

Digital technology, healthcare delivery, and patient satisfaction: The moderating effect of innovation technology on the Ghanaian health sector

Joseph Lanton Adjei Mensah,
Charity Adomako
Timothy Kingsford Addo
Annie-Ruth Woode
John Jasper Essuman
Pentecost University, Ghana

Keywords

Block Chain, Artificial intelligence, Patient, Robotics, Healthcare, humanoid, and Digital services

Abstract

Though there has been increased development of health delivery in the health sector across the world, nevertheless, there is little indication of how this has improved patient satisfaction in Ghanaian health services. The improvement of health services hinges on easy retrieval of patient records, and the ability of the health professional to study the history of the patient over some time, and how they are responding to medication: This requires the improvement of digital technology such as the blockchain system, which allow users to follow the thread of information. Artificial Intelligence heavily depends on the mining of data to be effective, and so is health care services. There have been many interventions by the Ghanaian Government to improve the health service through digital technology, such as creating centralized healthcare data systems and the blockchain system. However, measuring the level of this introduction on patient satisfaction is yet to be studied. This research tries to identify how this satisfaction is realized based on the healthcare personnel who have direct contact with the patients. The research findings indicate that the healthcare service has greatly improved with the introduction of digital services in both private and public health services, and it significantly impacts patient and doctor relationships. In addition, the research finding indicates that some barriers need to be addressed with to facilitate the introduction of these new digital technology. The research recommends that the government need focus on the improvement of the digitization of health services, and facilitate the replacement of out dated systems in the health care services.

Introduction

The willingness of organizations to transform and modernize their activities may be at a rising tempo as organizations find new ways of accomplishing their day-to-day undertakings. The impact of global competition on industrial performance has increased global industries' reliance on technology to improve organizational success. The shock resulted from Digital technologies such as crypto and blockchain in healthcare. Supply chains and financial services have significantly impacted the world's economy.

With the emergence of the fifth industrial revolution after the fourth in the last decade, with the rise of robotization and automation of the working process, the spreading of digital technologies, the Internet and the rise of the digital economy, changes in the labour market have intensified and created new factors for the decline of the welfare state (Prodanov, 2018). The industrial revolutions, which transformed the course of the contemporary world one after the other, have dominated the development of humans and have led to more dependence on technologies like artificial intelligence (AI), big data (BD), the Internet of things (IoT), digital platforms, augmented and virtual reality, and 3D printing. As the industrial revolution is ushering in the fifth with unexpected ways, businesses make significant investments in their future usage of digital technology to generate value, seize opportunities, and ultimately thrive (Catherine L & Ritu, 2011). This paper presents an empirical evaluation of business model theory's ability to predict

the future uses of digital technology. "Digitalization" has become the buzzword of today, dominating boardroom debates and driving unparalleled investment (Ricardo & Darek, 2021).

Indeed, the volume and scope of personal health information (PHI) are being captured and stored in digital form by both healthcare institutions such as hospitals (Kush et al. 2008) and non-health entities such as Google and Microsoft (Liedtke 2008, Mandle and Kohane 2008) is increasing every day, underscoring the urgency of finding appropriate policies to protect consumer privacy while reaping the benefits of digitization (Catherine L & Ritu, 2011). The emergence of Covid 19 has had much impact on digital technology (De, Neena, & and Abhipsa, 2020) Sparvell (2020) indicated that Microsoft Teams users across the education sector grew exponentially during 2020, with more than 230,000 educational institutions using Microsoft Teams: This shows how dramatic technology is impacting on all fields of life. In addition, Internet services have seen rises in usage from 40 % to 100 %, compared to pre-lockdown levels. Videoconferencing services like Zoom have seen a tenfold increase in usage, and content delivery services like Akamai have seen a 30 % increase in content usage (Branscombe, 2020). With every increase in the adaptation of new technology across industrial and educational service providers globally, there is an indication of a paradigm shift of classic service delivery across all forms of service delivery, which may impact social settings.

Literature Review

Digitization

Digitization is the process of changing from analogue to digital form, that is making physical products programmable, addressable, sensible, communicable, memorable, traceable and associable (Warnera, & Wäger, 2017; Yoo, 2010). The process of converting a product to digital form converts the product into 1s and 0s, or bits and bytes. As a result, digitalization offers a chance to develop solutions, shifting the focus from products to services and making information the foundation of effective operational performance (Paunov and Planes Satorra, 2019). Information Technology (ICT), is typically dependent on a collection of digital technologies that enable access to information through telecommunication, such as the internet, wireless networks, computers, software, middleware, videoconferencing, social networking, and other media applications and services. The indication is that digital technologies build upon and expand ICT, whereas ICT supports stakeholders as influential technology for users. Industrial practitioners are starting to pay more attention to the digitalization of business models, which is made possible by new digital technologies like the Internet of Things (IoT), intelligent sensors, big data, platforms, artificial intelligence, and cloud computing (Adwan and Alsoufi, 2016; Khin and Ho, 2019; Rachinger et al., 2019; Urbinati et al., 2017).

The concept of digitalization

The Fourth Industrial Revolution has been fueled by digital technologies, which are considered to be significant drivers of business model innovation (Elia et al., 2020; Schiavi and Behr, 2018). Digital innovation can be defined as the combination of digital and physical elements to produce new products or services through a sophisticated digital business model (Khin and Ho, 2019; Yoo et al., 2010). Technological innovation and digital technologies, on their own, cannot guarantee success in terms of competitive advantage and customer-added value; instead, they should be integrated into innovative business models (Blaschke et al., 2017). The influence of digitization on business model innovation has been examined in a limited number of studies (Cenamor et al., 2017; Kotarba, 2018). Despite this, digital technologies have the potential to disrupt traditional business models (Westerlund et al., 2014) and are therefore perceived as drivers for business model innovation (Crane and Kitchens, 2013).

Artificial intelligence (AI) and Health Care

Artificial intelligence (AI), robotics, innovative technology, and cloud computing are just a few of the applications that are disrupting industries throughout the globe and altering how things are done, including banking and financial services, retail, and healthcare (Trenerry et al., 2021). The use of these digital technologies is growing, driving digital transformation (DT) in businesses and changing value

chains, business structures, and job types (Reinartz et al., 2019; Zaki, 2019). For instance, merchants now provide omnichannel alternatives and augmented reality capabilities for customers to order curbside or in-store while navigating warehouses and visualizing merchandise. Peer-to-peer access-based services and healthcare are only two examples of how rapid digitalization has made it possible to create new businesses. DT is transforming service industries as new technologies are used to provide clients with multichannel and integrated value propositions (Reinartz et al., 2019; Verhoef et al., 2021). Digital technology delivers flow benefits in service procedures, intelligence, and digital experiences (Storbacka and Moser, 2020).

As a result, this represents a significant change in the front lines of service, affecting both service personnel and the clients they serve (De Keyser et al., 2019). Because the digital capabilities of service organizations can enable their service professionals in customer-facing jobs to negotiate service outages and preserve client orientation, such changes are more noticeable during extreme emergencies like pandemics, hurricanes, and terrorist attacks. For instance, service providers have modified their offerings and services during the COVID-19 epidemic due to digitalization. The importance of DT in assisting service employees with service continuity and competitive advantage is highlighted by crises.

