failure of CKMS and other ICT projects is usually attributed to a lack of commitment on the part of both management and staff. Another participant attributed complexity as a challenge to implementing CKMS in health care:

  "Medical practice is a science, no one is 100% right, what works for X might not work for Y, so which knowledge will we rely on or put on the system? Otherwise, it will be a very complex system to address all permutations and scenarios …"

- Usefulness: The perceived usefulness of a system defines the measure to which the expected users believe that the system will, indeed, improve their work performance (Davis, Bagozzi, & Warshaw, 1989). Without relevant content in the CKMS, the system cannot be trusted, accepted, and used as intended. Knowledge transformation, information consistency, and information sharing were highlighted as major issues affecting CKMS implementation. D1 had to say:

  "At one time I asked the IT manager to take away his computers and systems outside the hospital because he was making the system a sacred section and put so many rules and overprotect the computers more than the patients."

- Processes and procedures: Healthcare processes are regarded as sensitive and are thus usually known only by those in the field with a "ring-fence" being built around medical practitioners. The study established that there is a wide "digital gap" between healthcare and CKMS professionals, with a boundary separating ICT from business processes. Participants expressed their worry over the use of CKMS in their environment, with one making this statement:

> *"Overreliance on computer use will definitely affect the relationship between patients and medical practitioners. There are instances and situations where human judgement, analysis and decision are required. We cannot have CKMS overriding our human capacity."*

The participants were worried that there would be an overreliance on CKMS and distort the need for proper medical training programs. It was the older medical practitioners who expressed fear that overreliance on use of CKMS would affect instances in which human decisions, analysis, and investigation are required to deal with patients.

- Ease of use: Perceived ease of use defines the extent to which users are convinced that the system will reduce work effort and/or human effort (Davis, Bagozzi, & Warshaw, 1989). This study found some negativity on this issue, as two participants stated that any form of a computer system slowed their work and increased backlog:

> *"Imagine the backlog, these computers are so slow and sometimes just hang when they want, sorry I am not in favour of that idea."*

- Consistency: There is no unified CKMS healthcare experience and thus in the healthcare context, it is extremely difficult to provide a CKMS as an off-the-shelf system. The absence of compliance with required standards, procedures, and the appropriate use of healthcare information is the ubiquitous challenge in this sector. Many service provider firms rush to implement CKMS into healthcare institutions without adequate knowledge of the fundamental processes and procedures, and this leads to failure. N3 had this to say:

> *"There is too much negative news about computer systems being used wrongly, systems have become the centre of many crimes. One gets worried when asked to adopt a system that will aid decision making on patients such as computer-based knowledge management systems."*

- CKMS Funding: The interviews revealed that the funding of ICT projects in the healthcare sector is a challenge and that most ICT projects fail because institutions shifted their funding priorities and implemented projects on a "piecemeal" basis, which is not ideal for the successful implementation of CKMS; this was addressed by three participants, as one remarked with the following:

> *"... the major costs in this hospital are salaries and ICT facets which include maintenance, upgrades, software licenses, ICT consulting firms and telecommunications. However, we are still not at a level where we receive benefits from the ICT infrastructure. It's just demanding more money from every budget we set, we are forced every year to cut other costs because of ICT infrastructure expenses, I just do not get it ..."*

- Knowledge sharing: The findings reveal that medical practitioners rarely dedicate their time to assisting and educating those around them about their procedures and processes, as was attributed by another participant:

> *"... if you share too much information, then your service will not be needed, if we are to remain relevant in the societies, we need to protect what we know ..."*

- Technology fast-changing: It was noted further that there are no properly laid down business strategies, goals, objectives, ICT policies, frameworks, healthcare, or ICT privacy legislation.

> *"Technology is fast-changing, so are systems. This is not giving technology specialists time to familiarise and implement what they are working on, I have seen the evolution of smartphones. However, there should be a better way of building proper CKMS which will be widely acceptable …"*

Another participant viewed this from a slightly different dimension:

> *"The problem seems to be caused by the absence of unified experience, that is, healthcare CKMS become difficult to provide as an off the shelf system and each institution will need to build what works for them."*

- Healthcare work environment: Participants expressed their disapproval in using CKMS in the presence of their patients, and was noted by D1:

> *"… tell me, how would you feel, as a patient, if you were to come here, then I would say, just a moment, let me look up more information on Google or on the computer-based knowledge management system?"*

However, D2 was more worried about the patients' reactions, remarking:

> *"Our society is not ready for these innovations in the medical sector. One day I pulled out a book while a patient was in front of me, I could see from the patient's face he was not pleased, and I never saw that patient again."*

- The complexity of CKMS: The study noted that participants agreed that healthcare was a complex domain in which to implement CKMS successfully. D1 stated:

> *"Medical practice is a science, no one is 100% right, what works for X might not work for Y, so which knowledge will we rely on or put on the system. Otherwise, it will be a very complex system to address all permutations and scenarios …"*

The findings are summarized in Table 1 below.

