

# Technology-Oriented Innovations and Cyber Security Challenges in the Healthcare Delivery System: A Perspective from a Developing Economy

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**Abstract:** There is no dispute about the looming digital transformation of certain sectors within transitional economies, especially in Ghana. In fact, for most developed economies, digitalization has proven to have relevant visible effects. The paradox, however, is the seamless nature of this propagation in contrast to the myriad associated benefits. Suffice it to say that, the main purpose of this study was to identify the perceived impediments against the adoption and continuous acceptance of technology-oriented innovation for healthcare delivery in transitional economies through innovations. Especially, in the current technological dispensation where Africa and other developing countries are striving to bridge the technology gap in service delivery. Though, much research has been conducted within the healthcare sector, factors that hinder technology acceptance and continuous usage have rarely been their primary focus. To address this consequential lacuna, this study takes inspiration from literature through document and theme analysis and proposes a model which could serve as a remedy to the identifiable impediments and inhibitors to the seamless delivery of healthcare services in transitional economies. We emphasize good management and government-based interventions throughout the literature review as well as the document analyzed. We also made suggestions for further research, notably concerning means of increasing technology diffusion and possible remedy to cyber-security threats in the healthcare sector.

**Keywords:** Digital Innovations, Transitional Economies, Cyber-Security, Technology-Oriented and Healthcare Delivery.

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## 1. Introduction

In as many ways imaginable, technological advancement has impacted individuals' work and personal lives in various ways for several decades (Jain & Ranjan, 2020). The current generation is reliant on an era of an unparalleled digital revolution in which firms and organizations rely on the exponential increase in performance through technological leveraging at least in simple terms (Allam, 2019; Costa & Matias, 2020). The way individuals live, communicate, and work has been revolutionized by the evolution of technology in the form of industry 4.0's digital transformation of the business world through technologies such as artificial intelligence (AI), 3D printing and cloud computing. Technologies such as smartwatches, smart homes and online food delivery in the consumer space have also gone through a revolution (Allam, 2019). Again, firms' ability to steer through a turbulent business environment with exponential growth over the years is enhanced by these rapidly emerging information and communication technologies (ICTs) and technology-oriented innovations (Costa & Matias, 2020). Moreover, value creation in the day-to-day management of organizations is significantly influenced by the internet of things (IoT) (Bhatt & Chakraborty, 2021). Moreover, a key strategic benefit for the creation of knowledge by firms is facilitated by big data (Shamim et al., 2019). Unquestionably, lucrative job opportunities have contributed to the improvement of the quality of individual lives due to the favourable business environment of growth created by technology-oriented innovations (Bednárík, 2019).

The healthcare sector in particular has experienced an influx tidal wave of technological innovations for the past few years (Saracci, 2018). The healthcare sector has not only undergone a metamorphosis in multiple digitally-driven technological transformations in diagnostics and equipment but has also experienced an improvement in the administration, management and delivery (Kornyo, 2021). In spite, of enormous technology-driven benefits, such as a decrease in diagnostic errors, and improvement in healthcare delivery, yet, there is seeming resistance to technology by patients and clients alike to these innovations and advancement in digital healthcare technologies in transitional economies (Hira et al., 2022). Therefore, the main purpose of this study is to examine those possible factors that serve as hindrances and inhibitors to professionals in the healthcare sector towards e-health innovations that have proven even more useful in the mix of the pandemic. A conceptual framework based on the qualitative method is advanced subsequently to establish the link between technology-driven innovation and continuous adoption by both healthcare employees and patients. Managerial contributions of this study are to aid policymakers within the healthcare sector in developing a counterargument to condition industry players to accept technology-oriented innovations. Again, the scope of technology acceptance of innovative-driven technologies by stakeholders in the healthcare sector will be broadened in the literature.

The paper subsequently continues with a review of the theoretical foundation of technology-oriented innovations in the healthcare industry in transitional economies. A research methodology which specifies the qualitative process is also elaborated. Lastly, research inferences, deductions, limits and imminent exploration guidance are well-explicated subsequently.