Organizations' digital capabilities may enable the creation of digital service workspaces where service professionals can easily engage with their teams and clients. By giving customer-facing service staff the tools they need to handle stressful or dangerous situations at work, organizations help people in times of need. The engine of global progress is technology support to improve healthcare systems, infrastructure, and economic growth. Naturally, the world may be filled with products categorized as a product of nature or a man's work; innovation is all around us. Innovation is becoming better, faster, and smaller over time.

Blaya et al. argue that evaluating personal digital assistance and mobile technology convincingly demonstrates that such devices can effectively improve data collection time and quality. Similarly, Bukachi and Pakenham (2007), writing on information technology for health in developing countries, posited that harnessing the full potential of Information Communication Technology (ICT) to benefit health systems, health workers, and patients may demand an intricate mix of old and new technologies. The use of biochar technology in engineering, healthcare and the life sciences has the potential to enable quick communication, as claimed by Ok et al. (2015). The financial impact of such projects was the most frequently cited decision criterion: However, financial considerations were less significant than technology's impact on the quality of clinical care or its contribution to teaching and research. Weingart's (2009) research on "acquiring advanced technology: decision-making strategies at twelve medical centres." Again, there are particular studies on how different technological advancements have affected how well-equipped nations and health institutions are to improve the health of their inhabitants: These include the works of Tolentino and Park (2010), which concentrate on U-health systems for managing patient information over widespread medical sensor networks, Rempher et al. (2003) work, which concentrated on utilizing technology in the advanced practice nursing environment, and Bashshur and Reardon's "Telemedicine: a new healthcare delivery system. In addition, Omachonu and Einspruch are two others who addressed innovation in healthcare delivery systems, including a conceptual framework. None of these studies, which include Africa, Europe, and America, pay particular emphasis to science and technology as drivers of healthcare advancement in Ghana. With very few studies in the social sciences listed, most of these studies are also in the medicinal and physical sciences. Historical research on the Ghanaian instance has explicitly been minimal or nonexistent to address the knowledge gaps, and this study proposes the three research questions:

1. What is the influence of digital technology on healthcare delivery in Ghana?
2. How is digital technology influencing patients' satisfaction?
3. To what extent is innovation technology moderating the relationship between healthcare delivery and digital technology?
4. What is the moderating effect of digital technology on the relationship between digital technology and patient satisfaction?
5. What are the barriers to adopting digital technology in healthcare in Ghana?

Theoretical background and conceptual framework

A conceptual framework is the researcher's idea of how the research problem may be explored, and a theoretical framework focuses on time-tested theories that embody the findings of numerous investigations on how phenomena occur. This section presents the related review of the literature concerning the thematic areas of the study as well as the theories that are driving the study, the hypothetical formulations and the conceptual framework.

Health Sector Innovations in Ghana: A Historical Review

The United States is the only wealthy industrialized country that has not achieved universal health coverage (Ryan, Hilary, Thomas, & Lee, 2020). Scott's "Healthcare delivery with advanced technologies" was published in 1973: Among other things, the United States' current health care system lacks the essential component of the substantial participation of individuals who invent new technology. According to the Organisation For Economic Co-Operation And Development (OECD) (2022), one way of tracking technological change over time (and into the future) is to consider measurements of speed, size or cost. However, the argument is that any large-scale endeavour requiring the development and application of advanced technology requires the support of an entire league of development engineers and applied scientists and that this was and still is the kind of effort needed to address the health challenges faced by nations in the twenty-first century (OECD, 2020). Of seminal importance to the present contribution is that "as new insights into the prevention and treatment of diseases are attained through biomedical research, disease prevention must also be applied to the general healthcare of the population. The call of Scott is still a burgeoning issue in twenty-first-century Ghana.

However, the World Health Organization (WHO) indicated that about eighty percent (80%) of Africans use traditional medicine for their healthcare (Ampadu, & Abdul-H, 2022). Though traditional health care is most accessible to the average Ghanaian community, record keeping is poorly managed, especially relating to patient history, and the ability to track illness and resolve problems timely. However, a chronic problem of inaccessible, unfair, and unresponsive health services, particularly for poor and rural communities, has resulted from the neglect of crucial building blocks (such as medicines/technologies, leadership/governance), the selective use of evidence in policy development and implementation, the lack of integration of existing strategies, and poor management of pluralistic health systems (Aikins, & Koram, 2017).

Within the 1960s and 70s, Ghana had not made applicable entries regarding advancement in its medical infrastructure and technology. The health care challenges and woes were accentuated within the 1980s with structural adjustment programmes because of its ailing economy. Odutayo (2015) argued that contrary to what the program sponsors assert, the adjustment programs undermine recovery prospects and fail to protect access to health and social services (Odutayo, 2015). Previous research has shown that many technological innovations were introduced worldwide by the 1970s. In the Ghanaian context, Oseo-Asare (2008) on bioprospecting and resistance: transforming poisoned arrows into strophanthin pills in colonial Gold Coast, 1885-1922, captures the nineteenth and early twentieth centuries and argues, among other things, that breakthroughs in pharmaceutical chemistry increased international demand for *Strophanthus* seeds, prompting an unsuccessful export scheme from the Gold Coast during the First World War.

Reading narratives of drug discovery in Europe against colonial politics in West Africa reveals the world history in which pharmaceuticals continue to be embedded. Again, the research by Oseo-Asare (2013) reports that during the 1960s, experiments in laboratory education in Ghana indicated that the Ministry of Education in Ghana created a network of school laboratories to increase scientific literacy among young citizens. During this period, education officials and university scientists worked with teachers to create lesson plans relevant to science. The Ghanaian Government hoped that this direction may create scientifically minded school children that may be better prepared to staff future industries.

To organize and reorganize standards to function as an integrated whole and fight diseases and epidemics, Ghana needs investments in science and technology, particularly in the health sector. People's lives have improved thanks to unique and gradual breakthroughs in science and technology. Ghana ought

to participate in this trend. Ghana's healthcare system was mainly an indigenous system of healthcare delivery. The various modifications to this native health system resulted from the influences and modernization of the British administration (Adu-Gyamfi, Brenya, & Egyir, 2017). Similarly, the British Government's introduction of modern medicine has served as the nation's mainstay in providing healthcare.

Despite this assertion, AduGyamfi and Bing (2016) and Twumasi (2005) make compelling arguments for a medically pluralistic society with a range of solid arguments are made by Adu-Gyamfi and Bing (2016) and Twumasi (2005) in favour of a medically pluralistic society with a variety of ways for addressing healthcare that has endured over time. Addae (1996) detailed how the British Government took action to establish hospitals, health centres, and dispensaries outfitted with the necessary infrastructure to care for the majority of the whites and some Ghanaians in his book, "Evolution of Modern Medicine in a Developing Country: Ghana 1880-1960. As people's resources were trained and later facilities were strengthened, these pioneering actions provided the groundwork for the country's medical system, facilitating healthcare in Ghana long after independence. Most academics have written about how science and technology have benefited their nation or other nations. Garcia (2000) is one author who emphasizes the value of science and technology in all facets of life, particularly in health. He argued for the part that technology and science have played in Brazil's healthcare system.

In Brazil, the average lifespan has climbed from 45 to 60 years, a development that has just recently begun to occur. Garcia (2000) highlights the significance of upcoming breakthroughs that may benefit the Brazilian healthcare system and lengthen the average lifespan of Brazilians. The twenty-first century has recorded several studies into science and technology, which have wider ramifications concerning health care. Studies like Blaya et al. (2009) focused on eHealth technologies showing promise in developing countries.

