



## Health Informatics and Brain Drain Mitigation in Developing Countries – A Case of Ghana

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### ABSTRACT

Health workers' migration in Ghana, like in many developing countries, has been a major concern for most governments due to its impact on socioeconomic development. Extant literature has revealed that a number of researchers have made attempts from various disciplines to find solutions to this menace. In this study, the field of Information Systems (IS) tries to tackle this challenge from a technological perspective to uncover how and when technology, i.e. Health Informatics, can be used to mitigate brain drain in the health sector of developing countries, using Ghana as a case. The study dwells on 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 design is adopted for this study. Theoretically, the study contributes to IS literature on migration which is not a common area of research in the field of IS. Practically, the study may present a basis for more technological adoption within the health sectors of other developing countries which see medical brain drain as a challenge.

**Keywords:** Health Informatics, Brain Drain, Developing Countries, Migration, Healthcare Technologies

### iSTEAMS Cross-Border Conference Proceedings Paper Citation Format

Mansah Preko & Richard Boateng (2018): Health Informatics and Brain Drain Mitigation in Developing Countries – A Case of Ghana. Proceedings of the 13th iSTEAMS Multidisciplinary Conference, University of Ghana, Legon, Accra, Ghana. Vol. 2, Pp 146-152

### 1. BACKGROUND TO THE STUDY

The health sector in developing countries continues to struggle with the migration of critical health workers to developed regions, thereby creating a huge deficit (Adogla-Bessa, 2017). For instance, there is an estimated 56% and 24% Ghanaian trained doctors and nurses respectively working in developed countries (Teye, 2014). The brain drain of health workers in developing countries is a development challenge because other statistics over the period have similarly indicated the alarming rates of migration among health professionals in the health sector of Ghana (Boadi, 2015), and other developing countries, e.g. (Abera, 2014; Adogla-Bessa, 2017; Chatziprodromidou et al., 2017; Driessen et al., 2015). Although a number of studies have been conducted from other disciplines, including the fields of Economics, e.g. (Beine et al., 2008); Public Health, e.g. (Chatziprodromidou et al., 2017); Migration Studies, e.g. (Boadi, 2015); etc. to tackle the menace of healthcare professionals' migration in the health sector, none has been done in the field of information systems; hence this study.

### 2. LITERATURE REVIEW

The concept of health informatics 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 (Dalrymple, 2014). HI has strongly established its relevance in the health sector with increased efficiency in patient information retrieval, and health-related decision making (Alyami and Noteboom, 2017). Electronic Health (e-Health), Health Informatics (HI), Healthcare Information Systems (HIS), Telemedicine, etc. are just few of the variations used in literature to connote the connection between technology and its applications in the healthcare sector (Masrom and Rahimly, 2015). According to Parthasarathy and Steinbach (2015), HI-assisted interventions are becoming even more popular in the early detection, treatment and management of some diseases such as diabetes, cancer, mental health, cardiovascular diseases, etc.



HI applications dwell on population statistics as well as expert knowledge to offer real-time information to health workers (Parthasarathy and Steinbach, 2015). Bose (2003) notes that, the knowledge management capabilities embedded in HI are able to facilitate the integration and interoperability between previously disparate knowledge repositories within different units of a healthcare organization. In Bose's (2003) 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. It has therefore become imperative for healthcare providers to have repositories of clinical knowledge in HI Systems in order to keep clinical best practices up to date on a continuous basis as a fundamental requirement for evidence-based medical practice. However, health workers who are trained from developing countries to possess peculiar knowledge from both literature and practice-based evidence within the local contexts usually migrate to the Western world. The resultant effect of this phenomenon is 'brain drain', a situation which is viewed with so much unease due to its impact on socio-economic development. Bushnell and Choy (2001) described "brain" as any skill, competency or attribute that is considered an asset; and "drain" as the rate of exit that is greater than the normal rate. Hence, Chatziprodromidou et al. (2017) simply defines brain drain as "talent export" and "intelligence export".