## 2. Literature Review and Research Propositions

### 2.1 Infrastructural and Resource constraints

According to Chitungo et al., (2021), the term resource constraints are adopted to indicate the inadequate resources available in developing countries, for instance, the lack of adequate devices and internet connectivity hinders the use of e-health innovations. Different studies have expressed the consequences associated with these resource challenges affecting the operationalization of innovations in developing countries (Clohessy & Acton, 2019). In general, limited access to information through applications, the inability of aged and other vulnerable groups, lack of accessible and compatible mobile phones as well as patients', access to phones that are not supportive of downloads of applications or enabling live consultation (Banskota et al., 2020). Amongst these challenges, are the fact that poorer families' inability to access the internet presupposes that they must rely on the data plan by their network providers which ultimately will increase their expenses and diminish their standard of living should they choose the option of engaging in virtual health session (Van Deursen & Mossberger, 2018). In addition, the quality of software, the limited availability of hardware, as well as the planning and implementation of the overall digitization system depict infrastructural obstacles in healthcare delivery and e-health in developing countries (Kornyo, 2021). Lack of access to computers and internet sources in developing countries, especially, in the hinterlands has become an impediment to healthcare delivery. Whereas, computers and other required gadgets are needed in every facet of the healthcare delivery chain, yet, mostly, only one practitioner can access a computer at a time. Consequently, the primary issue of lack of equipment, which hinders simultaneous use, stagnates the healthcare delivery process. Moreover, the need for regular server and software upgrades, lack of cross-compatibility, uniformity and organizational level integration which poses challenges for accessing information adds to the complications associated with resources and infrastructure (Allam, 2019; Costa & Matias, 2020; Jain & Ranjan, 2020). Moreover, the difficulty of patients' experiences in the use of e-health innovations. For the diffusion of healthcare innovations, the existence of patient care, and patients' acceptance of e-health innovations are vital. Nonetheless, practical usability issues and technology anxieties have become a hindrance to the adoption and subsequent use of e-health innovations (Shaygan & Daim, 2021). It is an open secret that the key infrastructure for health services in every country is telecommunication and internet access (Viganò et al., 2020). However, the most common means of communication and access to the internet in developing countries is through internet café (Bhatt & Chakraborty, 2021). Even though internet penetration amongst Ghanaians has increased within the last decade, the boldness of both the policy formulation, implementation and acceptance of technology innovations by end-users has a hard nut to crack due to the perceived consequences associated with technology adoption and acceptance (Lindemulder, 2021). Healthcare records and transmission of healthcare data derived from these innovations are strengthened and aided by powerful instruments such as information and communication technologies (Aceto et al., 2020). We, therefore, propose that;

*P<sup>1</sup>: infrastructure and resource constraints will significantly increase cyber-security challenges*

### 2.2 Cyber Security Challenges

As the healthcare sector fast adopts technology for healthcare delivery, cyber security is becoming more important (Nifakos et al., 2021). The basic question today in the healthcare industry now is not about the capacity to invest in cybersecurity, but the amount of investment required to invest in cyber level security to ensure safety for not only their data but their entire network operation (Coventry & Branley, 2018; Demirkan et al., 2020). Cybersecurity attacks have become a common phenomenon it is no longer 'if' it happens it is now 'when' will it happen especially, in developing countries (Demirkan et al., 2020; Michael et al., 2019). According to Demirkan et al., (2020), many theories abound, for example; theories of planned behaviour and protection motivation. Nonetheless, all these theories focus on extrinsic rather than intrinsic factors which deal with matters like individuals' mindset of personal and professional lives explained by decision styles. So, many institutions especially, in developing countries are not adequately prepared to remedy the consequences of cyber-attack (Qasaimieh et al., 2022). However, to defend themselves against cyber criminals, institutions must be more prepared and conversant with cyber knowledge (Diogenes & Ozkaya, 2019). Again, cybercrimes are the