Blockchain in Health Care Record Keeping and Supply Chain

The concept of blockchain technology has provided enormous grounds for how the medics' supply chain is improving health care delivery. The blockchain concept introduced by IBM has been adopted to create digital currency such as cryptocurrency that provides a much more secure platform for transactions (Mensah, 2021). Blockchain technology is a component of Industry 4.0's new Internet of Things applications, including distributed ledgers, immutable technology, and cryptographically secure technology. Blockchain technology may be private or public, depending on the targeted use. A private blockchain network is either managed by a single entity or runs in a restricted environment, such as a closed network. In terms of Peer-to-peer (P2P) connectivity and decentralization, it performs similarly to a public blockchain network but is much smaller. In a private Blockchain, the network's creator is always aware of who the users are. A public web does not allow for the development of permission-based solutions, and users are entirely anonymous (Abid, Javaida, Ravi, Rajiv, & Shanay, 2021)..

Information placed within the block cannot be altered unless 50% of the data within the block has the information changed to correspond to the new data. Smart contracts within the block are ever-increasing, making a blockchain transaction much easier, as all assets, including currency and physical buildings, can be converted into digital assets.

The use of blockchain increases the security and quality of information within the block. Having a piece of secured information improves product description and quality. All transactions carried out within the blockchain can be tracked to the original manufacturer, which reduces the problem of counterfeiting within the supply chain. Blockchain technology enhances the healthcare system to provide adequate patient care and high-quality health facilities and helps to preserve and exchange patient data through hospitals, diagnostic laboratories, pharmacy firms, and physicians (Abid, Javaida, Ravi, Rajiv, & Shanay, 2021). Blockchain provides a high level of transparency in healthcare, which enhance doctor to patient relationship, also with the high level of transparency in asset listed on the chain, the supply chain within the health are secured, which help to improve the quality, time, and cost of the transaction (Mensah, 2021).

In Sub-Saharan Africa, the idea of blockchain has seen significant adoption in the real estate, supply chain, agricultural, and financial sectors. Sadly, there have not been sufficient efforts to bring this technology to the healthcare industry (Kombe, Sam, Ally, & Finne, 2019). Though accurate and well-managed medical records play a significant role in high-quality health care, which requires the introduction of technology such as blockchain with its extraordinary capability to improve record keeping, medical records receive little scholarly attention in Africa. Poor management and a lack of qualified staff who know how to record and retain these records hampered good record-keeping (Blanco, 2022). In advancing blockchain concepts worldwide, there is a clear indication that Africa may be behind the fast-improving record keeping and the use of such technology to improve the supply chain in health care service.

Big Data

Big data is data that contains greater variety, arriving in increasing volumes and with more velocity, known as the three Vs (Volume - The amount of data matters; Velocity - the fast rate at which data is received; and Variety - refers to the many types of data that are available) which provides more complex data sets, especially from new data sources (Oracle, 2022). Big data is a collection of structured, semi-structured, and unstructured data that businesses gather and may be mined for information in advanced analytics applications like machine learning and predictive modelling. Most humanoids have depended on big data to perform beyond human expectations. An example of such a humanoid Robot is Sophia, the first humanoid to receive citizenship in October 2017 in Saudi Arabian: Though this act received much criticism, the action shows how humanoid Robots are becoming part and parcel of our society. The height could not have been achieved without big data, which humanoid robots access and harness continually from the cloud internet.

Nevertheless, healthcare services also make excellent use of big data. For instance, medical doctors could access the Internet to provide instant patient diagnosis information and even the exact drug required for treatment. Electronic Health Records (EHRs) are medicine's most widely used big data. Each individual gets a digital profile that contains information about their background, health, allergies, and lab test results (Calzon, 2022). Records are accessible to providers from the public and private sectors and are shared via secure information systems. Patients may be provided with wearables which constantly collect data from the patient. Wearables are IoT gadgets; the device may transmit a live alert to the doctor if a patient's blood pressure rises alarmingly. The doctor may then take action to find the patient and start administering treatments to drop the pressure. Access to the public health database may enable medical professionals to compare the data in a socioeconomic context and adjust their delivery methods as necessary.

Artificial Intelligence (AI) and Internet of Things (IoT) within Helth Care

The emergence of Industrial 5 has shown a paradigm shift in digitization within all industry sectors worldwide, which has led to a whole new branch of robotics combining artificial intelligence called human-robot interaction (HRI). For instance, The robot Ameca, recently developed by the UK company Engineered Arts, surprises with its fluid facial expressions that appear almost human (Schmitt, 2022). There has been a vast improvement in combining robotics with digitized information in cloud systems. To adequately address tasks like predicting what emotion a human is experiencing by observing their visual facial expressions, humanoid robots are made up of artificial intelligence, sensors, mechatronics, and power: These capabilities allow them to recognize visual expressions and perceptions. The humanoid robots need to have supplied data that may provide enough knowledge to process so they can perform and expand the range of learning and activities they are already capable of. Installing the cloud may further analyze the digitize information and give it back to the humanoid robot; the robot must absorb, integrate, and capture the digitize information from the environment (Pajaziti, Bajrami, & Pula, 2021).

The increased advancement of humanoid robots is on the verge of taking over human activities in a high-risk environment. For instance, Boston Dynamics robotics manufactured a robotic humanoid called Atlas in 2021 that could master the parkour track (Mia, 2021). In addition to this advancement is the

introduction of the humanoid that could answer humans so accurately that this performance shocked viewers. Disney Imagineering Research and Development lab built a robotic stuntman to perform daring flips 60 feet in the air (Petrova, 2018). Robots having cognitive skills are required to facilitate human-robot interaction (HRI) so that their human counterparts' needs, capabilities, tasks, and demands may be met (Katiyar & Katiyar, 2022). Andtfolk, Nyholm, and Eide, (2021) indicated that the use of robotic technology in healthcare is increasing. Humanoid robots began working in hospitals worldwide as of mid-2020 to gather patient data from persons who may have been exposed to the SARS-Cov-2 virus, hence minimizing human contact (Chandrayan, 2020). Also, during the COVID-19 pandemic, humanoid service robots quickly assisted the overburdened international healthcare system (Ozturkcan & Merdin-Uygur, 2021) Addressing issues like the ageing population's growth and the shortage of caregivers, robot technology appears to hold some promise; however, the question requires answering for the introduction of humanoid robots are:

1. How much power are we willing to surrender to autonomous machines?
2. Who is liable for supposedly wrong decisions made by a robotic AI?
3. Will robots soon take over our jobs? (Schmitt, 2022)

Internet of Things primarily refers to the connection of things with a unique identification that uses the Internet as the medium to form a network of connected computing devices, mechanical and digital machinery, items, animals, or people that may exchange data across a network without requiring human-to-human or human-to-computer interaction (Gillis, 2022). The term "The Internet of Things" was coined in 1999 by British technology pioneer Kevin Ashton, co-founder of the Auto-ID Laboratory at MIT, to describe a system in which the Internet is connected to the real world by pervasive sensors, including Radio-frequency identification (RFID) (Kramp, Kranenburg Van, & Lange, 2013). Many hardware developments such as Wi-Fi, RFID, and Electronic Data Interchange (EDI) enhance IoT. Though RFID has broad industrial uses that may assist the health care system, due to the short range, RFID may not be suitable for humanoid robots. The RFID tag contains information that the reader reads and transfers to a central process.