CKMS Drivers	Finding
Culture	• No knowledge of CKMS. • CKMS perceived too complex and difficult to implement. • Inadequate systems training. • Inadequate awareness sessions. • Perception of the elimination of the doctor and patient relationship. • Lack of acceptance of new ideas and innovations. • Lack of incentives to motivate users. • Lack of honesty in sharing information. • Internal competition.

	• Lack of cohesion in privacy policies.
Content	• View CKMS as too risky to administer healthcare knowledge. • Reluctant to assume accountability for managing. • Everyone assumes their information is very important and sensitive. • No evidence of CKMS's value.
Processes	• Medical practitioners do not understand how CKMS may improve the standard of their work. • No track of effective CKMS processes.
Technology	• Technology and CKMS implemented as separate processes in the business universe. • Lack of a holistic approach causes division among users.
Other	• Lack of prioritization and support from leadership. • Lack of defined CKMS approach. • Short-term thinking. • Lack of performance drive.

Table 1. Summary of the Findings

Validation of the findings

This paper presents a single, real-world validation of the study findings. The validation was conducted using a private hospital owned by an asbestos mining company. The hospital is planning to implement CKMS, which was approved already by the board of directors. We approached the Chief Technology Officer (CTO) of the hospital, who is spearheading the CKMS project, to ask if we could test our study findings. The CTO advised us that the organization had already done a strategic plan and had identified the critical success factors for CKMS implementation. Since the organization was still in the planning process, we took the opportunity to validate the findings of this study.

The identified critical success factors included: leadership, organizational, human resources management, technology, and KMS process activities. These critical success factors need to be managed for the organization to realize the successful implementation of KMS.

Leadership*:* The participation of leadership is instrumental to the success of any organizational project. Leadership will need to manage these critical success factors for CKMS implementation to succeed.

- Enforce strategic and execution plans
- Conduct periodic reviews of CKMS project
- Create and maintain CKMS awareness in the whole organization
- Ensure organization stability during CKMS implementation
- Build trust amongst teams and organizational departments

Organizational*:* Once leadership have taken their position, the rest of the organization will adhere to the plans and perform their respective tasks to support the vision, strategy, and objectives setup. They need to break down tasks across the organization in order execute CKMS implementation.

- Manage evolving culture and staff expectations
- Manage knowledge sharing culture
- Setup required infrastructure to support KMS
- Educate staff on KMS role in the organization
- Adequate funding for the KMS project

Human resources management: The CKMS project requires committed human resources to succeed.

- Incentives and motivation to get staff commitment
- Redefine roles to align them with CKMS
- Provide and manage change management process
- Realign activities, tasks, and enforce teamwork
- Assigning responsibilities in line with CKMS

Technology: A CKMS is technologically driven artefacts.

- Adopt and use correct and appropriate technology
- CKMS must be available always when needed
- User friendly, correct and appropriate information and knowledge flow
- Upgradeable in future and integrating with other relevant systems

KM process activities: This section holds the operational activities of CKMS. Critical success factors in this category need to be properly defined and practically checked.

- Breakdown work structure
- Manage execution plan against complete and running activities,
- Benchmarking activities
- Interaction with KMS technologies
- Adherence to set milestones

The identified critical success factors from the hospital were mapped to the causes of challenges presented in Table 2. The mapping is provided below **in** Table 2**.**

Main Critical Success Factor category	**Critical success factor**	**Cause of challenge**
	Enforce strategic and execution plans	CKMS perceived too complex and difficult to implement
	Conduct periodic reviews of CKMS	Lack of acceptance of new ideas and innovations
	Create and maintain CKMS awareness in the whole organization	Inadequate awareness sessions
	Ensure organization stability during CKMS implementation	Lack of a holistic approach causes division among users
	Build trust among teams and organizational departments	Everyone assumes their information is very important