motivation for people looking for personal gains or profit (Nurse, 2018). As a result, sensitive documents can be stolen to make money from competitors within the healthcare sector (Demirkan et al., 2020). Therefore, institutions must research and implement robust security systems to minimize some of these cyber threats and fraud (Mugarura & Ssali, 2020). Safe to say that, there are many ways in which cyber-attacks can be carried out, which many institutions are facing today (Tao et al., 2019). Some of these threats are malware which is used by attackers to disrupt and disable computer systems (Alladi et al., 2020). Most of this malware is delivered via e-mail which is hidden from the employees as something else when they are opening it (Demirkan et al., 2020). Another of these threats is Phishing in which the attackers mirror the layout and communications of trusted businesses and common businesses they interrupt (Alawida et al., 2022). The aim is to obtain extra sensitive data from the institution. Again, ransomware is another cyber security threat, this threat is the most prevalent and rapidly emerging threat in which the attackers try to shut down servers and hold hostage data and files until a ransom demand is adhered to (Bhatt & Chakraborty, 2021). Finally, human errors are one of the threats that aid cyber-attacks for instance, unintended disclosures accidental data deletion or improper disposal of sensitive data open the floodgate for cybercriminals to take advantage of the cyber systems of institutions (Sidhu, 2018). As explained by Aldawood & Skinner, (2019), these challenges can be resolved by cyber-security training and awareness for employees. Overall, healthcare institutions must invest and make sure to protect themselves from these cybersecurity challenges (Bhuyan et al., 2020). We, therefore, propose that;

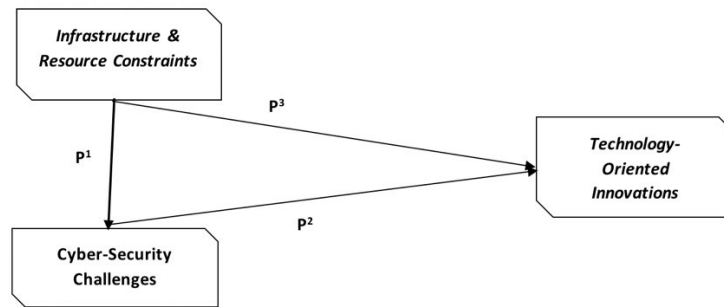
**P<sup>2</sup>:** *Cyber-security challenges will have a significant effect on the adoption and usage of technology-oriented innovations in developing economies.*

### **2.3 Resistance to Technology-Oriented Innovations**

Resistance to technology-oriented innovations can be defined as a complementary mechanism required to improve service delivery within organizations (Hansen et al., 2019). Therefore, value creation, value proposition and customer models of institutions and their branches are affected by digital transformation (Payne et al., 2021). Safe to say that, this scenario is not peculiar to the healthcare industry. Healthcare quality and cost reduction are enhanced by the huge potential of digital technologies (Dash et al., 2019). Nonetheless, digital technology-oriented innovations suffer resistance, especially in transitional economies. The main attributes of the healthcare sector are its complex, regulated and fragmented nature (Jensen et al., 2022). This is partly because healthcare performance is aided by digital technologies through manifold directions, be it new business models permit, or the reshaping of patients, and healthcare provider relationships (Ciasullo et al., 2022). Consequently, new ways and tools for the detection, diagnosis, the transformation of the entire process of and around healthcare as well as the therapy of diseases are provided (Dash et al., 2019; Payne et al., 2021). Eventually, the entire healthcare sector might be plausibly transformed by innovative and disruptive technologies with remarkable consequences for providers, patients and stakeholders (Emilsson et al., 2020). Moreover, hospitals struggle with the massive changes that occur around them, detected by real-world intuitions (Izquierdo et al., 2021). To comply with the latest standards and regulations for technology-oriented innovation to cater for patient security, healthcare institutions must be able to further manage critical technology-oriented innovation systems (Gleiss & Lewandowski, 2022). The difficulty, therefore, is the simultaneous management of existing technology and its continuous exploration (Ciasullo et al., 2022). Consequently, healthcare institutions must reconsider integrating technology-oriented innovations from startups as one of the vital drivers of diffusion of technology in healthcare to serve as a remedy (Behne, 2021). Even though, the healthcare sector has seen a tremendous transformation in terms of progress in the digital space (Wang et al., 2018). However, some barriers promote resistance to the usage of technology within the healthcare industry (Norris et al., 2019). First, technological constraints ranging from the availability of information communication technology (ICT) in a country to the functionality of the provision of service put impediments on the usage of technology (Aceto et al., 2020). Despite, the Ghana government's effort to work on these infrastructures, yet, the issue of interoperability among new and heritage systems has become problematic (Thiel, 2020). For instance, it is difficult to connect the core systems of hospitals in transitional economies with different technologies (Norris et al., 2019). This is partly because of low compatibility, especially when the available devices cannot operate offered services. Further, most healthcare centres in developing countries do not have network access. Safe to say that, poor data integrity and quality are associated with a lack of data which breeds low reliability and a poor foundation for superior data-based services (Behne, 2021). Processes and structures resulting from workflow deficiencies lead to concerned user groups being excluded from the defect in the decision-making process by these deficiencies (Grim et al., 2019). Again, physicians do not have enough time for non-patient-related issues (Gleiss & Lewandowski, 2022). Another constraint is the attitude towards technology devoid of intrinsic motivation and knowledge (Wang et al., 2018). The negative

