Exploring Healthcare Providers' Workaround Practices to an mhealth Intervention

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Abstract

This study explores how healthcare providers in South African public hospitals enact workaround practices to an m-health intervention to overcome its limitations and constraints. Employing the work systems method, we analyze the causing factors driving the enactment of workaround practices to an m-health intervention in the Western Cape referral system, in South Africa. A total of 15 semi-structured interviews were conducted with medical officers and IT personnel, to explore the rationales behind their enactment of workarounds. Despite the reported benefits such as improved mobility and communication between medical officers and specialists, the m-health intervention is currently not used as intended. Instead, health care providers (HCPs) are enacting workarounds to the current structures and subverting the m-health intervention due to design-reality gaps. While these design-reality gaps exist, these workarounds also offer opportunities for innovation and process improvements to the patient referral process in the public hospitals.

Keywords: workarounds, South Africa, work system method, m-health, health information systems

1. Introduction

M-health interventions are designed to streamline clinical processes in order to achieve optimal outcomes. However, if these interventions are implemented without adequate end-user involvement and consideration for realities and contexts in which they are deployed in, this can result in misfits between the technological intervention and actual needs of the end-users [1]. This study was conducted in the two tertiary hospitals in the Western Cape Province in South Africa, where an m-health intervention was implemented to facilitate patient referrals [2, 3, 4]. In this referral system, healthcare services are delivered in public and private health facilities, and by traditional medical practitioners [3, 4].

The public sector consists of a hierarchy of care levels ranging from tertiary , district, primary and specialized care, while the private healthcare sector renders services to citizens who personally finance the healthcare services or financed by the medical aid schemes [5]. This study was conducted in the Western Cape Province, public health sector consisting of three tertiary, forty-two districts, five regional hospitals and twenty-two clinics [2], [4]. The purpose of this research is to explain the causing factors driving the enactment of health care practitioner's workaround practices to an m-health intervention in the chosen public hospitals. Explaining these causing factors will aid in understanding the rationales behind these workaround practices. The study findings reveal that healthcare providers from the selected hospitals report impositions related to the design of the m-health intervention.

The m-health intervention examined in this research is the Vula mobile application. Vula is prominently utilised in the South African public hospitals. In particular, there has been a sharp uptake of this mobile application, and it has been adopted and mandated as the official referral application for the department of health in the Western Cape province [2]. Vula facilitates patient referrals among healthcare workers and specialists, enhancing care coordination and communication [6, 7]. It's widely used across various specialties in South African public hospitals. Several studies explore how Vula streamlines patient referrals and various benefits are reported including improved educational opportunities and efficient patient flow [6, 7], [14].

Healthcare providers can also seek second opinion and share knowledge within their communities of practice. The app effectively captures and transfers sensitive patient information between various healthcare providers [7]. However, shortcomings with the user interface functionality have led to HCPs devising workarounds and adapting it to complete referrals, which undermines the intended referral process. Bozan & Berger, study concluded that workarounds are largely found to be a direct result of dissatisfaction with Information Systems leading to some form of resistance [8]. Other studies claim that workarounds are a result of misfits between work and implemented systems in organizations. For example, Davison, argues that when misfits are not addressed, they can persist in coordinated workarounds [9]. Van Beijsterveld & Van Groenendaal confirms that these types of gaps between user needs and implemented systems are indeed defined as misfits [10, 11]. In this research, these misfits were result of the gaps between the design of the Vula application and the contextual realities in which the m-health intervention was implemented.

To explore the phenomenon understudy, this paper is organized as follows: The first section outlines the research methodology adopted for the study. Following that, the findings of the study are then presented in the next section, followed by a discussion of the findings and conclusion.

2. Research Methodology

This study aims to explore healthcare providers' workaround practices to an m-health intervention in South African public hospitals. The purpose of the study is to explain the causing factors driving the enactment HCPs workaround practices to Vula. To this end, a case study is conducted in the Western Cape referral system in two tertiary hospitals where Vula was implemented to automate the patient referrals.