### 1.1.1 Brain Drain in the Ghanaian 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 and Philips, 2015). The Ghanaian health sector is not immune to this phenomenon as it ranks 15<sup>th</sup> of the countries that contribute most human resources to the United Kingdom's (UK) National Health System (NHS) alone (Adogla-Bessa, 2017). Multifaceted reasons, including Economic, Political, Social, among others have been assigned to the brain drain problem in Ghana (Morton, 2016). According to a senior officer of the Ghana Medical Association, Ghana has lost more nurses to the UK, USA, and Canada than it has been able to train since 1999 (Triggle, 2005). A similar assessment by the Registered Nurses and Midwives Association of Ghana also revealed that Ghana 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 as an acceptable ration by the World Health Organization (WHO) standards. Currently, Ghana is said to have 22 nurses to every 10,000 patients (Adogla-Bessa, 2017), a ratio that far exceeds the WHO standards. The report also revealed deficits for doctors which suggests a ratio of one doctor to about 10,450 patients – a far cry from the one doctor to 5000 patients' ratio, per the recommendations of the Commonwealth (Adogla-Bessa, 2017).

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, while 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 people (Damte and Aanestad, 2011). In Sierra Leone, the entire medical population is made up of 136 medical doctors and 1017 nurses (Adogla-Bessa, 2017), making it one of the countries with the weakest health systems in the world, with a doctor-to-patient ratio of 1 to 45,000. 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 1 to 42,706 (Abera, 2014), which is also far below the WHO standards.

### 1.1.2 HI 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 and 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, 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 US and Canada which indicated the need to increase HI workforce to about 40 percent if IT adoption in the health sector continues to grow. Although there has been very little evidence concerning the best competencies and skills required across roles, as well as competencies for maximizing effective clinical activities, healthcare organizations are facing a hard time identifying and retaining competent and versatile human resources in the health sector (Varri et al, 2016). Hence, a collection and retention of competencies can also be a useful starting point for the improvement of the HI skill shortages and an increased adoption of HI applications in healthcare organizations.



### 1.1.3 Theoretical/Conceptual Framework

Information technology has been identified as one of the major elements for effecting change in healthcare organizations. Hence, there have been calls by researchers to study technology affordances as a way to understanding technology-enabled social change (Pozzi et al., 2014). The theory of affordances, as originally used by Gibson (1986) in ecological psychology to study the interactions between organisms and their environment, has found its application in numerous fields, including the renewed attention in IS literature (Leonardi, 2013). For instance, Strong et al., (2014) applied the theory of affordances to develop a mid-range theory to reveal the affordances that exist as relationships between Healthcare professionals and Electronic Health Records (EHR) systems. In this study, healthcare professionals are represented as actors to emphasize the active roles 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.

