

# **Health Informatics and Brain Drain Mitigation in Ghana**

*Completed Research Paper*

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## **Abstract**

Migration of health workers has been a major issue of concern for most developing countries including Ghana. Extant literature has revealed that several attempts have been made from various disciplines to counter this menace in some developing countries. In this paper, the field of Information Systems (IS) tries to uncover how technology can also be used to mitigate brain drain in the health sector of developing countries, using Ghana as a case. This study adopts the theory of affordance, Maslow's theory of motivation, and Herzberg's Two-Factor theory to support the development of a conceptual framework. An exploratory research approach using a qualitative research method was adopted. Theoretically, this paper contributes to the IS literature on migration. Practically, the paper presents a basis for more technological adoption within the health sector of Ghana and other developing countries that experience medical brain drain as a challenge.

## **Keywords**

Health Informatics, Brain Drain, Developing Countries, Migration, Healthcare Technologies

## **Introduction**

The Ghanaian health sector continues to struggle with a deficit in critical health workers (Adogla-Bassa, 2017). As in many Developing Countries (DCs), the migration of healthcare professionals, especially doctors and nurses, remains a development challenge in Ghana. For instance, there is an estimated 56% and 24% Ghanaian trained doctors and nurses respectively working in the developed countries (Acheampong, 2013). Some recent specific statistics also revealed that 2289 Ghanaian health workers were found under the United Kingdom's (UK) National Health Service alone (Adogla-Bassa, 2017). Other statistics over the period have similarly indicated the alarming rates of migration among health professionals in the Ghanaian health sector. Although a number of studies have been conducted from other disciplines including Public Health (e.g. Chatziprodromidou, Emmanouilides, Yfanti, Ganas, Roupas, Varsamidis & Apostolou, 2017), Management, Migration Studies (Boadi, 2015), etc. to tackle healthcare professionals' migration in the health sector, none has been done in the field of IS.

Studies on Health Informatics (HI) over the years have addressed several diverse issues ranging from lack of specificity of scope (Parthasarathy & Steinbach, 2015) to disease prevention (Hoque, Bao & Sorwar, 2016). In DC contexts, for instance, most research publications on HI have focused on challenges, and factors influencing HI adoption (e.g. Bedeley & Palvia, 2014). Yet, none of these studies, from both developed and developing country contexts have been able to explain how HI could be used to address brain drain in the health sector, a gap that this study seeks to fill. As noted by Hoque et al. (2016), the

adoption of ICTs in the health sector of DCs can accelerate knowledge diffusion and increase access to health information. However, knowledge diffusion, especially tacit knowledge and experiences, within the medical field in DCs end up in the form of brain drain (Ozden & Phillips, 2015). To mitigate this challenge, this study attempts to fill the gap in both literature and in practice by adopting the theory of affordances (Gibson, 1986), in addition to the Maslow's theory of needs (Maslow, 1989), and the Herzberg theory of two factors (Herzberg, 1989) to answer the major underpinning question: "how can HI resolve Ghana's brain drain problem in the health sector"?

The paper is divided into five sections. Section one covers the introduction of the paper. In section two, we contextualize HI and its possible relationships with brain drain from a DC context, drawing inferences from existing literature. Section three presents the framework and methods for the research. Section four presents the case findings and analysis of the case studies. Conclusion and directions for future research are presented in section five.