In the supply chain systems, Radio-frequency identification combined with Electronic Interchange delivers various industrial uses that allow computers from different companies to communicate and provide real-time solutions to supply chain challenges (Mensah, 2021). Big retail companies such as Walmart Inc. (WMT), Amazon.com Inc. (AMZN), Costco Wholesale Corp. (COST), and Walgreens Boots Alliance Inc. (WBA) use RFID to augment their supply chain efficiency, improve customers experience, and improve brand visibility (Asset, 2020). Medical errors are the third-leading cause of death in the US and significantly influence public health (Healthcare, 2017). The organization further indicated that significant industry concerns include a lack of information and access, patient tracking, lengthy hospital wait times, inventory management, pharmaceutical errors, and parking management. However, automatically identifying and tracking RFID tags attached to items would offer various solutions to these issues. In healthcare services, RFID facilitates clinical trial procedures, enhances patient identification accuracy, makes inventory management more accessible, streamlines patient tracking, enhances communication between caregivers and patients, and eliminates the possibility of providing incorrect prescriptions. RFID is crucial for surgical procedures as it allows surgeons and the operating room team to locate all necessary equipment quickly. As RFID demonstrates superior efficiency, reasonable process control, increased safety, better planning and control, patient comfort, and a faster response to critical events, more hospitals are integrating it with their healthcare information systems.

The use of the Internet of Things (IoT) in the healthcare sector, consumer and professional healthcare, and healthcare payment applications has dramatically expanded. For instance, IoT can help health practitioners remotely investigate their patients' histories. By using the Internet of things, real-time data may be sent from the patient to the doctor indicating the patient's health status through a device inserted or attached to the patient for the doctor to provide immediate help to the patient: This provides 360-degree monitoring of the patient. More integrated strategies and advantages are sought within a more extensive linked healthcare and eHealth picture, with a role for the Internet of Healthcare Things (IoHT) or Internet of Medical Things (IoMT). The transformation was most significant from 2017 to 2022, with

some modifications occurring before 2020 (ISCOOP, 2022). With this advancement, the Internet of Things advancements in healthcare must be viewed from the perspective of the various healthcare sectors' digital revolution.

Though Ghana has widely used the Internet through the mobile network, there has not been any attempt to apply this system to the health care systems. Private individuals widely use IoT to control and monitor activities such as security cameras and other home gadgets using their mobile devices. The application of IoT in the health service would provide a significant breakthrough for the health sector, which is overburdened with a low doctor-patient ratio.

Health Information Technology (HIT)

An examination of each country's health information systems (HISs) should not be restricted to data collected and provided typically by care providers. In this regard, the first step in any national project's development is to learn from the experiences of other countries around the world, particularly those with economic, political, cultural, and regional partnerships, and then to use their resources and documents to have a broader attitude and a better profitability in planning the development strategy (Bagherian & Sattaric, 2022). Health information systems are spreading worldwide, thus promoting human health and prosperity. The simplest definition of a hospital information system is a Computer application in a hospital. HIS is an N-tier application built for a single or multi-location environment. Essential features of an effective and functional HIS should include easy, friendly, and ready-to-use, well-integrated customization properties and possible tracking and alert facility. Automation backup is necessary to prevent data loss (Parida et al., 2019).

In health technology, several methods are employed to promote health services, prevent diseases, and treat them appropriately. Health technology can be used to enhance long-term care, which includes medications, equipment, and procedures, as well as short-term care (rehabilitation). A few instances of health information technology in use in various healthcare settings include computerized medical records in clinics and hospitals, document delivery via the Internet, information exchange, and communication, e-cards developed for patient identification, electronic appointment scheduling systems, hospital labs, admission examinations, and computerized protocols for diagnosis and treatment support (Parida et al., 2019). Better decision-making and the appropriate administration of therapeutic drugs and diagnostic laboratory tests are made possible by the HIT system. The resources available in the current health information system infrastructure are insufficient to fulfill the expectations and needs of the growing population in emerging nations. Significant obstacles to the health care systems of developing nations include poverty and a lack of advanced technology capabilities. The main challenges or obstacles associated with utilizing information technologies include inadequate or inadequate resource allocation, hardware accessibility issues, and inadequate or inadequate infrastructure. In developing nations, the state of population health can be enhanced by removing these obstacles. The writers have noted obstacles that need to be overcome for HIT to be established and promoted in developing nations. These obstacles are categorized into six categories: ICT infrastructure, time and cost, national HIT policies, social and cultural, educational, organizational, and ethical barriers (Teece, 2010).

Barriers Related To Infrastructure

Although most developing nations lack the technology infrastructure to construct national health information systems, which these nations unable to promote HIT in commercial and public institutions: This is critical to reshape the infrastructure of an existing health system. The following is a list of infrastructure impediments (Henfridsson et al., 2018, Nguyen, 2018):

Insufficient Infrastructure: Most developing nations do not have satisfactory frameworks such as computer equipment, program, wired and remote communication channels, Web, and talented human assets. The accessibility and operation of these ICT Infrastructure components are vital for setting up and advancing HIT in immature nations. A robust Infrastructure is required for a strong data framework to move forward the existing framework by arranging and presenting modern healthcare intercessions.

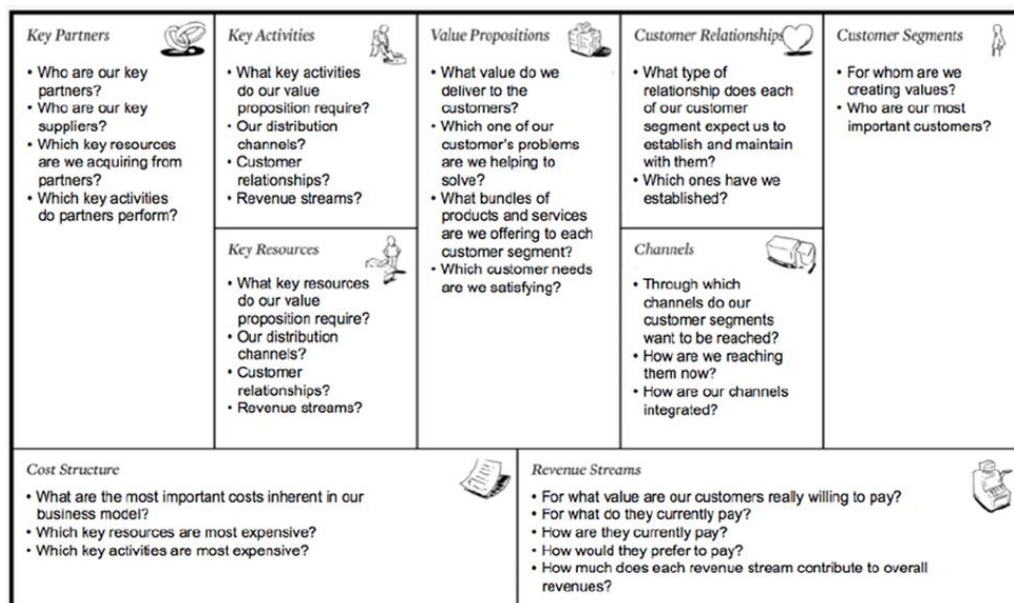
Financial and Time Barriers: The main issue with planning workshops and training sessions for setting up and executing HIT in developing nations is that these two factors make system transformations difficult to accomplish in a short amount of time. The introduction and adaptation of new health technologies is severely limited by these factors, as well as other side effects like the initial decline in productivity brought on by adjusting to a new technological environment and systems.