The empirical data was collected through semi-structured interviews, observations, and document analysis. A total of 15 semi-structured interviews were conducted with key informants ranging from head of units, medical officers and IT personnel involved with the Vula application. To triangulate the study results, a document analysis of e-health strategies, referral policies and annual reports was also carried out. Observation of data on the m-health intervention was granted (with an observer account with limited access rights) to evaluate the referral information.

The interviews lasting between 30-40 minutes, were recorded verbatim and transcribed into Microsoft word. The interview transcripts were then imported into NVivo where a thematic analysis was conducted to identify the research themes [12]. The work systems method (WSM) is adopted to analyse the "as-is" practices of HCPs in order to understand the rationales behind the enactment of these practices and to explore how these can be improved through planned and emergent change. Alter, explains that this method can be instrumental in high-level guidance and designing work systems that do not involve software development, but rather analysing the current state of a work system ("as-is") and designing an enhanced version known as the "to-be" work system [13]. The "as-is" activities are presented in table 1 and the improved version is explained through the design-reality gap model in Section 3.3.

A deductive approach was adopted drawing on the concepts of the design-reality gap model. A coding manual was developed based on the applicable concepts. The coding template was then applied to the data, and additional coding was undertaken. As the review

was carried out, some codes were redefined and renamed to come up with clear themes describing the data. The study findings consisting of final themes are presented in the next section.

3. Results and Discussion

The objective of the m-health intervention is to streamline the referral process. This referral process involves both inpatient and outpatient activities conducted by HCPs in public hospitals. Inpatient referrals are received from units within the same hospital. On the other hand, outpatient referrals are referrals received from other health facilities for advanced health care and management [2], [4].

3.1. Referral activities, processes and Technology

In the Western Cape Referral system, the Vula Mobile application is implemented at tertiary hospitals in the public health sector [3, 4], [14]. Vula is used to transmit patient referral information between HCPs from primary, secondary, and then at tertiary healthcare levels [3], [7], [14]. Vula was adopted in different specialties such as dermatology, orthopedics and cardiology in the public hospitals under study. The intervention is part of the hospital's standard operating procedures for facilitating referrals in the respective departments. The referral activities facilitated by the m-health intervention are described in Table 1.

Table 1. Work system snapshot of the Western Cape Referral System

<table>
<tr><td colspan="3">Work system snapshot of the Western Cape Referral system</td></tr>
<tr><td colspan="2">Customers</td><td>Services</td></tr>
<tr><td colspan="2">Patients</td><td>Patient referral information received from lower levels of the healthcare system.</td></tr>
<tr><td colspan="3">Work Practices (Processes & Activities)</td></tr>
<tr><td colspan="3">• The referral process involves HCPs communicating and transferring patients between health facilities at different levels of care.
• Referral activities are made up of inpatient and outpatient referrals.
• Inpatient referrals are received from units within the same hospital using traditional or electronic methods.
• Outpatient referrals are received from other health facilities (district / regional hospitals) through traditional or electronic methods.
• Outpatient referral activities range from bookings with the central office at a tertiary hospital. Inter-sectoral, horizontal, downward, and vertical referrals.
• Medical doctors or nurses in district hospitals send referral letters/note to the medical officers or specialists in tertiary hospitals.
• Medical doctors or nurses in district hospitals book patients
• Outpatient referrals occur when a patient is referred (through the Vula application or referral notes) to another health facility to receive specialist outpatient care or further management.
• HCPs use different types of referral methods such as referral letters, telephone Vula mobile application and WhatsApp to share and transfer patient information with specialists.
• Electronic referral methods are used to overcome constraints experienced with traditional referral methods (referral letters; telephone).</td></tr>
<tr><td colspan="3">Workaround related practices</td></tr>
<tr><td colspan="3">• Medical officers enact workarounds to the Vula mobile application using WhatsApp.
• All HCPs share patient information using traditional referral methods email, referral letters and telephone.</td></tr>
<tr><td>Participants</td><td>Information</td><td>Technologies/Tools</td></tr>
<tr><td>• Medical officers
• Nurses
• Specialists (Dermatologists)
• IT personnel
• Medical doctors</td><td>• Patient biographical information.
• Patient medical history (patient medication, allergies, problem, procedure lists).
• Patient medical imaging (x-rays, MRI magnetic resonance imaging).
• Referral policies, procedures and guidelines governing referral systems.
• Referral protocols.</td><td>• Vula Mobile® App
• WhatsApp® messenger
• Health Information Systems
• Email
• Telephones
• Referral register
• Referral notes</td></tr>
</table>

