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Health information systems: Developing solutions to support patients' mobility

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ABSTRACT

The spread and movements of individuals and groups, particularly the old, poor, and nomadic people necessitates mobility of service for healthcare purposes. Also, in Namibia, health records are not centralized, which makes it difficult or impossible to access patients' medical records from any location of the country. This influences healthcare service delivery, which have impact on patients' health conditions as well as the socioeconomic activities of the country. Thus, the objective of this study was to develop a framework, which could be used to guide mobility of service, to improve healthcare in Namibia. The interpretivist approach was employed. Qualitative data were gathered from primary healthcare service providers, by using the semi-structured interview technique. Actor network theory was used as lens to guide the data analysis. From the analysis, the research suggests that six factors are of critical influence to mobility of service in improving healthcare in the community of Namibia. The factors are ICT artefacts; categorization of patients; response time; an understanding of the actors; actors' participatory to service delivery; and actors' alliance. Based on the findings, a framework was developed, which can be used to guide mobility of service in the provision of healthcare at a micro level. Based on the framework, three models were developed, purposely to aid the improvement of healthcare through mobility of services at a more macro level, towards economic growth. This study is intended to benefit academics, health practitioners particularly in developing countries, and patients in rural areas.

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1. Introduction

The need to continually plan and prevent disease outbreaks and control, significantly necessitates healthcare data management, more efficient service delivery, improved healthcare information flows between health practitioners and patients, and increased information sharing between healthcare levels of operations [1]. However, these plans seem to be challenged in many parts of the world, due to movements and spreads of people from one location to another, particularly in developing countries, which impact on how healthcare services are provided and received [2]. From communicable diseases of HIV/AIDS, malaria and tuberculosis perspectives, Hartman et al. [3] explain how poor healthcare services hampers economic growth of a country. Thus, many hospitals are involved in extensive efforts to substitute electronic patients' records for paper-based records, in order to improve the quality and efficiency of healthcare services [4]. Such initiative is also intended to promote centralization of patients' records, which can improve service delivery [5].

The purpose of curative, preventative and disease control can only be made possible across geographical locations through information sharing [6]. The nomadic people as an example, they resides in rural areas but constantly move from one geographical location to another in search of various activities including greener

pastures [7]. Aiyegbajeje and Ajayi [8] argue that travels from one location to another, to access healthcare can be reduced through mobility of care services. However, this is not the case in Namibia [9]. Thus, the challenging question was whether the available healthcare services are spread enough to accommodate the nomadic patients. This increases the need to investigate different dimensions in the processes of providing healthcare service in Namibia. In Chang's [10] assessment, there is a scenario where the patient may visit a different healthcare organization, either because the patient is dissatisfied with the treatment of his or her previous visit or the patient moves to a different geographic location. This makes it important to have available services in designated localities, since many patients continue to move from one location to another. This is to expand coverage and improve healthcare services [2].

Mobility in this study refers to ease of access to health services from any geographical location [11]. The essentiality of mobility of healthcare is centred on factors, such as portability, transferability and availability of healthcare services, which include information exchange, and real-time interaction between healthcare providers and patients [12]. In healthcare, mobility is typically associated with mobile healthcare systems and applications, the use of health public

kiosk, cellular phone devices, and other portable computing devices [13]. Through this paper, I would like to state that mobility can also be classified by the availability of healthcare services at different levels of healthcare operations.

Mobility of healthcare services can undergo subjective translation by various human actors (patients and healthcare workers), based on their experiences at different moments. In actor network theory (ANT), translation is influenced by interest of the actors [14], during the process of interaction within networks. Translation is important to both health practitioners and patients, towards common or the same level of understanding in the provision and receipt of services. This is because interaction can improve, at the same time derail relationship between healthcare practitioners and patients. ANT is popular for its focus to provide a rich and dynamic way of bringing together the socio-technical and non-technical factors that exist in and about an organization [15]. In ANT, society and organizations are a formation of different actors, and the actors interact to form heterogeneous networks [16–18], within which health services are delivered and received. The networks therefore define, describe and provide substance to the various actors. ANT then, deeply question and provide retorts to the existing circumstance, strong or weak networks.

The research objective was to develop a framework, which can be used to support and guide the improvement of healthcare in the country, through mobility of service. This leads to the research question, which is how can health services be provided to a nomadic population in Namibia? The remainder of this paper is organized into six main sections, as follows: the literature review that was conducted is presented in the first section. The second section discusses the research approach that was applied in the study. The third section presents the data analysis. In the fourth section, the findings and its interpretations including the framework and models are presented and discussed. The implications for healthcare management practice are covered in the fifth section. The conclusion is drawn in the sixth section.