National HIT Policy Frameworks: A national strategy that is secure, safe, and efficient can meet local health requirements in accordance with environmental changes. These policies can be developed by practitioners and policymakers to evaluate and apply study findings. In developing nations, it is challenging to enforce laws, and it is more difficult to get community support for any system change. The Ministry of Planning, Development, and Special Initiatives published a paper (Butt and Faraz, 2022) that states that the federal government allocated approximately Rs. 622.7 billion for PSDP in the 2019–20 fiscal year, while the provinces received Rs. 540 billion. The population is growing at a pitifully slow average annual rate. However according to Boachie, Agyemang, Immurana (2022), IMF programs with its associated conditionalities insignificantly reduce public health spending Ghana.

Business model theory

Research on business models and business model innovation is in its infancy and bereft of mid-range theory. Researchers should investigate systematic business model design and implementation in order to move from business model concepts to business model theories (Lambert and Montemari, 2017; Souchkov, 2010). Innovation in business models is defined as the transformation of components of a business model in order to create and capture value (Chesbrough, 2010; Foss and Saebi, 2017; Ramdani et al., 2019). As the name suggests, business model innovation refers to the basic logic of how a company conducts business and tries to remain profitable in a dynamic business environment (Hossain, 2017). As a result, business model innovation is considered one of the most important sources of competitive advantage (Baden-Fuller and Morgan, 2010; Chesbrough and Rosenbloom, 2002; Johnson et al., 2008). Therefore, business model innovation is considered a key source of competitive advantage (Baden-Fuller and Morgan, 2010; Chesbrough and Rosenbloom, 2002; Johnson et al., 2008). In spite of the widespread recognition of the importance of business model innovation, little research has been done in traditional sectors, such as construction (Huang, & Ichikohji, 2023; Pekuri et al., 2013). Though Business model innovation has attracted much attention from scholars and practitioners, there is limited literature on business model innovation focuses mainly on associated drivers and barriers instead of providing novel approaches to systematic innovation (Foss and Saebi, 2017; Huang, & Ichikohji, 2023). As such, the business model canvas is commonly used for structuring, describing, and discussing business models (Osterwalder and Pigneur, 2010), but not for systematically innovating them (Brad and Brad, 2016). The business model canvas is a framework for visualizing and structuring business models based on the core concept of the value proposition. According to this framework, each business model can be divided into nine building blocks. According to Osterwalder and Pigneur, the right side illustrates how value is created for customers and the company, while the left side explains what the company needs to do in order to successfully implement the business model (Osterwalder and Pigneur, 2010).

While the business model canvas is useful for summarizing or illustrating business models, it is unable to systematically convert an existing business model into a new one because it is unable to direct the associated innovation processes (Ladd, 2018). Thus, there is still a need for a roadmap that takes a methodical, structured approach to the reinvention of traditional business models while systematically incorporating digital technologies (Souchkov, 2010). By recognizing important internal and external obstacles inside the business model at different stages, an integrative framework is required to assist managers in designing and implementing new business models.



Customer satisfaction

Oliver (1997) defines customer satisfaction as a "consumer's fulfilment response. It is a judgment that a product or service feature, or the product or service itself, provides (or is providing) a pleasurable level of consumption-related fulfilment, including levels of under- or over-fulfilment" (Oliver, 1997, p. 13). In marketing literature, customer satisfaction is widely viewed as the customer's cognitive ability and emotional tendency to evaluate the desired service with the actual service received subjectively. The extant literature empirically investigating the relationship between satisfaction and eWOM found a positive relationship between them (Serra-Cantalops et al., 2018). Customer satisfaction is also considered a reliable indicator of positive eWOM; customers encountering a more positive digital platform experience are more enticed to become loyal and spread warmer eWOM (Lii and Lee, 2012). Based on this argumentation and rationale, the hypothesis is postulated as

Utility and satisfaction

According to Childers et al. (2001), a utility can be conceptualized as the ease and convenience in both access and speed in consuming the desired market offering; it also can be viewed as providing an experience that minimizes the investment in both time and effort. Therefore, in understanding utility in a platform business, it is paramount to highlight the various utility sources and where they stem. First, a utility can stem from the transaction itself in which customers perceive the use of a platform is superior in terms of deal value to other alternative options (Lamberton and Rose, 2012); second, a utility can be manifested in terms of better offer flexibility, such as mobility utility, ownership reduction and accessibility (Fritze et al., 2020). The utility can also come in the form of social utility, in which the user of a digital platform may receive approval from reference groups (Lamberton and Rose, 2012). Overall, a utility can be distinguished as a primary and add-on utility; the former can be conceptualized as closely related to the core service in which the market offer is helping in solving a particular problem for the customer (Eyal et al., 2004), whilst add-on utility can manifest in providing relational, social and emotional change to customers pre- and post-consumption. Mohlmann (2015) found a positive relationship between utility in a platform context and customer satisfaction. Furthermore, empirical evidence suggests that platforms which maximize benefits relative to costs increase customer knowledge and achieve higher positive customer attitude, customer satisfaction and a positive digital customer experience (MingSung Cheng et al., 2009; Foroudi et al., 2018). Following this reasoning, the study postulates that:

H1: Digital technology has a positive influence on patients' satisfaction

Digital technology and healthcare delivery

According to Kemp, Zhang, Inglis, Wiljer, Sockalingam, Crawford, Lo, Charow, Munnery, Singh Takhar, and Strudwick (2020), even though the use of digital technology has improved healthcare delivery, there has not been an adequate understanding of the best practices and uses of digital technology. Health care systems need adequate information about patient history to provide the needed diagnostic analysis that may benefit the patient. Patient records are very important, and for health practitioners to provide them requires that data be available enough to make decisions. An important exposition, that needs to be acknowledged is that though big data is good for decision-making, analyzing big data is sometimes difficult, and costly. Analysing patient data requires the ability to balance the skill to determine the amount of data that may be enough for decision-making, which requires the skill of threading through the fine line between small data and big data. The revolutionary healthcare delivery model has saved many people's lives and is also an inspiration to most people (Van Velthoven et al., 2019; Pathak et al., 2019). It is hypothesized that:

H2: Digital technology has a positive influence on healthcare delivery

Moderating effects of perceived technological innovativeness

In this research, technological innovation is defined as the perceived level of novelty and enhancement compared to current alternatives (Shetu, Islam & Promi, 2022; Lowe and Alpert, 2015, p. 4). Thus, this design may generally be identified by either market originality or technology novelty, customer service superiority, or customer adoption difficulty. Innovation literature has indicated that firms that emphasize their technological superiority in their ads lead to better customer communication and better returns on their innovation-driven ventures (Simon and Honore Petnji Yaya, 2012). As a result, platform companies must additionally emphasize how platform technological innovation has enhanced total client benefits. Additionally, studies reveal that clients of businesses utilizing cutting-edge technology had higher levels of online engagement and were more willing to recommend the technology and advantages of the service providers (Hoang, Kousi & Martinez, 2023; Gruen et al., 2006). Dou et al. (2021) found that companies tend to compete through an array of novel designs and technologies embedded in new service platforms that complicate customer interaction and ease of use, resulting in a drop in customer emotional engagement and satisfaction with technology usage frustration. For platform businesses to become more effective, a platform's technical innovation (PTI) is a necessary quality. This can aid in the early detection of client problems and the development of solutions that maximize resource mobilization. Platforms that enhance client services by reducing costs and waiting times with artificial intelligence technology can improve the consumer experience and foster customer loyalty (Prentice et al., 2020). Earlier According to research, PTI has a moderating effect as well as a direct impact on customer happiness and purchase intention. For example, customers with higher PTI levels exhibit higher levels of satisfaction and online involvement in eWOM (Hwang and Griffiths, 2017). These impacts stem from consumer inventiveness, which can be realized through the conviction that a single online story can have some influence (Gruen et al., 2006). In line with these results and drawing from existing research, this study proposes that customer perception of platform innovation can enhance the influence of satisfaction on electronic word-of-mouth (eWOM) in a collaborative consumption setting. Thus, it is proposed that:

H3: Technological innovation positively moderates the relationship between digital technology and healthcare delivery

H4: Technological innovation positively moderates the relationship between digital technology and patient satisfaction

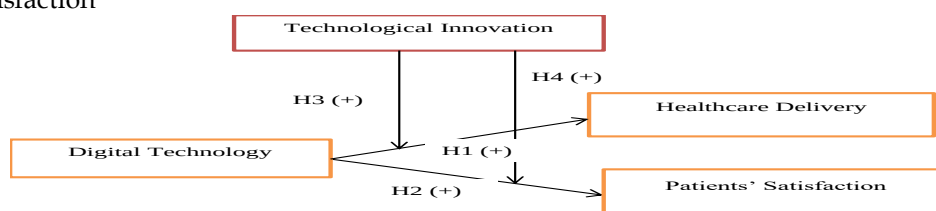


Figure 1: Hypothetical model for the study

Methods

The study employed a quantitative method. Quantitative research requires the process of collecting and analyzing numerical data, which may lead to finding patterns, making predictions, test causal relationships, and generalize results to wider populations. The study used both primary and secondary sources of data, however, this research collected primary data using well-structured closed-ended questions. The study population was the entire health service across the country and the sample size was five hundred and forty-eight (548). The participant was randomly selected, and snowball sampling was used where the researcher knew a medical officer, who may assist the researchers to get to the wider community of the health service.

Aim of the research

One of the main challenges of Ghanaian health care is the readily available patient data to assist medical officers in studying the medical history of patients and providing informed medical assistance to patients (Botchwey, 2022). The research aims to identify the impact of improved data collection from patients, and how stored data may help physicians to improve on delivering future health care.

Research setting

According to the World Bank's collection of development indicators derived from officially recognized sources, Ghana's number of physicians (per 1,000 inhabitants) was 0.1064 in 2019, as indicated in the projection in figure 1 (Economics, 2022). However, the Ghana Medical and Dental Council indicates that the medical doctors and physicians in Ghana stand as 2322 and 1267 respectively; totalling 3,589 (Medical and Dental Council, 2022).

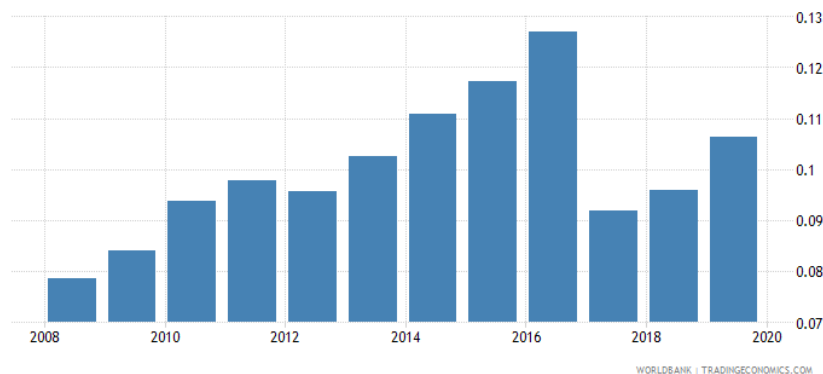


Figure 2: Physicians include generalist and specialist medical practitioners. (Trade Economics 2022)

The research focused mainly on Kule-bu Teaching Hospital, which has the largest concentration of medical officers in the country. Also, in addition to Korle-Bu Teaching Hospital, 37 Military Hospital, the Ghana Police Hospital, and 10 private medical facilities were contacted: These provided about 40% of the population, which were directly coverage through purposive sampling, and in addition, 60% of the population were covered through snowball sampling; through the recommendation and help from other health professionals.

Research design

The research methodology adopted was the quantitative research method. Random sampling and snowball sampling were used in the data collection procedure. Health practitioners were randomly selected across the health sectors of the Ghanaian Health Services, and known health practitioners were encouraged to send questions to their colleagues and social media platforms. Hypothesis testing was conducted to test each assumption, an idea proposed for the argument's sake if it might be accurate. The hypotheses considered are:

H1: Digital technology has a positive influence on patients' satisfaction

H2: Digital technology has a positive influence on healthcare delivery

H3: Technological innovation positively moderates the relationship between digital technology and healthcare delivery

H4: Technological innovation positively moderates the relationship between digital technology and patients' satisfaction.

The sample size was calculated from the population of 3589 with the formula to arrive at the sample size of 348

$$\text{Finite population: } n' = \frac{n}{1 + \frac{z^2 \times \hat{p}(1-\hat{p})}{\epsilon^2 N}}$$

where

z is z score

p̂ is the population proportion

n and n' are sample size

N is the population size

Participation in the research was voluntary, and the data was collected using google forms. The researchers adapted random and snowball sampling collection methods to collect the data. Snowball was used because the researchers needed to contact a physician known to be practising who may recommend another. The contact of the physicians was done randomly without any pattern.

Ethical Consideration

The voluntary participation of respondents in the research is essential; however, the respondents participated based on informed consent. Full consent was obtained from the participants before the study, considering that the privacy of research participants has to be ensured. An adequate level of confidentiality of the research data was also maintained.

Results

The research data was collected using google forms, which were made available to personal through social media such as WhatsApp and emailed to potential medical colleagues. The research working within time also constrained through the ball approach had the research question sent to the largest medical facility in Ghana, namely Korle-Bu Teaching Hospital, which is a medical training centre, and the Ghana Police Hospital. About 10 private medical facilities were also contacted: This was done to reach a more significant number of health community personnel across Ghana. In addition, due to constraints to reaching the number of 320 Medical Doctors in Ghana, the data collection process added other health personnel such as Physician assistants and Nurses who also have direct experience with patients.

Analysis of the Data

Table 2 presents the profile of the respondents. Concerning their age, 250 respondents were male, representing 38.6%, whereas 398 were female, representing 61.4%. Concerning their age, 227 of the respondents were between the ages of 20 and 24 years, representing 35.0%, 204 of the respondents were between the ages of 25 and 34 years, representing 31.5%, 127 of the respondents were between the ages of 35 - 44 years representing 19.6% and 90 of the respondents were over 50 years representing 13.9%. In their position, 132 of the respondents were Medical Doctors representing 20.4%. 320 of the respondents were Nurses representing 49.4%, 56 of the respondents were Physicians representing 8.6%, and 140 were Senior Nurses representing 21.6%. Their employment status shows that 31 of the respondents were on contract representing 4.8%, 399 of the respondents were Full-time employees representing 61.6%, 29 of the respondents were Part-time, representing 4.5%, and 189 of the respondents were unemployed, representing 29.2%.