At the time of this study, Vula was only adopted in some public hospitals in South Africa. The app was adopted as a response to challenges experienced by rural healthcare workers to provide access to specialist advice and means to efficient referrals [3], [14]. In addition, the application was also implemented as an intervention to link healthcare workers with specialist care [7], [14]. The dermatology units in the two public hospitals were among the first to introduce e-referrals via Vula and it has offered numerous benefits. For example, Vula brings about educational benefits and an efficient patient flow between hospitals [3], [5], [14]. Furthermore, the application automates referral activities and overcomes numerous constraints such as self-referrals, illegible handwriting, and data loss, which are often associated with paper-based referrals.

At the time of this study, the application was not yet mandated by the Western Cape Department of Health but deployed in some of the departments such as the dermatology unit where this study was conducted.

Findings from the interviews show that the Vula application was used by 98% of healthcare providers interviewed. Despite the good uptake of the application by HCPs in these hospitals, the empirical evidence from the data shows misfits between HCPs' work and Vula. Study findings reveal the workarounds practices characterized by augmenting, fitting, and workaround behavior. These practices suggest gaps between the design of Vula and the local realities of end-users in the public hospitals under study. These practices were later interpreted through the lens of the theory of workarounds and the design-reality model.

3.2. Causing factors driving workaround practices

This study draws on the concepts of the DRG (Design-Reality Gap) framework to understand HCPs' causal factors driving their workaround practices. Furthermore, the notion of contingency is relevant in this study, as fit or congruence that looks at the mismatch and match between systems design and systems delivery. The aim is to look at ways to adapt Vula to avoid mismatches. Furthermore, the dimensions are applied to illustrate the design-reality gaps between technology, people, and organizations [15, 16]. The DRG framework was employed to explain workarounds practices and their relationship to design-reality dimensions. The Design-reality gap framework describes the difference between the "design" or assumptions built into the IT artefact by designers and the reality of the real needs of end-users in the given context [13], [17].

There was a total of 244 references coded to various design-reality dimensions. Code references show the instances of data coded and mentions of data related to concepts in the design-reality model. Findings show several causing factors driving HCPs to subvert the m-health intervention. The causing factors includes deficient rollout and implementation of e-Health strategies, insufficient engagement of healthcare providers, inadequacies of Vula to support referral activities of HCPs and lack of policy and guidelines awareness. These causing factors were interpreted and mapped to concepts from theory of workarounds namely, fitting , augmenting and workarounds. Fitting is an activity or task of changing the structure of work or computing to accommodate technical misfits [18].

Additionally, when an IT artefact cannot accommodate all the required functionality, end-users undertake additional work to make up for misfits by augmenting it with additional processes or other tools to meet the user needs [18, 19]. When an IT artefact does not meet the realities and needs of end-users, HCPs ultimately subvert processes or altogether adapt existing processes or tools to achieve a desired level of efficiency, effectiveness, or other organizational or personal goals [20]. The next section explains the relationship between workaround practices and causing factors.

3.3. Workarounds and design-reality gaps

The relationship between workaround practices and misfits related to the design of the m-health intervention and realities of HCPs were later interpreted through the lens of the DRG framework. The references coded under each design-reality gap dimensions are presented in figure 1. In this case study, workaround practices were enacted by HCPs due to gaps related to deficient rollout and implementation of e-Health strategies, insufficient

engagement of healthcare providers, inadequacies of Vula to support referral activities of HCPs and lack of policy and guidelines awareness.

Additionally, HCPs were enacting workarounds due to the absence of IT policies for regulating third-party applications in the public hospitals under study (2, 3, 24). The were more gaps observed between the management systems and structures, technology. The gaps on the technology, information staffing and skills, processes dimensions were medium. For the rest of dimensions, there were less than 13 code references, which indicates a low gap on these dimensions. The illustration in Figure 1, thus indicates the magnitude of the gaps observed in the empirical data from this case study.