response towards technology is a result of a lack of incentives and perceived usefulness and confidence in technology generally, especially in the case of the aged (Gleiss & Lewandowski, 2022). Mistrust towards newly technology-oriented innovations and missing acceptance of digital health acceptance especially, wrong or missing information are all factors that lead to resistance to technology-oriented innovations (Nymberg et al., 2019). Fear of transparency within the medical process is also another constraint that results in a lack of control of clinicians and medical staff while strengthening patients' positions (Shammi et al., 2020). Verification issues and missing public funds are some of the constraints are some of the monetary problems associated with technology-oriented innovations (Gleiss & Lewandowski, 2022). Therefore, we propose that;

**P<sup>3</sup>: lack of infrastructure and resources will affect the adoption and usage of technology-oriented innovations in developing economies.**



**Figure 1: Conceptual Framework**

*Source: Authors own construct depicting the various propositions made.*

### 3. Methodology

The researchers adopted document analysis as the fulcrum in reaching their overall goals. Safe to say that this was wholly qualitative-based research. Much as document analysis is a first-rate preliminary subject for drawing upon germane phenomena given its wider coverage area, it might be taken for an inexperienced research method. Nonetheless, it is deep-rooted in systematic documents obtained from both paid and open databases such as EBSCO, SCOPUS, Thompsons Reuters WoS, Google scholar and other web-based sources aided by keyword search. Moreover, theme analysis was adopted to identify the relations among the research construct. Theme analysis offered the opportunity in searching for likely links and patterns across numerous research domains taking cognizance of the deductive research aim (Eisenhardt, 2021). Subject to mined information, the secondary sources tied with the researchers' knowledge, the related domains identified were linked to the main research constructs, technology-oriented innovations. In addition, due to the array of literature dealing with the broader theme of technology-oriented innovations. Document analysis is an appropriate method since it lays bare the copious background to studying the variation of the study's phenomenon. The themes of the study were usually as the case may be gathered from the organizational performance strategy and particularly from research-based concepts (RBC) and the research domain of technology-oriented innovations and the continuous usage within the healthcare sector. Overall, the researchers have more or less organized as many themes of the relevant content through document analysis, to accomplish the desired objectives of the study. This concept was aimed at building a conceptual model. (see Figure 1). Readers are implored to examine the works of others for the advocacy of document analysis as a treasured method for conducting a qualitative analysis such as the current study. Again readers are encouraged to find the works of Khitous et al., (2020), and Best et al., (2017), (2019) for a dynamic read on themes analysis. The researchers unequivocally do not claim the thorough documentary analysis and the resultant themes that arose from the procedure. Nonetheless, an effort has been made to expound critically related themes of the research to extend the literature on the phenomenon under study.