Table 1: Respondents' Demographic

Profile	Characteristics	Frequency	Percentage
Gender	Male	250	38.6
	Female	398	61.4
	Total	648	100
Age	20-24 years	227	35.0
	25-34 years	204	31.5
	35-44 years	127	19.6
	Over 50 years	90	13.9
	Total	648	100
Position	Medical Doctor	132	20.4
	Nurse	320	49.4
	Physician	56	8.6
	Senior Nurse	140	21.6
	Total	648	100
Employment Status	Contract	31	4.8
	Full-time	399	61.6
	Part-time	29	4.5
	Unemployment	189	29.2
	Total	648	100
Institution	Private	242	37.3
	Public	406	62.7
	Total	648	100

The reliability of the constructs used for the study was tested, and table 3 presents the result. The Cronbach alpha values indicate that the items used to measure the constructs are highly reliable, and the Kaiser-Meyer-Olkin Measure of Sampling Adequacy and their Approx. Chi-Square confirmed that the items for the constructs are reliable.

Table 3 indicates the Kaiser-Meyer-Olkin (KMO), which measures the sampling adequacy; a sample measure closer to 1.0 is more accurate. KMO values between 0.8 and 1 indicate the sampling is adequate, and values less than 0.6 indicate the sampling is not adequate and that remedial action should be taken (Nuri & Nasution, 2019).

Table 2: Test of Validity and Reliability

Constructs	Cronbach's Alpha	Kaiser-Meyer-Olkin Measure of Sampling Adequacy.	Approx. Chi-Square
DT	.711	.500	75.388
HCD	.812	.567	90.473
TIN	.776	.560	224.433
PS	.855	.689	423.282
BR	.868	.761	628.668

DT = Digital Technology, PS = Patients' Satisfaction, HCD = Healthcare Delivery, TIN = Innovation Technology, BR = Barriers

Table 4 examines the influence of digital technology on healthcare delivery; the R Square indicate that digital technology can overall influence healthcare delivery by about 17%. The (Beta = .408; $t = 11.374$ and $p < .000$) statistically indicate that digital technology positively and significantly influences healthcare delivery.

The effect of digital technology on patient satisfaction, the R Square indicate that digital technology can influence patient satisfaction by about 11%. The (Beta = .332; $t = 8.946$ and $p < .000$) statistically indicate that digital technology positively and significantly influences patient satisfaction.

Table 3: Influence of Digital Technology on Healthcare Delivery and Patients' Satisfaction

Model 1	R	R Square	Adjusted R Square	Std. An error in the Estimate
	.408 ^a	.167	.166	.644
ANOVA ^a				
Sum of Squares	df	Mean Square	F	Sig.
53.684	1	53.684	129.357	.000 ^b
Unstandardized Coefficients		Standardized Coefficients		
B	Std. Error	Beta	T	Sig.
.401	.035	.408	11.374	.000
Model 2	R	R Square	Adjusted R Square	Std. An error in the Estimate
	.332 ^a	.110	.109	.703
ANOVA ^a				
39.596	1	39.596	80.029	.000 ^b
Unstandardized Coefficients		Standardized Coefficients		
B	Std. Error	Beta	T	Sig.
.344	.038	.332	8.946	.000

The moderating effect of technological innovation on the relationship between digital technology and healthcare delivery and the moderating effect of technological innovation on the relationship between digital technology and patient satisfaction, Table 5 presents the results. The R Square indicate that technological innovation can moderate the relationship between digital technology and healthcare delivery by 26%. Test(s) of highest order unconditional interaction(s) p-value of (.0003), the conditional effects of the focal predictor at values of the moderator(s) t value of 9.0308 and $p < 0.0000$ statically established that technological innovation positively and significantly moderates the relationship between digital technology on healthcare delivery.

Table 5 indicates the goodness of the research data measuring the strength of the relationship between the dependent variable on a convenient 0 – 100% scale. From Table 5, the moderating effect of technological innovation on the relationship between digital technology and patient satisfaction, the R Square indicate that technological innovation can moderate the relationship between digital technology and healthcare delivery 23%. Test(s) of highest order unconditional interaction(s) p-value of (.0002), the conditional effects of the focal predictor at values of the moderator(s) t value of 6.0669 and $p < 0.0000$ statically indicate that technological innovation positively and significantly moderates the relationship between digital technology on patient's satisfaction.

Table 4: Moderating effect of Technological Innovation

R	R-sq	MSE	F	df1	df2	p
.5128	.2630	.3683	76.5902	3.0000	644.0000	.0000
	Coeff	Se	T	P	LLCI	ULCI
Int_1	.2741	.0759	3.6102	.0003	.4231	.1250
Test(s) of highest order unconditional interaction(s)						
	R2-chng	F	df1	df2	p	
	.0149	13.0335	1.0000	644.0000	.0003	
Conditional effects of the focal predictor at values of the moderator(s)						
	Effect	Se	T	P	LLCI	ULCI
	.3356	.0372	9.0308	.0000	.2626	.4085
R	R-sq	MSE	F	df1	df2	p
.4831	.2334	.4276	65.3658	3.0000	644.0000	.0000
	Coeff	Se	T	P	LLCI	ULCI
Int_1	.3114	.0818	3.8064	.0002	.1507	.4720

Test(s) of highest order unconditional interaction(s):					
R2-chng	F	df1	df2	p	
.0172	14.4888	1.0000	644.0000	.0002	
Conditional effects of the focal predictor at values of the moderator(s)					
Effect	Se	T	P	LLCI	ULCI
.4826	.0796	6.0669	.0000	.3264	.6388

Table 5: Hypothesis Testing and Findings

Hypothesis	Relationship	T=value	P=value	Remarks
H1	DT- - > HCD	11.374	.000	Supported
H2	DT - - > PS	8.946	.000	Supported
H3	TIN - - > HCD *DT	9.0308	.0000	Supported
H4	TIN - - > HCD*PS	6.0669	.0000	Supported

Discussion

The study's findings indicate that digital technology positively and significantly influences healthcare delivery. Until the introduction of medical drones in Ghana, if the necessary medicine is unavailable, the patients may likely succumb to the sicknesses (Ghana Health Service, 2019 & Ackerman, 2019). Ghana has an estimated population of 30.8 million. According to data from the World Bank (2019), about 45% of Ghana's population is found in rural areas. World Health Organization estimated earlier that by the year 2017, there would be 270 cases of malaria per 1000 people. Though the disease can be prevented and curable, in 2019, the country piloted a new vaccine for children in rural areas that mainly lack timely access to the treatment that could save their lives due to the lack of readily available data on the case.

Digital technology has a positive and significant influence on patient satisfaction. Using technology to provide quality healthcare services is highly commendable and a noble idea. The revolutionary healthcare delivery model has saved many people's lives and is also an inspiration to most people (Van Velthoven et al., 2019; Pathak et al., 2019).