2. Review of related works

In recent years, the need to employ information systems (IS) for healthcare services has increased. This includes, at both private and public healthcare facilities, which strives to take advantage of the opportunities that IS presents, in improving the specialized and general services that they provide. The use of healthcare information systems (HIS) has evolved with the rapid development of IS and advances in technology [19]. Rodrigues [20] defines HIS as powerful ICT-based tools that are able to make healthcare delivery more effective and efficient. Thus, healthcare information

systems and technologies are needed to effectively satisfy the needs of healthcare organization in caring for its patients and partners [10]. HIS has the potential to restructure, and revive the processes and activities that are involved in healthcare service delivery, through mobility of service. A better healthcare service could improve relationship amongst stakeholders, through effective information flows, especially in the rural areas. According to Rygh and Jortdahl [2], healthcare providers in rural areas face numerous challenges in providing coherent and integrated services as compared to those in urban areas, especially in the area of mobile healthcare facilities.

However, there is a high failure rate of HIS mainly in public organizations [21]. This includes challenges in attempt to remotely interact with patients, and access their data from different locations [6]. The failure can be attributed to the fact that there is lack of shared standard in data collection, which creates fragmentations in the services that healthcare organizations provide [22]. Data standards can however be linked to organizational characteristics, such as public, private healthcare service provider or geographical locations and departmental links. Health service providers need flexible systems that can accommodate certain amount of variation in achieving unique organizational processes, for effectiveness [23], from any location. Paules Ciprés, Fardoun, Alghazzawi and Oadah [24] draw emphasis on mobile technologies in health, which are typically associated with the availability of healthcare services at different places, at the same time; at different places, at different times; and at the same time, at the same place. There seem to be the assumption that, with the implementation of mobile health technologies, healthcare problems, such as inadequate availability of doctors and poor clinical examination that are caused by insufficient skilled healthcare workers and scarcity of healthcare centre can be reduced or eradicated [25].

Due to the geographical spread of citizens, mobile healthcare is highly essential, but does come with its challenges as well [3]. This could be one of the rationale that motivates Rygh and Hjortdahl [2] to examine how mobile health can be used as an innovative solution, in providing healthcare services to patients who reside in remote locations in a country. As observed in India by Mohapatra [26], information systems can be used to integrate the activities of healthcare to improve comprehensive management of services. Also, the approaches that are often used by primary healthcare service providers in the rural areas are primitive and obsolete [27].

As it is in many countries, the Ministry of Health and Social Services (MoHSS) of Namibia coordinates and oversee the activities of the medical and health sectors in the country [6]. The MoHSS is mandated to provide an integrated, affordable, accessible, and quality health including social welfare services that is

responsive to the needs of the Namibian population [27]. The population seek services from the available healthcare facilities, which are located at different levels of operations in the country [9]. Processes and activities of the MoHSS are mostly performed manually (paper-based) or through the HIS [7]. This can be a huge setback for the services, such as distribution of the Human Immunodeficiency Virus (HIV) treatment and immunization against contagious diseases' outbreaks which the MoHSS provides to the communities in the country. Worse, the manual approach significantly delays centralization of processes and activities [9]. This indeed is dangerous to patients' need for healthcare, particularly those that are of intensive and chronic nature including nomadic patients.

3. Research methodology

Based on the objective of the study, which was to develop framework that could be used to improve healthcare for the Namibian society through mobility of service, the qualitative methods and case study approach were selected. One of the key benefit of the methods, is its flexibility in studying a phenomena over a period of time [28], which was useful in gathering data for this study. The case study approach was employed mainly because of its focus on real-life situation, allows deeper understanding of a phenomena within context, as described by Yin [29]. The Namibian Ministry of Health and Social Services (MoHSS) was used as the case in the study. In addition to MoHSS, the general populace was allowed to participate in the study, in order to have balanced view in the context of this study and the country.

Data were collected by using the semi-structured interview technique. This was to recognize and focus on the subjective meaning, which participants share [30], on how healthcare services was provided and received in the country. One-on-one interviews were conducted with a total of 23 participants. The number was reached heuristically, at the point of saturation, which Iyamu [31] describes as a point where no new information was forthcoming during an interview process. Of the 23 participants, 10 were employees at the MoHSS (case). The participants were selected from different units of the MoHSS as follows: nurses (x6), and doctors (x4). The main criteria that were used in selecting the health practitioners were length of years of service. As at the time of the study, each of the participants had been in their professions for at least five years. This was considered long enough to ensure quality of data in terms of an understanding of the types of services that they render to both nomadic and stationed patients within the country. The other participants were 13 community members: patients (x8) and non-patients (x5) across the country. This group of participants were selected based on their length of

visits to health facilities, at least five visits in the last 12 months before this study began in 2017. The period was also considered enough to assess the different types of services that they did receive.

The interpretive approach was employed in the data analysis by using the hermeneutics technique, which was guided by moments of translation as lens from the perspective of ANT. Goldkuhl [32] explains that the core idea of interpretivism is to understand the subjective meaning of persons. ANT was selected mainly because it enables examining of the process of translation, formulation of networks of actors, and the interaction that happens between human and non-human actors. Without the use of ANT, it would have been difficult or impossible to examine and understand the processes and actors' influences in the mobility of healthcare services in the Namibia environment. This is primarily because only ANT could help explains how heterogeneous networks [33] are formed, and how the activities are translated in the delivery and receipt of healthcare services in the country. Translation occurs when actors start to define roles, distribute and redistribute responsibilities, and employ resources as source of power, and describe a scenario to form aligned interest of actors, of healthcare practitioners and patients.