## **Conceptualizing Health Informatics and Brain Drain**

The concept of HI is concerned with the application of information science methods to collect, store, analyze and understand healthcare information. This includes diagnosis and tests, procedures, and case management recommendations for improved problem solving, and decision making (Parthasarathy & Steinbach, 2015). Electronic Health (e-Health), Health Informatics (HI), Healthcare Information Systems (HIS), Telemedicine, etc. are just a few of the variations used in literature to connote the connection between technology and its applications in the healthcare sector. Parthasarathy & Steinbach (2015) note that HI-assisted interventions have even become more popular in the early detection, treatment and management of some diseases such as diabetes, cancer, mental health, etc. which are derived from both population statistics and expert knowledge. Knowledge management capabilities embedded in HI are also able to facilitate the integration and interoperability between previously disparate knowledge repositories within different units of a healthcare organization (Bose, 2003). In Bose's view, care recommendations made by systems are based on best practice knowledge, evident in the fact that clinical knowledge makes use of both literature and practice-based evidence, as well as personal experiences to make site-specific clinical decisions. However, health workers who are trained from DCs to possess peculiar knowledge from both literature and practice-based evidence within the local contexts usually migrate to the Western world resulting in 'brain drain'; a situation which is viewed with so much unease due to its impact on socio-economic development. Bushnell & Choy (2001) described "brain" as any skill, competency or attribute that is considered an asset; and described "drain" as the rate of exit that is greater than the normal rate. Chatziprodromidou et al. (2017) also defined brain drain as "talent export" and "intelligence export".

### ***Brain Drain in Ghana's Health Sector and Other Developing Countries***

The migration of healthcare professionals holds a prominent place in literature and has consequently generated a lot of emotions and controversies as the "impact of medical migration", especially of African doctors to the developed world Ozden & Philips (2015). The Ghanaian health sector is not immune to this phenomenon as it ranks 15th of the countries that contribute most human resources to the UK's National Health System (Adogla-Bessa, 2017). Multifaceted reasons, including Economic, Political, International, Moral, Prestigious, Social, among others, have been assigned to the brain drain problem in Ghana (Morton, 2016). Other specific determinants of migration in the Ghanaian health sector also include wage differential between Ghana and the destination countries, the pursuit of higher education, skill improvements, family considerations, visits, etc. (Anarfi, Quartey, & Agyei, 2010). Through these, Ghana has lost more nurses to the UK, USA, and Canada than it has been able to train since 1999 (Triggle, 2005); and it will need not less than 38,000 Nurses and Midwives to fill the nurses-to-patient ratio which pegs 40 nurses to every 10,000 patients. Similar reasons such as completion of education, family considerations, social ties, love for home country, conditions or requirements of sponsorship, etc. have been posited as factors which cause the possible return of migrants into the Ghanaian health sector (Anarfi et al., 2010). Currently, Ghana is said to have 22 nurses to every 10,000 patients, and one doctor to about 10,450 patients (Adogla-Bessa, 2017), a ratio which is still far below the World Health Organisation (WHO) standards.

Countries including Nigeria, South Africa and Egypt have also contributed 5,040, 1,626, and 887 respectively to the UK's NHS alone, as of 2016 (Adogla-Bessa, 2017). Chatziprodromidou et al (2017) gave specific statistics of about 6000 medical doctors who migrated from the Athens Medication Association of Greece between 2009 and 2013, whilst more than 830 migrated in the first half of 2014. In Uganda, the Human Resources for Health (HRH) reported a severe constrain in their health sector with an average of one healthcare professional to 700 patients. This takes Uganda close to two times beyond the WHO crisis threshold which assigns one healthcare professional to 435 patients (Driessen, Settle, Potenziani, Tulenko, Kabocho, & Wadembere, 2015). In Sierra Leone, the entire medical population is made up of 136 medical doctors and 1017 nurses. This makes Sierra Leone one of the countries with the weakest health systems in the world with a doctor-to-patient ratio of one to 45,000 (Adogla-Bessa, 2017). Again, Ethiopia is also considered as one of the countries with the lowest health professionals-to-population ratio in the world (Abera, 2014). According to a WHO survey ranking in 2007, Ethiopia with a total number of 46,666 health professionals ranked 180 out of 190 countries with healthcare professionals' shortages. This figure translates into a physician-to-patient ratio of one to 42,706 (Abera, 2014). These sample statistics indicate that brain drain in Africa's health sector is leading to the "loss of hope and years of investment" (Ozden & Phillips, 2015).