### 4. Discussions, Implications and Research Limitations

A postmortem analysis of other studies concerning technology-oriented innovations characterizes this work. Primarily, the researchers try to obtain empirical data from a transitional economic country to analyze the reluctance of both healthcare employees and patients to accept technology-oriented innovations in the Ghanaian healthcare space. As stated by Saracci, (2018), the healthcare industry has experienced a tidal wave

of technological innovations for the past few decades. Consequently, the healthcare sector has gradually metamorphosed into multiple digitally-driven technological transformations in diagnostics and equipment but has also experienced an improvement in administration as suggested by Kornyo, (2021). According to Hira et al., (2022), even though, there have been enormous benefits derived from technology-driven innovations, such as a decrease in diagnostic errors, and improvement in healthcare delivery, yet, there is seemingly resistance to these innovations and advancements of technologies in developing economies. This situation is primarily because of circumstances such as infrastructural and resource constraints, as well as cyber-security challenges.

First, insufficient resources such as device and internet connectivity and availability in developing countries hinder the application of technology-driven innovations as explained by Chitungo et al., (2021). Banskota et al., (2020), believe that, generally, inhibitors such as limited access to information through applications, the inability of the aged and other vulnerable groups to apply these gadgets, accessibility of compatible mobile phones and access to mobile phones which are unable to download an application or unable for live consultations, especially in the hinterlands. Moreover, poorer families' inability to access the internet indicates that they must rely on a data plan by network providers which ultimately increase their overall expenses and diminish their standard of living, should they choose the option of engaging in virtual health session (Van Deursen & Mossberger, 2018). The quality of software, the limited availability of hardware, and the planning and implementation of the overall digitization system is an indication of infrastructure obstacles in healthcare delivery in developing countries (Clohessy & Acton, 2019). As long as these technological devices are scarce, some of these hindrances will continue to exist. Even worse, is the fear of cyberattacks by unscrupulous people who will do anything to get hold of sensitive data to the detriment of patients and employees of the healthcare sector for their self-parochial interest. According to Demirkan et al., (2020), cyberattacks are no longer 'if it happens' it is now about 'when will it happen?'. The basic question then is not about the capacity to invest in cyber-security but the magnitude of investment that will ensure safety for not only data but network operations (Coventry & Branley, 2018).

According to Kouhizadeh et al., (2021), organizational constraints are factors that hinder the exploration of technology-oriented innovations in organizational settings and culture within the healthcare delivery system. As observed by Carney, (2011); & Duffy, (2018) Healthcare organizations are driven by care, healing and quality of service, for healthcare organizations (Abuosi et al., 2022), to strive for excellence in meeting the needs of their patients, through a focused and safety environment (Gleiss & Lewandowski, 2022). Globally, there is a need to develop a culture of safety where adverse measures are reported, analyzed and critiqued. After all, there is a connection between a healthy workplace environment and a healthy patient (Munro & Hope, 2020). In addition, as stated by Curtis et al., (2019) needed competencies for the achievement of high reliability on the assurance of safe patient care are based on team and technical competence. Again, for healthcare institutions to disseminate technology-oriented innovations in developing countries, clinicians and non-clinicians must be strategic thinkers and also understand, know and appreciate the mission for a clear and focused strategic direction (Aufegger et al., 2020).

Overall, time and effort must be invested in top-level managers, clinicians and non-clinicians to know and understand the organizational strategy to improve the strategic thinking which buttresses strategic planning at the top level (Aufegger et al., 2020). Moreover, according to Payne et al., (2021), value creation, value propositions and customer models of institutions and their branches are affected by digital information and technology-oriented innovations. Even though healthcare quality and cost reduction are enhanced by the huge potential of technology-oriented innovations, it suffers resistance, especially in transitional economies. The Healthcare industry has an attribute of fragmented, complex and regulatory issues (Hansen et al., 2019). This is partly because healthcare performances are aided by digital technologies via manifold directions, be it new business model permits, or the reshaping of the relationship between patients and healthcare providers as explained by Ciasullo et al., (2022). Consequently, new ways and tools for the detection, diagnosis and transformation of the entire process of and around healthcare as well as therapy of diseases are provided. Nonetheless, hospitals struggle with massive changes that occur around detected by real-world intuition (Izquierdo et al., 2021). To comply with the latest standards and regulations for technology-orientated innovations and patient security, healthcare institutions have to be able to further manage critical technology-oriented innovation systems (Gleiss & Lewandowski, 2022). The difficulty, therefore, is simultaneous management of the existing technology, information and its exploration, consequently, healthcare institutions must reconsider integrating information technology-oriented innovation. We can therefore say that all the propositions ( $P^1$ ,  $P^2$  &  $P^3$ ) are supported.