In ANT, moments of translation involve four stages: problematization, interessement, enrolment and mobilization [34]. (i) Problematization is the stage which reveals what necessitates and triggers the formation of a network. Uden and Francis [35] elaborate, suggesting that during problematization, actors establish themselves as an obligatory passage point (OPP) between them and the network for the purposes of indispensability [36]. (ii) Interessement: at this stage, actors consciously or unconsciously reveal their individual or groups' interest about the item that has been problematized by the focal actor [37]. (iii) Enrolment: process begins with actors imposing their will on others for actions to be executed, which requires yielding from the affected actors [38]. (iv) Mobilization: an enrolled actor speaks on behalf of the network, and tries to persuade others to partake in the activities of the network [18].

4. Data analysis and results

The data were analysed using the interpretive approach, through the moments of translation from the perspective of ANT. Thus, the analysis began with actor-network, followed by the four moments, which include problematization, interessement, enrolment and mobilization. Thus, the data was viewed from the perspectives of actors, networks and interactions, which include relationship among actors and activities within networks.

Often than not, patients seek care at health facilities (hospitals and clinic), where interaction between them and the service providers are harmonized. On each visit to the health facilities, patients uphold and present their health passport, which was issued to them by the healthcare service providers. Also, the health passport was used to document the type of activities, such as diagnosis, treatment and prescriptions that were offered to each patient. Also documented in the health passport place and time of events. Interactions between healthcare practitioners and patients can be classified as part of a network activities that can be immobile, but exists to offer and receive services.

4.1. Actor-network

There were human and non-human actors, which whole fully depended on each other in providing and receiving healthcare. The human actors included patients, healthcare practitioners, and the government (MoHSS). The non-human actors consisted of processes, ICT artefacts, healthcare facilities and medical apparatus or tools. As at the time of this study, different networks existed, which included doctors, pharmacists, nurses, urban patients, rural patients, Nomadic patients and tribal patients.

Even though the actors had different interest, each of them made a difference in their network, through the services (such diagnosis and medications) that they provided or received. The differences were mostly on the impact that the actors had on each other. For example, the practitioners acquire knowledge and experiences based on the health services that they provided to the patients. *One of the nurses, who claimed to have learned something new during the course of her service, explains: I did not know that people from this area (Eastern part) of the country do not allow female medical practitioners to attend to their health if the practitioner is touch their bodies.*

Individuals and groups belong to various networks, which were influenced by their personal or collective interest. Some of the interests were influenced by factors, such as spoken language and culture, and manifested into other factors, which included enrolment and accessibility. *According to one of the participants, I can only go to the hospital or clinic if I am sure that the practitioners understand and speak my language, which is Oshiwambo. This is primarily because I am not educated.*

However, the networks were moderately closed, and lacked ease of access. This could be attributed to many factors in that it is a sensitive environment, and therefore requires privacy. Thus, there was no ease of access to patients' records, from different locations by medical practitioners. Kaye et al. [39] argue that healthcare information technology can be used to ease access to medical record and maintain privacy of the patients.

The situation was more challenging, in attempts to access medical records of nomadic patients or those on transit. For example, HIV patients that were under the care of private doctors, who wishes to access government hospitals had difficulty in doing so. This was due to little or no communication or connectivity between the health facilities that were on different networks. This happens, when patients were either illiterate or in state of unconsciousness, coma. One attempt of overcoming such issues was by implementing an Electronic Patient Monitoring System (EPMS) and Electronic Dispensary Tool (EDT) that were linked to all health facilities in the country, instead of reliance on either patient's explanation or his/her hardcopy of identification document.

4.2. Moments of translation

Through the moments of translation, interactions between patients and health practitioners were examined. This was to gain better understanding of suitability and transformation of the current *status quo* to era of mobility of service within the Namibian healthcare environment.

4.2.1. Problematization

The activities of the healthcare sector were initiated, problematized through two primary channels, patients and government (MoHSS). The patients problematize an activity through consultation or illnesses, which often varies. While the other focal actor, the government does same, problematize its healthcare-related activities through the MoHSS.

Patients or their representatives (relations/guardian) visit, or are taken to healthcare facilities for various health conditions, which are recorded by the front-office professionals, nurses or administrative assistants. Procedurally, the nurses escalate the incidents to the appropriate or respective specialists for further and more detailed attention. Another criterion that was used for the referral of patients was language, to enable communication and gain an understanding between human actors (patients and specialists).