### ***Health Informatics Competencies and Employment in the Health Sector***

Technological advancements have introduced a new dimension to healthcare delivery which has escalated the level of expertise necessary to assume healthcare IT roles (Custis & Hawkins, 2017). Two prominent disciplines, i.e. Health Informatics (HI), and Health Information Management (HIM) have emerged from the mix of e-health workers who are employed in the health sector (Gibson, Dixon & Abrams, 2015). HI workforce and its related competency-based issues are one of the major areas of interest in the field of HI. Some studies have sought to determine HI workforce shortages and its implications, as well as, skills and opportunities for the HI profession. A number of context-based studies for instance, including USA, Canada, Australia, Nigeria, Kenya, Libya, etc. have identified challenges involved in the management of HI workforce shortages (Al Kiyumi et al., 2015). The authors revealed specific reports from the USA and Canada which indicated the need to increase HI workforce to about 40 percent if IT adoption in the health sector continues to grow. In DC contexts, Hersh, et al. (2010) noted that it is critical to determine the skills and competencies that are consistent with the culture, language, and health systems within a particular context in order to fully realize the benefits of any HI implementations. Although there has been very little evidence concerning the best competencies and skills required across roles, healthcare organisations are facing a hard time identifying and retaining competent and versatile human resources in the health sector (Varri, Blake, Roberts, Fenton, Cleary, Zacks, Datta, Kaye, Parker, Nguyen, Dougherty, Barry & Cunningham, 2016). Hence, the deliberate collection and retention of competencies can also be a useful starting point for the improvement of the HI skill shortages and increased adoption of HI applications in the health sector of DCs.

## **Conceptual Framework**

Information technology has been identified as one of the major elements for effecting change in the health sector. Hence, there have been calls by researchers to study technology affordances as a way of understanding technology-enabled social change (Pozzi, Pigni, & Vitari, 2014). The theory of affordance, as originally used by Gibson (Gibson, 1986) in ecological psychology, has found its application in numerous fields, including the renewed attention in IS literature (Leonardi, 2013). Strong et al., (2014), for instance, applied the theory of affordance to develop a mid-range theory to reveal the affordances that exist as relationships between healthcare professionals and Electronic Health Records (EHR) systems. Similarly, in this study, healthcare professionals are represented as actors to emphasize the active role of humans and their interaction with the IT artifact (Health Informatics); which is also characterized by its features; as well as an organization (Healthcare Institutions) which has expertise and goals. According to Strong et al. (2014), the three factors that can constrain individual actualization journeys in the health sector include actor characteristics (e.g. poor/excellent HI skills and competencies of healthcare professionals, motivated/demotivated staff, etc.); features of the IT artifact (e.g. complex/user-friendly features of the HI System); and the organizational context (e.g. incentivized/disincentivized working environment). In their view, although affordances exist as potentials, some actors, or some HI features, or some organizational contexts may not be ready for actualizing them.

Since the three factors outlined by Strong et al. (2014) play such an important role in perceiving and actualizing affordances, it was imperative to consider the theory of human needs and motivation as part of this study to establish a relationship between motivated actors within the health sector and how this relationship affects their level of perceiving and actualizing affordances. This can then be translated into how these affordances influence employee churn out and migration rate in the health sector. The theory of human needs is a very useful model in understanding and addressing the physical and emotional needs of the individual (Maslow, 1989). In addition to the theory of human needs, the Herzberg’s two factor theory (Herzberg, 1989) which indicates that staff stimulation consists of incentives, which are related to the purpose and nature of the individual’s work; and disincentives which are mainly related to the working environment of the individual, was also employed in this conceptualization. These perspectives provide a holistic view of both the human and environmental factors that contribute to the technological affordances that are experienced by healthcare professionals. By extension, the study delves deeper into Pozzi et al.’s (2014) affordances theoretical framework by incorporating the theory of human motivation and Herzberg’s two factor theory to determine its effect on an affordance cognition process. Figure 1 explains the conceptual framework for this study.