## 4.1 Implications of The Study

### 4.1.1 Theoretical, Managerial and Practical Implications.

The focal point of this research is the dissection of factors that hinders the acceptance of technology-oriented innovations by the healthcare industry. Even though there are enormous benefits of technology-driven innovations there is seeming resistance to these innovations and advancement in digital healthcare technologies in developing countries. Therefore, the main purpose of this study is to examine factors which inhibit the adoption of technology-oriented innovations which has proven to be even more useful in the mix of covid-19 within the healthcare industry in developing countries. This study provides useful insights for healthcare managers in their policy formulation and implementation. Generally, healthcare facilities invest in physical infrastructure as opposed to technology infrastructure. This is primarily may be due to the resistance of patients and clients to technology-oriented innovations usage (Gleiss & Lewandowski, 2022). Nonetheless, this study recommends a tangible indication of how investment in technology-oriented innovations will promote a proper healthcare delivery system. The study also looks at how an existent literature review gives academics theoretical insights into some of the constraints that hinder the adoption of technology-oriented innovations. Most qualitative research on the aforementioned topic is conducted in developed economies. Therefore, our study seeks to add a significant contribution to the of adoption technology-oriented innovations for the good of the healthcare industry in developing countries. An orientational guide in aiding technology-oriented innovations in policy formulation and planning is the focal point of this study. Naturally, resources in technology are considered as a cost rather than an investment due to the resistance from an organizational point of view. Because technology-related investments fail to yield actual tangible returns. Moreover, whereas organizations prefer the investment of more resources into visible infrastructure in their policy formulation other than technology, especially in developing countries, yet, the current trend calls for the adoption and the introduction of technology-oriented innovations other than physical infrastructure. This study provides a persuasive reason why the healthcare industry must invest in technology-driven innovations. Due to the resistance to the adoption of technology-oriented innovations, lack of infrastructure and other resourced constraints. For instance, the Ghana government through digitalization policy is trying to invest in aspects of these technology-driven innovations to remedy the aforementioned obstacles. However, there is still the challenge of technology usage amongst the people especially those in the hinterlands. Therefore, showcase the bond between the availability of digital technology amongst the citizenry and the policy and planning of the management of the various healthcare facilities. For instance, when managers of health facilities invest in infrastructure and technology-oriented innovations, it stands to improve health delivery but, the problem remains the usability by clients and patients. Suffice it to say that; data and network security are equally relevant as cyberattack security has become a common phenomenon. Therefore, for both patients and health professionals to adopt technology-oriented innovations, managers in the healthcare sector must be ready to invest in robust security systems to minimize cyber threats and fraud.

## 5. Research Limitations and Future Research Directions

Our study not only supplements accumulated literature with valuable insights but also proposes real-world contributions. In contrast, notwithstanding the substantial contributions, as with all other academic enquiries, our study involves certain limitations in its method and scope. A crucial prerequisite for acknowledging future research directions is susceptible to these limitations. Regarding the methodological limitations, a wholly conceptual study via qualitative research was adopted for this enquiry. Future research can adopt a different research method like mixed methodology or a wholly empirical method to yield more robust insights. Regarding the scope, firstly, the technology-driven innovations as described in this work stem from the works of (Aufegger et al., 2020; Banskota et al., 2020; Carney, 2011; Chitungo et al., 2021; Demirkan et al., 2020; Gleiss & Lewandowski, 2022; Qasaimeh et al., 2022). Safe to admit that, empirically validated data will be enough to affirm or prove otherwise, despite, the reluctance of some organizations to release data due to concerns for security perceived to be sensitive. There are many parts of qualitative research, yet, our work is wholly centred on a conceptual model, therefore, future studies may consider other qualitative models like surveys or in-depth interviews to broaden the horizon of the adoption of information and technology-oriented innovations to make the healthcare delivery effective and efficient.

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