The government problematizes all initiatives relating healthcare in the country through the Minister of health. The Minister further problematizes the initiatives to heads of units and departments of agencies and organization within the health sector in the country. This was often done through workshops and strategic meetings of stakeholders, which include government representatives, health practitioners and community members. However, some of the initiatives were not always filtered down to districts and rural communities, where they were considered to be most needed. *According to one of the participants, to the best of my knowledge, there are no specialized facilities in the rural communities that focus on care of HIV*

patients. Healthcare service providers are stationed at different locations of operations, which are far apart, of about 150kms on average. Nomadic people are therefore forced to seek healthcare from the nearest location where service is available.

There was a national policy which was intended to address the challenges of patients who were 'on-transits' within the country. In the policy 'on-transit' was defined as a maximum duration of three months stay in location other than an individual's original or permanent residence. One of the implications was that, a patient who exceed the prescribed period may be denied the privilege that the on-transit healthcare service offers. Also, to receive medical attention while on-transit, a patient require a letter or medical passport. This requirement was intended to grant practitioners legal access to the patient's medical information, which includes previous diagnoses, treatments, prescriptions or medications. This was critical as many healthcare service providers remain adamant on this requirement before they can provide service, irrespective of the illnesses. According to one of the health practitioner, *legally, it was wrong for us to provide service to patients who had no medical passport*. The challenge was that many people inevitably loss or damage their medical passport over a period of time. Also, some people do not always have their medical passport with them, because health conditions, incidents or accidents are not always predictive. Even though the medical passport was replaceable, the process was not real-time. As such, it delays treatment to the patients. The situation is worst, if the incident is severe. The challenges and other activities that were involved in the provision and receipt of healthcare draws and defines various interests from the actors.

4.2.2. Interessemment

In the process of providing care to individuals and groups, actors had different interests, which were in two main categories, healthcare service recipients (patients) and providers (practitioners). The interests were in diverse nature, even though the common goal was healthcare service delivery.

The interest of the healthcare recipients was influenced by three factors, which include proximity, type of health-related service that was required, and the affordability of service. Proximity was a hindrance to many of the people who lives in the rural areas of the country. The healthcare facilities were far apart from each other. As a result, only few options appeals to those who needed attention for their health conditions, such as HIV. Thus, some patients who needed to get their Antiretroviral (ARV) medications from healthcare facilities were challenged in doing so. One of the patients explained, *'I am not regular and consistent with my medications because I don't always have access to them due to logistic challenges'*. Also, due to the

fewness of the facilities and practitioners or specialists, it was difficult or impossible to access specialists and certain services.

The interest of MoHSS was primarily about government political agenda that was tagged social responsibility rather than healthcare at various levels and locations. Based on the power bestowed on MoHSS, they set themselves up as the focal actors. Thus, created obligatory passage point (OPP), through which they restricted and controlled the activities of both private and public healthcare service providers. Also, although the MoHSS had directorates and divisional managers, which were mandated to oversee the execution and management of healthcare facilities, little or no results were being achieved mainly because of the restriction and control.

Many of the healthcare service providers had personal interests in the course of their duties. These interests were more of self-development, financial incentive and job security. Healthcare service providers enjoy different types of benefits while carrying out their practices. The types of benefits were influenced by the locations and the responsibilities that the practitioners were assigned to. Some of the benefits included flexible and shift working hours, housing subsidy, and free medical aid to their families. According to one of the participants, *'because I was posted to rural area of Okakarara, I was rewarded free medical aid to members of family'*. From responsibility perspective, due to shortage of health personnel, many of the practitioners had the opportunity to be exposed to different health-related cases, which were ordinarily out of their scope. One of the nurses explained, *'in the 11 years of my service, I have never been involved in surgical operations until now. I have learned so many new things since I came here in Otjiwarongo'*.

ICT solutions were used differently by the healthcare facilities, to support parts of service delivery, such as diagnostics and documentation of individual and group's records. The use of ICT artefacts was also influenced by the interest of the users. The interests were informed by their technical skill and know-how of the technologies. Another factor was whether the technologies were supported, for use in the environment that they were deployed, to enable healthcare services in the Namibian environment. As a result, many of the practitioners anchored their interests on paper-based processes, which they were more comfortable with, for service delivery. The various interests enacted the different networks that existed, whether consciously or unconsciously formed.

4.2.3. Enrolment to the networks

Through various strategic plans and initiatives, both health practitioners and patients were encouraged to participate in health-related activities and programmes in the country. This process began with a primary

agent, the MoHSS management who created an OPP through which they imposed their will on the healthcare service providers. This was in attempt to achieve a common goal, and politically driven agenda in the country. The other objective was to encourage participation of key stakeholders, which was to determine the success of healthcare initiatives in Namibia. According to one of the employees, 'we are always going for training because of the frequently changing needs and objectives. As a result, some of our colleagues are frustrated and loose interest in their duties'. However, participation was always a challenge, as a result, definition of roles and responsibilities were seen as critical.