Design-reality dimension	References coded to dimension	Magnitude of gap
Technology	66	very high
Management systems and structures	59	very high
Information	38	high
Staffing and skills	32	Medium
Processes	25	high
Objectives and values	13	very low
Patient privacy and confidentiality/Ethical issues	10	low
Other resources	1	very low

Fig. 1. Code references to Design-reality dimensions.

The above findings show the relationships between workaround practices and design-reality dimensions highlighting gaps uncovered from the data. There were design-reality gaps related to management systems and structures (59 code references). The management systems and structures are concerned with Information systems and structures guiding and supporting the strategic decisions of an organisation. The empirical evidence shows that a top-down implementation approach was taken to implement Vula in the hospitals understudy. The head of the unit took on a supervisory role in authorizing the deployment of the initial implementation of the m-health intervention. However, employing the top-down approach brought about covert resistance from HCPs to fully adopt Vula for the intended purpose (technology – 66 code references). Due to this poor management approach in rolling out Vula, at the time of this study there was no-buy in from some HCPs because of lack of training.

> *Introducing Vula and conducting initial training is not sufficient enough for me to use the application. There needs to be some sort of needs analysis [laughs]. Because you don't, you don't just say wow, we have found this new exciting tool, this is how you use it. I'm going to train you how to use it. But then you don't assess my needs and access to Vula" [respondent_3].*

As a result, some HCPs were adapting the application to meet their needs and ultimately referral goals. For example, some HCPs registered for an account on Vula, but they were not initiating neither actively using the application for referrals. Others were not adhering to rules of changing roles on the application after their work shift, until reminded by the supervisor or until referral messages were channelled to them for processing. At the time of this study, there was thus a mismatch between management objectives and contextual needs of HCPs. On the other hand, the information dimension looks at objectives of Vula in facilitating the referral process. Despite the clear objectives of streamlining the referral process, the study findings show that the intervention was not utilized to its full capacity in this case study (Information – 38 references). The design expectation of Vula was to build-in a notification feature which alerts HCPs of incoming referral messages. The notification sound is designed to send reminders to HCPs on call or off duty. In reality, at the time of the study, the HCPs reported that this notification sound was intrusive. The HCPs were therefore opting to use WhatsApp, as an alternative platform to share patient information.

> *"The developer must change the sound. That notification sound is loud and it's intrusive. [Laughs]" [HCP_12].*

On the processes (25 code references) and technology dimensions (66 code references), HCPs reported that the Vula application was only available on the Android operating system at the time of the study. Some HCPs reported that their personal devices were incompatible with Android and could not afford to buy new personal devices to install the app. The software incompatibility, technical settings on the user interface of Vula resulted in usability issues and insufficient service delivery. This user requirement was later accommodated by the developer as newer versions were also released for the iPhone operating system- IOS [21], [14]. Staffing and skills (32 code references) was another dimension where gaps were identified in the empirical data. Some HCPs found the mobile application difficult to use and there was no sufficient training provided to equip them with skills for operating the application. For example, there was a gap between end-users' knowledge and requirements of the application design. HCPs found there were features they recommended to management and the developer to be modified and they were not incorporated in the design of the app at the time of this study. Moreover, the application requires a relatively stable internet connection. However, this need was not matched or met by the technological infrastructure of hospitals understudy. Findings confirm that both hospitals lacked a stable internet connection, and HCPs were relying on their personal data bundles to access and respond to referrals on the application.

> *"I think people also maybe don't like the app because it uses your own data bundles. You know, for some of us, we're on Wi-Fi so it's fine. But if you're outside the hospital, now you're having to log on and put in all this patient's information," [respodent_2].*

Although some HCPs had access to Wi-Fi in some hospitals the wireless connection was unstable, and they had limited internet connectivity.