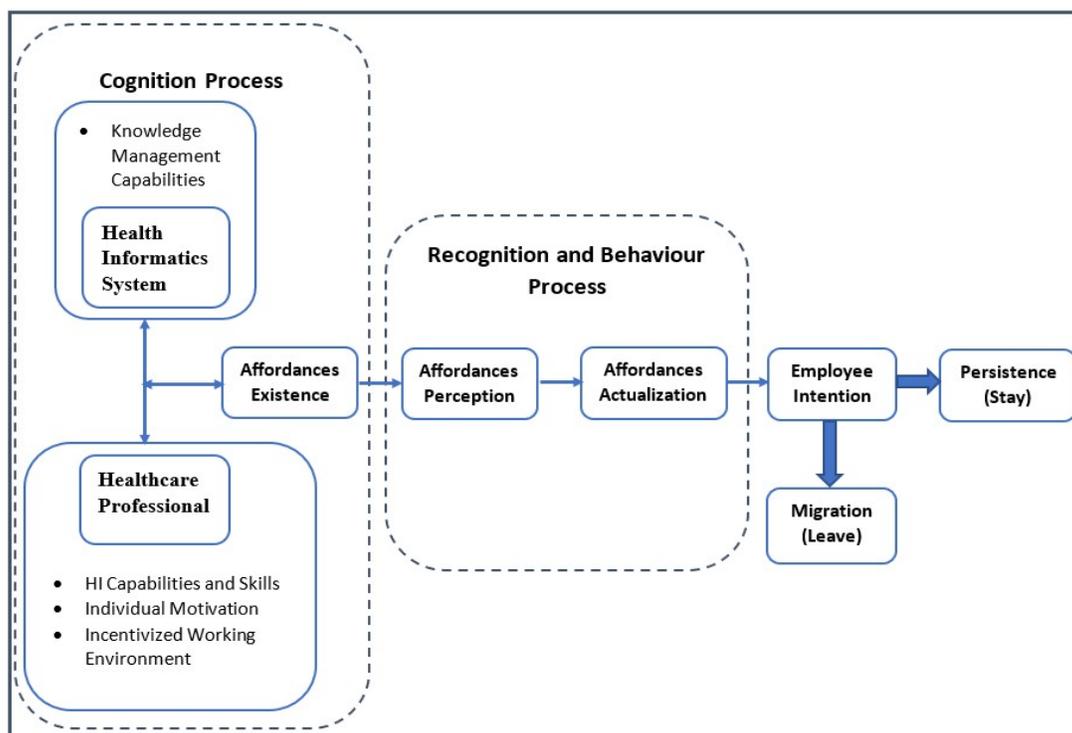


Figure 1: Conceptual Framework

Strong et al., (2014) notes that, although affordances exist as potentials, some actors, or some HI features, or some organizational contexts may not be ready for actualizing them. Hence, since these factors play such an important role in perceiving and actualizing affordances, it is imperative to also consider a theory of human needs and motivation as part of this research to establish a relationship between motivated actors within the healthcare organization and how this relationship affects their level of perceiving and actualizing affordances. 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 theory of two factors (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 is also employed in this conceptualization. These perspectives present 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 the research, with researcher's constructs.



## **2. STATEMENT OF PROBLEM**

Studies on HI over the years have tackled diverse issues ranging from lack of specificity of scope (Parthasarathy and Steinbach, 2015) to disease prevention (Hoque et al., 2016). In developing country contexts, for instance, most research publications on HI have focused on challenges, and factors influencing HI adoption (Hoque et al., 2014; Bedeley and Palvia, 2014); etc. Yet, none of these studies, from both developed and developing country contexts, have been able to explain how HI could be used to mitigate brain drain in the health sector, a gap that this paper seeks to fill. Hoque et al., (2016) noted that the adoption of ICTs in the health sector of developing countries can accelerate knowledge diffusion and increase access to health information. However, knowledge diffusion, especially tacit knowledge and experiences, within the medical field in developing countries end up in the form of brain drain (Ozden and Phillips, 2015). To mitigate this challenge, this study attempts to fill the gap in both literature and in practice by answering the major underpinning questions: How can health informatics resolve Ghana's brain drain problem? To what extent can technology play a role in the global migration discussion?

## **3. OBJECTIVE**

In light of the literature review and forgoing discussions, the main objective of this study is to find out how technology can play a role in the global migration discussion. This objective is achieved by assessing how health informatics can be used to mitigate brain drain in developing countries, using Ghana as a case.



## 4. METHODOLOGY

### 4.1 Research Design and Approach

The paper adopted an exploratory research using a qualitative research design to enable us 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 the challenge. There was also a strong case for using a case study approach for this paper 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 and 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 is justified to the extent that the validity of the case has more to do with the "plausibility and cogency of the logical reasoning", and less with the number of cases (Walsham, 1993). Besides, the validity of case studies can be enhanced by the strategic selection of cases rather than the numbers involved (Boateng et al., 2011). This paper is therefore based on evidences from one government hospital in Ghana. Evidences were gathered from healthcare professionals who had both pre and post HI experiences in the hospital under study in order to capture the migration considerations of these professionals before and after the HI implementations.

### 4.2 Data Collection

Data was collected over a period of one-month. It consisted of personal interviews with 9 medical doctors and 20 nurses (including general nurses, midwives and some hospital administrators) from one government hospital in Accra. The design of a data collection instrument was guided by the research questions, literature review, and the conceptual framework of the paper. This consequently guided us in obtaining rich and context-specific data that were relevant to the study. 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.

### 4.3 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, e.g. HI; enablers and constraints of their migration considerations; etc. Damtew and anestad (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 which aided in drawing conclusions for the research, as well as presenting directions for future research.



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