The MoHSS defines the regulations, roles and responsibilities to healthcare providers, and standardized service delivery at public healthcare facilities. This process centred on negotiation, which was tied to aligned interests of the different networks. The process was challenging in that it was always lengthy and difficult, and conflicts arose as a result. Some of the challenges were manifestation of the different cultural background, interests and administrations, such as record keeping. For example, some patients had relocated to different location, and others had lost their medical passports, and they needed medical attention but their precious records could not be traced.

Even though health services were considered essential and critical, some patients would not enrol in the health-related programmes, or reluctantly did so. This challenge was prevalence in the rural parts of the country. Many of the community members cited reasons for their lack of participation in the health-related programmes, which included lack of accessibility, language barrier and lack of affordability. According to a participant, 'many members of the community are not literate enough to understand the messages being communicated due to language barrier'. Inscription occurs in that the primary interest of MoHSS at different healthcare facilities was to provide efficient services to all, including nomadic patients. However, due to arising aligned interests, there was a need to maintain and manage the networks. Each of the networks requires mobilization for stability purposes towards improvement of healthcare service delivery.

4.2.4. Mobilization

Due to the essentiality of healthcare services in the country, it was vital for some individuals and groups from both MoHSS and the community to mobilize healthcare service providers and recipients towards a common goal. During mobilization, some actors were assigned the role of new initiators by becoming delegates or spokespersons for the focal actor [40]. In this case, hospital matrons and supervisors at different healthcare facilities tried to mobilize their colleagues to actively participate in the networks, in the provision of

care to the patients. This contributed to stability of the processes through which healthcare services were delivered in some communities, particularly in the urban areas.

As a result of stability, which occur through adequate services, more patients became spokespersons to different healthcare facilities, informing others of the good service that they received from certain doctors or nurses. The self-appointed spokespersons encouraged others with the same or different health conditions to seek healthcare services from designated locations of their preference. Also, the attitude and tribal inclination were the others factors that influenced mobilization of patients. For example, some patients recommended to others, to visit or seek assistance from health facilities where majority of the health practitioners were of their tribal origin and spoke the same language as them.

5. Mobility of healthcare services in Namibia

From the analysis, six factors were found to be of critical influence to mobility of service towards improving healthcare in the Namibian community. The factors include: (1) ICT artefacts; (2) Categorization of Patients; (3) Response Time; (4) an Understanding of the Actors; (5) Actors' participatory to service delivery; and (6) Actors' Alliance. Based on the findings, a Framework was developed, as shown in [Figure 1](#).

From the interpretation of the Framework, three Models, [Figures 2–4](#) were developed. The models are intended to aid mobility of services, to improve healthcare delivery in the Namibian environment.

As shown in [Figure 1](#), the entire process of the Framework consists of three main actors, (1) people; (2) technology; and (3) procedures, in the delivering of healthcare service. ANT's moments of translation process was used to guide the analysis of the data. This includes how networks were defined and formulated, which helped to identify the groupings and alliance of the actors. The process began with the main actor who defines roles and responsibilities through problematization of the activities. This was done by localization of the events, so as to foster relationship, and get more and regional actors to be interested, and partake in the initiatives.

The employment of technical personnel was primarily to address healthcare challenges in the communities, for a better society. However, it was the MoHSS who had the power to employ healthcare providers and extend their provision of services to different levels of operations. This signifies authority, to define procedures of service delivery. This includes change to the national policy, which guides the management of patients on transit, or implement an Electronic Patient Management System (EPMS) at healthcare centres. By so doing, associations of

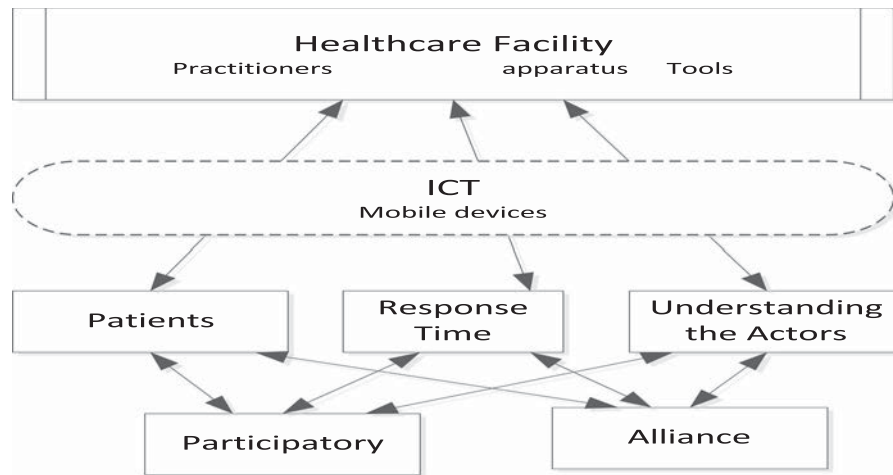


Figure 1. Mobility of services for healthcare.

technical and non-technical actants were seemingly strengthened.

Moreover, the mobility of healthcare services was enabled, and at the same time constrained within networks, such as community and facilities. Both the enablement and constraints were manifestations from actors' actions, which were often based on individual or group knowledge and access to resource. Mobilization is necessary to educate and inform actants about the available services. Patients need to know about their rights to health services at all levels and locations.