Leadership		and sensitive.
	Unmapped	Perception of the elimination of the doctor and patient relationship.
	Unmapped	Lack of cohesion in privacy policies
	Unmapped	CKMS as too risky to administer healthcare knowledge
Organizational	Manage evolving culture and staff expectations	Reluctant to assume accountability for managing
	Manage knowledge sharing culture	Lack of honesty in sharing information
	Setup required for infrastructure to support CKMS	Lack of defined CKMS approach
	Educate staff on CKMS role in the organization	Perception of the elimination of the doctor and patient relationship.
	Adequate funding for the KMS project	CKMS funding
	Unmapped	No evidence of CKMS's value
Human resources management	Incentives & motivation to get staff commitment	Lack of incentives to motivate users.
	Redefine roles to align them with CKMS	Internal competition
	Provide and manage change management process	Lack of performance drive
	Realign activities, tasks, and enforce teamwork	No knowledge of CKMS
	Assigning responsibilities in line with CKMS	Career and job threat because of CKMS
Technology	Adopt and use correct and appropriate technology	Fast changing pace of technology
	CKMS must be available always when needed.	No track of effective CKMS processes
	User friendly, correct, and appropriate information and knowledge flow	Medical practitioners do not understand how CKMS may improve the standard of their work.
	Upgradeable in future and integrating with other relevant systems	Lack of knowledge on technological trends

	Unmapped	Technology and CKMS implemented as separate processes in the business universe.
KM process activities	Breakdown work structure	Reluctant to assume accountability for managing
	Manage execution plan against complete and running activities	No track of effective CKMS processes
	Adherence to set milestones	Lack of performance drive

Table 2. Validation of Causes of challenges

CKMS implementation challenges will be encountered if critical success factors are not adhered to, which will point to the cause why the challenge has been encountered. We presented the mapping in Table 2 to the CTO; he was very happy as we informed him that there were other causes of challenges that were not mapped by their critical success factors. The project team was advised to revise and update their critical success factors based on our causes of challenges after which they would embark on preparing an implementation and execution plan of their CKMS project.

The CTO expressed satisfaction that the causes of challenges we provided were adequate to reveal the critical success factors which would enable the organization to counter any threats and weaknesses. We can, therefore, benchmark that the provided synopsis of the cause of challenges identified in this study are a good foundation to start from and adequate to equip and inform a CKMS project accordingly.

Contribution

The aim of the study was to present a comprehensive synopsis of causes of challenges encountered when implementing CKMS in Johannesburg private healthcare organizations. This study provides both a theoretical and practical contribution.

Theoretical contribution: The causes of challenges presented are from a real-world environment, adding valuable knowledge to the e-health subject domain. Organizations can use this study's findings as a guideline when formulating CKMS implementation strategic and execution plans.

Practical contribution: This study's findings provide knowledge that can be used in the actual implementation of CKMS, which is a practical problem, as noted in the study. The findings have been evaluated in a real-world scenario, which makes the study authentic and reliable.

Limitation

Only doctors and nurses were used as participants in this study, but other stakeholders could have been useful as well, such as ICT experts and administrators, since they are involved in the implementation and use of CKMS. This study was limited to only three hospitals and six participants, which might not be fully representative of all private hospitals in Johannesburg.

Future research

Future studies on this subject should also be conducted to explore policies and regulations in the medical sector. There is a need to conduct wider and intensive studies to document fully the causes of the challenges encountered in implementing CKMS in healthcare institutions across a much bigger

population to improve the richness and depth of this subject matter. There is a need to conduct a wider study with a more diverse population of healthcare practitioners.

CONCLUSION

While it is not an easy matter to implement CKMS in healthcare institutions, there is a significant future benefit, as technology and CKMS are fast becoming the 'backbone' of modern businesses. The implementation of CKMS must be embedded in the organizational strategy, which should be executed from the top-level to the operational level of the organization. At an operational level, CKMS tasks and activities must be binding and incorporated into employees' work, as "optional work" is never regarded as important and will not be prioritized.

The major benefit of CKMS is the ability to share authenticated information of disease patterns and trends, thereby providing several ways in which to eradicate them. In addition, knowledge sharing in healthcare enables medical practitioners to react quickly and appropriately when faced with pandemics. Every country requires the expertise and up-to-date knowledge of medical science to provide citizens with appropriate health services and thus the need to harness and invest in computer-based healthcare knowledge management systems. It is important that organizations, governments, policymakers, and CKMS designers keep abreast of emerging technologies and apply them in healthcare institutions.

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