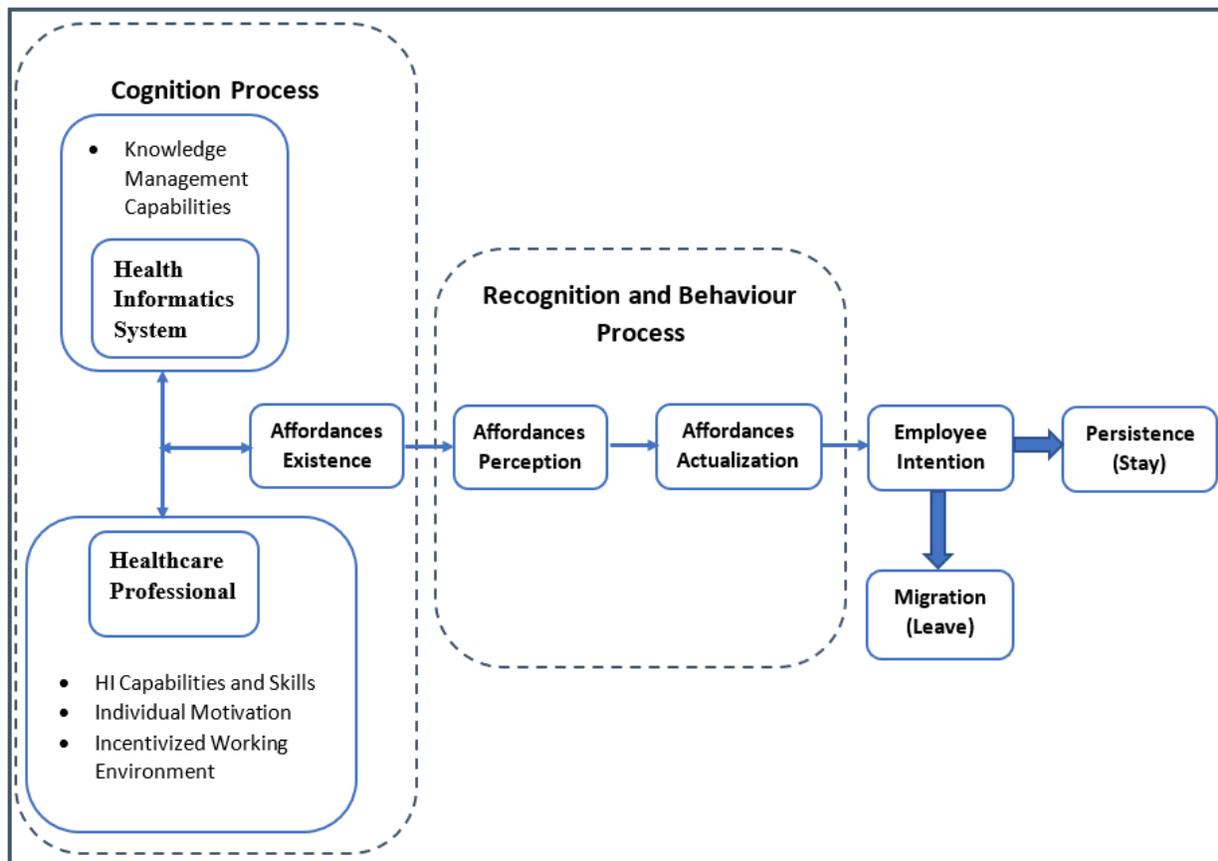


Figure 1: Conceptual Framework

## Methodology

### Research Design and Approach

The paper adopted an exploratory research, using a qualitative research design in order to obtain rich experiences and insights into what influences medical professionals’ migration, and how technology and other motivational factors can play a role in mitigating it. There was also a strong case for using a case

study approach for this study since case studies are usually used for exploring and understanding the complex and localized human activity systems and social environments (Yin, 2003). According to Boateng, Molla, Heeks & Hinson (2011), there is no universally acceptable number of cases for a case-study research, hence a case study could be based on either a single case or multiple cases. This paper is therefore based on evidences from one government hospital in Ghana.