5.1. Categorization of patients

Categorization of patients was found to be significant, due to the different types of healthcare services that were required and provided to the patients. There were two main categories, demographic and indexing:

5.1.1. Demographic

The actors required profiling into demographic, in terms of networks creation. The different networks that were formed in the context of health challenges, included gender, spoken languages, cultural affiliations and patient locations. The categories were useful and help in three main ways, mobility of service for health facilities, allocation of practitioners, and referral to specialists:

- (a) Mobility of service for health facilities – this was to ensure and guide how health facilities can be distributed, in accordance to population density, needs and locations.
- (b) Allocation of practitioners – as revealed, not all patients were willing to receive service from any practitioners. For example, some male patients will not allow female practitioners to carry out diagnosis on them for cultural reasons.

- (c) Referral – it will make it easier to refer patients to specialists irrespective of their physical locations and spoke language.

5.1.2. Index key

Indexing of patients' records are critical for accessing and tracing purposes. This therefore enable searches, by using different indexing keys, such as spoken language, tribal origin, current location, and diagnoses. This helps to improve response time for service delivery.

Some patients could only enrol in the networks where their home language (preferred language) was used as the medium of communication. Even though interpreters were readily available, they preferred to express themselves rather than the use of translator. Also, enrolment in the networks by patients in some parts of the country was influenced by their culture. *According to one of the people that participated in this study, 'my tradition prohibit a person of opposite sex from touching my body, this means that I cannot be medically treated or examined by female practitioners. This view was echoed by two other, a male and female participants'.*

5.2. Response time

From the data analysis, *response time* was found to be a crucial factor in healthcare service delivery across the country. The factor became more critical as patients travels long distances to get care, and the number of nomadic people increases. Response time was further viewed from two perspectives of significance, in the mobility of healthcare services in Namibia. The factors include the impact of bureaucratic process and lack of real-time access to medical data:

5.2.1. Bureaucratic process

The process of initiating medical attention requires mandatory completion of forms, identification of

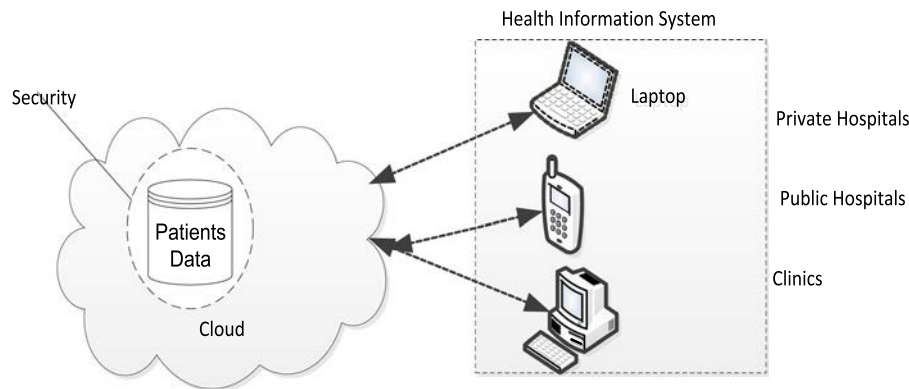


Figure 2. Patients' data in the cloud.

patients and health passport. This process was considered to be too bureaucratic for healthcare-related incidents, especially during emergency including life-threatening conditions. This type of situation can be more challenging in rural areas, and worst, when there is no next of kin to provide relevant information about the patient.

5.2.2. Real-time data

There was lack of real-time access to patients' records from the health facilities. This means that there was no immediate terms of reference. Also, not all patients could provide accurate information about their health conditions. As a result, it was difficult for healthcare providers, to access previous diagnoses and prescriptions, in providing services to the patients.

The interpretation of the findings is that the bureaucratic process and lack of real-time access to patients' medical data have a negative impact on service delivery. One of the implications is that overdose can be given to patient, which can cause more harm including deaths. Based on this interpretation and findings from the data analysis, a model (Figure 2) was developed, to help improve healthcare service delivery through cloud computing solution.

Cloud Computing – the model (Figure 2), depicts the use of cloud computing solution to store and access patients' data for healthcare-related activities in Namibia. Armbrust et al. [41.p.1] refer to cloud computing as *both the applications delivered as services over the Internet and the hardware and software in the data*

centres that enable and support the services. This allows specialists to store and access patients' data from Private and Public hospitals, including clinics, by using different computing devices, such as laptop, mobile phones and desktop. The architecture model (Figure 2), using the cloud solution, to enables practitioners to have real-time access to data for the services that they provide to the patients.