> *"We don't have data bundles. So, if you are here at work...In a Wi-Fi zone, then it's not an issue. But the minute you're outside of the Wi-Fi zone or at the clinic or around the hospital and you don't have data... then obviously you miss all those referral messages" [respodent_4].*

Moreover, the HCPs were using their personal devices (Bring Your Own Device) for professional tasks. Using personal phones for professional work was expected without IT support and no compensation for use of personal data bundles. This gap was also one of the constraints limiting use of the Vula application. This can further be interpreted as a design-reality gap between expected resources to support functioning of the Vula application. The availability of financial resources to buy data bundles is obviously a serious challenge for many HCPs. This matter did not receive sufficient attention from management before the application deployment to ensure the infrastructure particularly the internet connection was in place to support the functioning of the application. In addition, slow responsiveness from IT to implement their user requirements affected smooth adoption and ultimately use of Vula by HCPs. A more interesting finding was related to HCPs' lack of knowledge and awareness of referral guidelines or policies. It is expected that HCPs and other end-users are aware of the guidelines or protocols governing the referral pathways and the overall referrals process. In reality, the HPCs' lacked awareness of policies, strategies and guidelines related to referrals.

> *"I am not aware of any referral guidelines, except obviously, which, which hospitals refer to which, uh, who falls under your referral area, but as far as actual referral guidelines, I am not aware of any" [HCP_2].*

In cases where HCPs were unaware of the guidelines, they relied on their supervisors in particular head of units to provide guidance on how to handle inappropriate referrals. Furthermore, HCPs resorted to use of shadow IT such as WhatsApp to seek second opinion from their colleagues or from senior specialists. Shadow IT is defined as the use of autonomous software systems or extensions to existing systems by end-users where the IT department neither develops nor controls these systems [22] This gap affected the dimensions of information, process, management systems and structures. Given the prevalent use of

WhatsApp for referrals, there was no evidence of IT policies designed to manage the risks of shadow IT. This presented a threat to patient safety, in particular transmission of information on social media platforms and this threatens the privacy and confidentiality of patient's information. This gap can therefore be elaborated that due to the absence of clear IT policies, HCPs freely resorted to WhatsApp and Telegram as there was no IT policy to regulate adoption and use of these third-party applications. It can therefore be interpreted that absence of these IT policies exacerbated adoption of third-party applications in this case study.

4. Conclusion

There is a mismatch between the objectives and values of Vula and the social context where the application is implemented. The rationales behind workaround practices of HCPs to Vula as an m-health intervention can be attributed to the design-reality gaps. The causing factors or gaps identified are related to deficient rollout and implementation of e-health strategies, insufficient engagement of healthcare providers, inadequacies of Vula to support referral activities of HCPs and lack of policy and guidelines awareness. These gaps can generally be interpreted as misalignment between IT and health organisations. This has resulted in ineffective implementation and use of e-health applications in this case study. The m-health intervention was implemented without fully understanding the context and needs of health care providers. There was limited involvement with end-users and hence in the software selection process, the application did not adequately address unique users' needs and some requirements for healthcare providers. This resulted in frustration and decreased satisfaction with the application. Consequently, HCPs resorted to workarounds to accomplish their work. These workaround practices emanate from autonomy exercised by HCPs to deliberately subvert Vula to complete work activities. Arguably the aim of enacting workarounds is to find alternative ways of effectively and efficiently complete referral activities. The findings of this study, however, demonstrate that in effect workarounds amplify patient safety concerns and negative outcomes for IT as a business unit. While workarounds can have these adverse consequences, they equally present opportunities for process improvements and innovation to address design inadequacies with the current m-health intervention. Engaging healthcare providers in understanding the risks of workarounds and involving them in finding solutions to their challenges fosters a culture of innovation and continuous process improvements. This collaborative approach encourages healthcare providers to actively seek creative ways to optimize processes and achieve better outcomes. By embracing the positive aspects of workarounds in this manner, healthcare practitioners can become more effective and efficient, ultimately benefiting both healthcare providers and the patients they serve. This proactive involvement of healthcare providers in identifying and implementing solutions aligns with the goal of enhancing healthcare delivery and underscores the importance of empowering healthcare professionals at the point of care to contribute to the improvement of healthcare systems. In conclusion, the work system snapshot can be adopted fully or partially by practitioners or researchers in analysing workarounds of other health information systems in similar settings.

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