### **Data Collection**

Data was collected over a period of one-month. It consisted of personal interviews with 9 medical doctors and 20 nurses from the hospital under study. The design of a data collection instrument was guided by the research questions, literature review, and the conceptual framework of the paper. The paper adopted semi-structured interviews for obtaining the data. Interview questions were modified based on employee roles and the level of interaction with the HI system in the hospital. Interviews consisted of open-ended questions about health professionals' migration intentions and considerations before and after the HI implementation. Interviews were recorded electronically with the permission of interviewees.

### **Data Analysis**

Interviews were transcribed and analyzed qualitatively. According to Seidler (1998), qualitative data analysis is a process of noticing, collecting, and thinking about interesting 'things' in the material. 'Things' in this research were related to the skills and competences of healthcare professionals and their interactions with the HI system; their personal motivation; motivation from their working environments; the affordances given them by the healthcare technologies, etc. Damtew & Aanestad (2012) describes the qualitative data analysis as an iterative process since it keeps repeating itself. Major themes that emerged from these iterative processes were interpreted and discussed with the aim of answering the major underpinning research question. Results from the analysis were presented in both descriptive and narrative forms.

## **Case Findings and Discussion**

### **Demographics**

The 29 healthcare professionals that were interviewed consisted of 9 medical officers, 17 nurses and 3 administrative staff. Out of these numbers (i.e. 12 males and 17 females), 25 of them were between the ages of 20 and 40. Only 4 respondents were above the ages of 40. The number of years worked was also taken into considerations since that could also inform one's decision to migrate. In reference to that, none of the respondents had worked for more than 25 years. Rather, 6 respondents had worked for up to 5 years, 5 had worked between six and ten years, 9 had worked between eleven and fifteen years, and two had worked between sixteen to twenty-five years.

### **HI Related Factors – Interaction with HI System**

The HI System in use at the Hospital under study was known as the Axon Electronic Medical Record System (AEMR). Most interviewees attested to the benefits of the system based on their interactions with it. From the clinical perspective for instance, most of the medical professionals gave diverse responses based on their roles and levels of interaction with the system. Some responses included:

*“(1) it helps me to capture clinical notes. But sometimes you can't carry the computer around for notes taking so I sometimes note them on paper and later key the information into the system” – nurse 1; (2) “It makes it easier for me to work because all the patients are now in one place, and at a click of a button, you can have access to all your notes. The only problem I have is that, it can sometimes go off whiles you are working; apart from that, I can say it is really helpful” – nurse 2; (3) “It gives me easy access to information” – nurse 3; (4) “I attend to patients on the system, I think it's supportive – doctor 1”; (5) “the system makes it somehow easier, the only problem is the typing” – doctor 3; (6) “the system has improved the accuracy of our data and prevented leakages – Administrator 1; (7) “the system has helped to increase our revenue since*

*we don't spend much on other logistics again, but it is cumbersome, and erratic in nature" – Administrator 2;*

The common challenge that was eminent at all levels of engagement with the system was network connectivity issues and system downtimes which were experienced once in a while. However, this didn't seem to be a major concern for them since they felt the advantages far outweighed the challenges.