5.3. Understanding the actors

An understanding of the actors is significant, to ensure usefulness and appropriateness of types of care that are delivered to individuals and groups with the same or different diagnosis. Only through an understanding of the actors, mobility of service can be ensured in improving healthcare in Namibia. Thus, an understanding of the actors was examined from the perspectives of awareness and technology know-how:

5.3.1. Awareness

The healthcare providers and patients share responsibilities in the ways in which care are or can be provided and received. Both practitioners and patients' responsibilities are often influenced by their levels of awareness. For example, as revealed in this study, some health professionals performed their duties based on personal benefits rather than on the basis of professional ethics and obligations. Also, some patients have preferred healthcare facility over another, which was often influenced by their personal interests, such as cultural

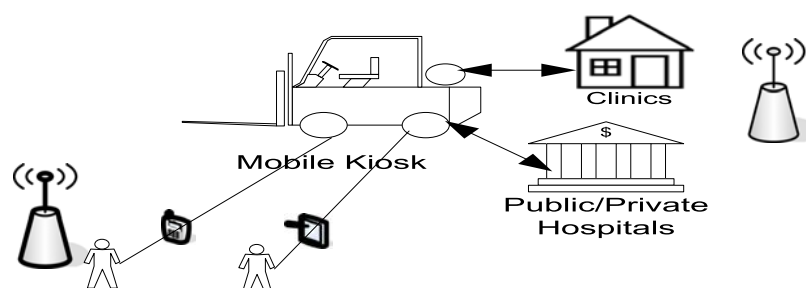


Figure 3. Mobile kiosk for healthcare.

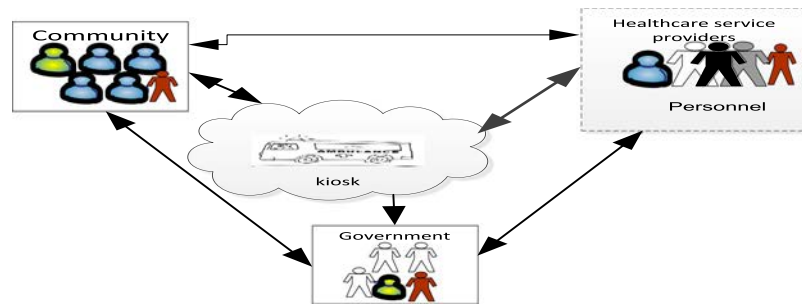


Figure 4. Aligned interest of healthcare actors.

affiliation rather than the types of illnesses, proximity to facilities or availability of specialists.

5.3.2. Technology know-how

Healthcare providers make use of the technologies that they were familiar or comfortable with rather than what is most or best suitable for the task being performed. For example, some practitioners could hardly use computer systems to capture or access patients' data, to improve security, access and manageability of patients' data. This was potentially detrimental to patients, due to inaccuracy of data, while applying manual process.

The lack of awareness and technology know-how do sometimes have detrimental implications for patients' lives. However, this can be addressed through mobility of service, by using mobile kiosk model (Figure 3). The use of mobile kiosk helps to improve proximity and ease of access to care, due to its mobility, from one location to another. Also, as the kiosk move between locations, it could assist patients to garner more information that are offered and available in the different facilities, which they didn't have the privilege to access.

As shown in the model (Figure 3), mobile kiosk is equipped and enabled with necessary ICT artefacts, such as connectivity to base stations, which can be used to connect and access patients' data from any location, and at any time. The kiosk is expected to move within cells (geographical location covered by base stations), so that it can be used to access, and be accessed via mobile devices from other facilities (hospitals and clinics) in any locations. According to Haeberlen et al. [42], mobile devices include microwave ovens, Bluetooth devices, and cordless phones. However, personnel at the hospitals and clinics need to have the know-how on the use and operability of mobile devices in attempts to accessing the mobile kiosk.

5.4. Actors' participatory to service delivery

Human actors include both health practitioners and patients, who were involved various activities in order to ensure provision and receipt of health service

delivery. Lack of participation from either practitioners or patients derails healthcare service delivery. This was primarily because actors drew from connection, relationship and interaction that happens among them, to complete a service. Through participatory process, mobility of service for healthcare are essentially ensured within the Namibian environment. The connection and relationship between individuals and groups was enacted by different tools and devices, to enable and encourage participation in the MoHSS initiatives on health-related programmes, across the country:

5.4.1. Connectivity of actors

Connectivity fosters actors' enrolment in the mobility of healthcare services. As shown in Figure 3, both healthcare service providers and patients need to have software application on their devices, which enables them to access the mobile kiosks for service purposes. The application should be symmetrical, in that it has to be users' friendly, to ensure usefulness to both literate and illiterate patients, from any location including rural areas, and impromptu times.

5.4.2. Interactive system

The interactive application establishes a step-by-step conversation between the caller or patient and the system in the kiosk. The application is therefore intended to scrutinize calls from the communities, thereby narrows the requests or inquiries towards specific need of the callers. This is purposely for efficiency and effectiveness of the mobile kiosks, towards improving response time in providing service to the community.