### **Non- HI Related Factors – Capabilities and Skills**

According to Gibson, Dixon & Abrams (2015), the increased adoption and use of technological systems in the health sector have consequently raised new breeds of health workers who are capable of performing both clinical and administrative, as well as technological roles within healthcare institutions. In view of this, the IT competences and skill levels needed to interact with the HI system were tested among healthcare professionals in this study. Some responses included:

*(1) "I think one needs normal computing knowledge to be able to use the system; (2) "my HI skills are quite good, and it's because I have prior knowledge in computing"; (3) "I have the user abilities to work with the system". Some other professionals also mentioned their weak user abilities by indicating that (4) "My computing skills are not too good, and even typing is a challenge". Others responses also included (5) "my skills are okay, just that I'm scared to make mistakes sometimes"*

### **Knowledge Management**

From the interviews, health professionals admitted that the EMR gives them the opportunity to learn from what others have done in the past, which also enables knowledge and experience transfers as explained by Wu and Hu (2012). A medical officer indicated that:

*"Yes, the system gives one the opportunity to learn about what others have already done, especially with respect to patient's information since their past history can be retrieved from the system like how it was done with the manual folder system. But in medicine, we have standard practices that we follow, so what works for patient "A" may not necessarily work for patient "B" due to a whole lot of genetic and physical variations. However, since every consultation and medical case is recorded in the system, it can always be retrieved. Besides, the ERM is more secure than the folder-based system in terms of patient information, so one can be certain of getting any information at any time".*

This assertion confirms Bose's (2003) view in literature which indicates that care recommendations made by systems are based on best practice knowledge, which is also evident in the fact that clinical knowledge makes use of literature and practice-based evidence, as well as personal experiences to make site-specific clinical decisions.

### **Affordance**

Affordances in the context of IS have been described as the intersection of IT and organizational systems (Zammuto, Griffith, Majchrzak, Dougherty, & Faraj, 2007). Relating this concept to a practical situation, this study sought to identify the affordances that emerged from the hospital's interaction with the ERM system to ease the tasks of healthcare professionals. Some common responses that came out included:

*"(1) Information capturing (2) records keeping; (3) easy access to patient information since it can even be accessed on mobile devices; (4) patient clerking (i.e. documentation of patient history before treatment); (4) standardization of work data; (5) improved clinical decision making, (6) coordinated hospital activities; (7) improved data security; (8) monitoring patient's movement and (9) monitoring organizational operations including payments".*

The affordances identified in this study are similar to the EHR affordances identified and discussed by Strong et al. (2014). Although the majority of healthcare professionals seemed to be satisfied with all the affordances given them, one clinical staff wished the system could provide instant billing.

### **Motivation – Individual**

From Maslow's theory of needs, before an individual can be motivated to meet their self-actualization needs, they may have satisfied some basic, security, social, and self-esteem needs. From the interviews, the individual motivation of health professionals was influenced by a wide array of factors, most of which were in line with Maslow's theory of needs. These factors were themed as:

*“(1) love and passion for the work (2) freedom and flexible working hours (3) patient care and seeing the sick get well”.*

However, what seemed to demotivate health professionals included:

*“(1) low income, and (2) lack of adequate resources, including working tools”.*

### **Motivation – Organizational**

According to Herzberg's theory of two factors, staff stimulation consists of incentives which are related to the purpose and nature of the individual's work, and disincentives (including hygiene/maintenance factors) which are mainly related to the working environment of the individual. The study sought to find out if anything about the working environment motivated or demotivated staff to stay or migrate. Responses indicated that staff motivation from the working environment was categorized as:

*“(1) Friendly working environment, (2) military regimentation, (3) seeing the sick get treated. However, some staff members were also demotivated by (1) strict military supervision, (2) bureaucracy, (3) non-availability of resources, including working tools”.*

Again, the study sought to find out if the affordances given by the system played any role in motivating health professionals at the work place or not. From the responses, the ERM system played a very vital role in getting staff motivated to work. Some of the responses were captured as:

*“(1) Yes, the ERM plays a role in my motivation to come to work because it has dramatically reduced the stress of folder loss which was a major headache for us in time past – medical officer 1; (2) Yes, it makes work a lot easier – medical officer 2; (3) Yes, it has cut down waiting time – nurse 1, (4) Yes, because the issue of missing folders has reduced – nurse 2, (5) Yes, because of the easy access to information – Administrator 1.”*

From these views, it was established that affordances could lead to both individual and organizational motivation.