5.5. Actors' alliance

Individuals and groups formed formal and informal alliances, through conscious and unconscious actions. The alliances were significantly helpful in understanding the challenging factors in the quest to providing healthcare services to various communities in Namibia. Some of the alliances manifested from collaboration and political affiliations:

5.5.1. Collaboration

Mobility of service for healthcare requires collaboration between community members and healthcare providers. The collaboration has to be driven by an individual or group of individuals that are influential in the community, for mobilization purposes. However, it is a collective responsibility of all that are involved in the mobility of service in the drive to improving healthcare service in the country. Also, the collaboration should happen at different levels and networks, such as community members, health practitioners, and the government (MoHSS).

5.5.2. Political affiliation

Based on the findings, it empirically correct to say that the mobility of service for healthcare in Namibia was endangered by tribal preferences. This manifests from political affiliation of individuals and groups. Political inclination has potentials of influencing mobilization of actors, to participate or not participate in the initiative of healthcare services. Political inclination is critical as some actors are heterogeneous in the networks, as shown in [Figure 4](#), a model to guide aligned interest.

Social networking approach helps to bring all actors together, in fostering mobility of service for healthcare in Namibia. According to Dwyer et al. [43], social

networking is a type of virtual community that has grown tremendously in popularity over the past few years. Significantly, social networking has no boundaries, in terms of spoken language and tribal origin. It brings people of common interest together into the same network.

Another important factor of social networking is that, an individual can be heterogeneous, which means that the individual belongs to more than one network, as shown on [Figure 4](#). In such instance, the actor is able to influence and connect different networks which he or she belong to each other. This helps to eradicate or silence tribal or political inclination, which has potential to derail common goal, mobility of service for healthcare.

6. Implication for healthcare management practice

The lack of mobility of healthcare service in the Namibian environment have implications for health management practice, the society and economy, towards healthcare development and general growth of the country. Based on the findings from the data analysis as presented above, there are five main factors, which have implications health management practice in the country. The factors are sparse distribution of medications; insufficient facilities to cater for patients' care; shortage of medical practitioners; Lack of centralized access to patients' records; and Low investment on healthcare facilities. As shown in [Table 1](#), the factors have an impact on the society, which subsequently affects the health sector and the general economic growth of the country.

As summarized in [Table 1](#), lack of mobility of service for healthcare have implications for improvement of healthcare and economic growth of the country. There exists complex relationship between health practice and economic growth of an environment. In the context of this study, the relationship affects the management of health practice from the perspectives of, distribution of medications to the health facilities, which influence service delivery and standard of living [44] and access to care. The most affected areas are communicable diseases such as HIV/AIDS, malaria and tuberculosis, which require regular and consistent care and use of medications. Such delay has a negative impact on economic growth of a country [3]. Disparity in the healthcare environment can be caused by shortage of facilities and medical practitioners, which affects the economic growth in developing countries [45], such as Namibia. Also, lack of investment on health infrastructure affects primary health care network and service delivery [16].

Table 1. Implication for development.

Health factor	Society	Economic Growth
Sparse distribution of medications	Sparse distribution is often influenced by imbalanced caused by patients' categorization. Slow response time increases patients' waiting period for medications, which sometimes result to more complications of health conditions.	Actors' participation in the provision and receipt of health services influence the type of delivery. More sick leave days have implications, such as cost and low productivity on the employers.
Insufficient facilities to cater for patients' care	Some patients are not able to travel long distances to seek care. This can increase mortality rate.	Affects population growth, resulting to shortage of workforce. Also, increases orphanages, which increases government spending on social security (grant).
Shortage of medical practitioners	Increases the ration of patients to practitioner, which affects the quality of care that patients receive. This is also influenced by actors' alliance.	Have impact on workforce. Increases financial spending on medical aid scheme because patients are compelled to visit or consult with private health facilities.
Lack of real-time access to patients' records	Delay in response time can lead to complications of patient's health conditions.	This affects workforce, sometimes lead to loss of employment, as a result of deterioration in patients' health condition.
Low investment on healthcare facilities	Patients travel long distances to seek care, which could be addressed by mobile kiosk.	Shortage of investment affects infrastructure development, which in turn have impact on growth.

7. Conclusion

This paper presents a critical analysis of the role and account of actors in the mobility of healthcare services in Namibia. The analysis is of vital importance to Namibia, and other countries that might have similar settings and challenges, in that it unveils issues that the State governments and many healthcare professionals are not aware of, or do sometimes take for granted. The paper contributions are from three perspectives: First, it contributes theoretically, through its addition to existing literature on how ANT can conceptually enrich the practice of health practitioners through better understanding of actors' activities. Second, it methodologically advances the use of ANT in both IS studies and health informatics. Finally, the practical contribution comes from the framework and models that were developed, which can be used to guide health-related programmes and facilities, towards providing services to patients in every location of the community.

This paper can be used as a foundation for further studies, such as an investigation on how implementation of mobility of healthcare service can be executed. These types of studies should focus on developing countries, where the use of mobile technologies for healthcare services seem to be more critical and needed.

Disclosure statement

No potential conflict of interest was reported by the author.

Notes on contributor

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