### **Employee Migration Intentions**

Although intentions may represent “mere words” rather than “true plans” in actual sense, according to Manchin & Orazbayev (2018), there was still the need to assess the migration intentions of the healthcare professionals. Hence, their intentions to migrate before and after the EMR implementation were sought. Conflicting and interesting viewpoints emerged as some health professionals experienced an improved system which adversely affected their intentions and decisions to migrate. On the contrary, some other health professionals also indicated that, they would migrate anyway with or without the system. Some of their responses included:

*(1) “No, I have none at all; I only want to visit abroad once in a while. Nothing has changed” – medical officer 1; (2) “No I don't have any migration intentions because of my family and my*

*social networks; for the system, it has eased me of my work pressures a lot but I don't think it would be a factor for me not to migrate if I really wanted to" – nurse 1; (3) "No I am just not interested in living abroad, the system hasn't really changed anything – medical officer 2.*

However, some did not have any migration intentions at all. For these professionals, the system had reinforced and affirmed their decisions to stay. For instance, a nurse indicated that:

*"I didn't have any migration intentions though, but the EMR has convinced me more to remain at post since it has made my work a bit easier now".*

The other set of health professionals who constituted 7 of the 29 interviewees who had migration considerations before and after the system implementation indicated that they would still want to migrate if they wanted to. For them, their considerations would rather be based on the prevalent socioeconomic factors, and not on the system. For instance, a medical officer indicated that:

*"I intended to migrate, and still intend to migrate due to the relatively low-income levels and the high cost of living in Ghana".*

Out of the 29 interviewees, only one healthcare professional in the hospital indicated that she had migration considerations in the past, but it has been greatly reduced because of how smooth the EMR is making her work. She noted that:

*"Yes, I had migration intentions but it has been greatly reduced because at least one bit of the stress is taken off; the stress related to patient care is taken off".*

## **Conclusion**

The study sought to answer the major underpinning question: "how can health informatics resolve Ghana's brain drain problem in the health sector?" by adopting the theory of affordances, the theory of human needs, and the Herzberg theory of two factors. The case findings revealed interesting viewpoints about the respective themes in the conceptual framework of this study and their relationships with healthcare professionals' migration in Ghana. From the study, it was evident that although the HI system was playing a very vital role in easing the pressures on healthcare professionals, as well as, granting them some affordances, their migration considerations were not solely dependent on the technology. Rather, their migration considerations were more dependent on the socioeconomic factors discussed by Chatziprodromidou et al. (2017), although they acknowledged the critical role played by the HI system. However, it was clear in the findings that if proper knowledge management is done with health informatics, there is an opportunity to retain and transfer some amount of clinical knowledge and experiences within the health sector even if professionals decide to migrate or change their working environments. Again, the narratives on affordances revealed that HI-related affordances can serve as both individual and organizational motivating factors that can influence healthcare professionals' migration considerations if those affordances are actually managed well.

Since much has not yet been done on migration in the field of IS, researchers are encouraged to conduct further studies and generate new insights into how and when technology can be a major contributing factor in curbing brain drain, especially in DCs. We also acknowledge the limitations of this study as conclusions were based on only one case. Hence, recommendations are being made for other researchers to investigate the problem using multiple case studies, as well as longitudinal approaches to present a better perspective on health professionals' migration intentions. Research could also be conducted in other contexts such as public healthcare systems vis-à-vis private healthcare systems to identify any differences and/or similarities between the technological and non-technological factors that affect healthcare professionals' intentions to migrate. There are however practical implications for this study which enlightens healthcare organizations to see the need for more technological adoptions in the health

sector, as well as the employment of competent and motivated individuals to the point where practitioners may not see the need to migrate out of their home countries.

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