Technological innovation positively and significantly moderates the relationship between digital technology on healthcare delivery. According to Bambale, Kamselen, Lateef, Qing, and Ado (2022), healthcare facilities need to concentrate on technology-based services since customer satisfaction levels decline as populations grow. In addressing the healthcare problem in Ghana, technologically based management systems and equipment must be implemented to improve hospitals' operational performance, decreasing treatment delays and lessening clinicians' workload.

The platform-market offering should be perceived as innovative by the consumers for the digital platform to achieve the sought return from innovation (Anselmsson and Johansson, 2009). Innovation literature has indicated that firms that emphasize their technological superiority in their ads lead to better customer communication and better returns on their innovation-driven ventures (Simon and Honore Petnji Yaya, 2012); therefore, there is a need to highlight the overall improved doctor-patient relationship via technological advancement.

Technological innovation positively and significantly moderates the relationship between digital technology on patient satisfaction. Research also shows that customers of companies with new superior market technology had better online engagement and were more eager to advocate the service providers' technology and benefits (Gruen et al., 2006). Product-development literature argued that new product advantages could be leveraged by enhancing product or service innovativeness to the limit, which does not hamper customer satisfaction and eWOM (Calantone et al., 2006). Dou et al. (2021) found that companies tend to compete through an array of novel designs and technologies embedded in new service platforms that complicate customer interaction and ease of use, resulting in a drop in customer emotional engagement and satisfaction with technology usage frustration. Therefore, we argue that customer technology familiarity is paramount to enhancing the perception of useful healthcare innovativeness (Dai et al., 2015).

Conclusions

According to the World Bank Report (2019), the rapid digital change is redefining our global economy, affecting almost every industry and facet of everyday life, and altering how we access information, study, work, trade, and socialize, public and private services and information of which the report stated that Ghana was not an exception. The report further indicated that the adaptation of disruptive technologies by the Government of Ghana in the private sector has also contributed to this demand for instant:

1. The Vaccine Wastage Sentinel Monitoring System, created by the Ghana Health Service in collaboration with the World Health Organization (WHO), employs sensor technology to track the supply chain of vaccinations to enhance management and reduce wastage.
2. In April 2019, Google built the first AI research facility in Africa in Accra, Ghana.
3. Ghana's Ministry of Lands and Natural Resources is planning a blockchain-based land management system with IBM: This may replace the outdated, paper-based central land records system with an immutable, secure, and decentralized land records ledger.
4. Rancard, a Ghana-based firm that pioneered social recommendations and AI-powered consumer engagement technology, just released R2, a virtual agent that automates interactions between companies and their clients by utilizing the most significant machine learning and AI.
5. The Government and American tech company Zipline have inked a contract that calls for unmanned drones to carry medical supplies like blood to hospitals and clinics (World Bank Report, 2022).

Notwithstanding the huge contribution in the health service by both the public and the private sector, the current situation needs a lot of improvement to make the health care service delivered effective and efficient. Barriers within the health care services, which currently exist, and impact negatively change management in the aspect of technological advancement require immediate attention: This may ensure improved health care provided to patients.

With the apparent advancement of digital technology in all aspects of the Ghanaian economy, of which the health care sector has received a significant boost to improve the activities within this sector, we conclude that digital technology plays a significant success factor in health service.

Limitations

Attitudes of the population for one particular item, in reality, exist on a vast, multi-dimensional continuum. Therefore, the Likert Scale with uni-dimensional and with only 5-7 options of choice fails to measure the actual attitudes of respondents. The study findings should be interpreted cautiously as the study material was randomly collected, and the participants volunteered, so the findings might not be generalizable to a broader population. Even though we saw no tendency for the participants to automatically select a particular score when encountering the 1-5 scale, this research validated the test for future study. In addition to the lapses indicated, most of the medical professional contacted were highly demanded in their field of operations, which gave them very little time to concentrate and fully evaluate the research questionnaires. For instance, almost all the highly skilled health professionals in Koforidua Teaching Hospital, 37 Military Hospital, and Ghana Police Hospital also buffer as full-time personnel in the private specialist hospitals.

Declaration

We declare that this work is an original report of our research, has been written us and has not been submitted for any previous degree or journal. The experimental work is almost entirely our work; the collaborative contributions have been indicated clearly and acknowledged.

Signed: Joseph Lanton Adjei Mensah, Issah Ofori, Mercy Kwakye, Ebenezer Aninkorah, and Silas Adjei

Ethics approval and consent to participate:

https://docs.google.com/forms/d/1Z6iBqQvRvcPwZ6Kk_egeQ2B_Db9l2unlzfGSEML9XA/edit?usp=forms_home&ths=true&pli=1

Consent for publication:

https://docs.google.com/forms/d/1Z6iBqQvRvcPwZ6Kk_egeQ2B_Db9l2unlzfGSEML9XA/edit?usp=forms_home&ths=true&pli=1

Availability of data and materials:

https://docs.google.com/forms/d/1Z6iBqQvRvcPwZ6Kk_egeQ2B_Db9l2unlzfGSEML9XA/edit?usp=forms_home&ths=true&pli=1

References

- Abdelkafi, N. and Pero, M. (2018)**, "Supply chain innovation-driven business models: exploratory analysis and implications for management", *Business Process Management Journal*, Vol. 24 No. 2, pp. 589-608, doi: 10.1108/BPMJ-05-2016-0109.
- Abid, H., Javaida, M., Ravi, P. S., Rajiv, S., & Shanay, R. (2021)**. Blockchain technology applications in healthcare: An overview. *International Journal of Intelligent Networks*, 130-139.
- Ackerman, Evan. (2019)**. Zipline Expands Medical Drone Delivery to Ghana, *IEEE Spectrum*,
- Addae Stephen, "Evolution of Modern Medicine in a Developing Country: Ghana 1880-1960"**, Durham Academic Press, 1997, pp. XII, 523
- Adu-Gyamfi Samuel, "From Vital Force to the Scientific or an Admixture (2018)**. A Historical Discourse on Individuals Value for Indigenous Medical Practices in Ghana", *Journal of Basic and Applied research international*, 2018 (No Page)
- Adu-Gyamfi, S., Brenya, E., & Egyir, N. E. (2017)**. Public Health in Colonial and Post-Colonial Ghana: Lesson-Drawing for The Twenty-First Century. ResearchGate.
- Adu-Gyamfi, Samuel, and Aminu Dramani (2017)**. "Sustaining Ghana's National Health Insurance Scheme Through Preventive Healthcare Strategies and Legislation." *International and Multidisciplinary Journal of Social Sciences* 6, no. 1 (2017): 47-69. <https://doi.org/10.17583/rimcis.2017.2149>
- Adwan, E. and Alsoufi, A. (2016)**, "A review of ICT technology in construction", *International Journal of Managing Information Technology*, Vol. 8 Nos 3-4, pp. 1-21, doi: 10.5121/ijmit.2016.8401.
- Alexander, D.L., Lynch, J.G. and Wang, Q. (2008)**, "As time goes by: do cold feet follow warm intentions for really new versus incrementally new products?", *Journal of Marketing Research*, Vol. 45 No. 3, pp. 307-319, doi: 10.1509/jmkr.45.3.307.
- Altshuller, G. (1999)**, *The Innovation Algorithm: TRIZ, Systematic Innovation and Technical Creativity*, Technical Innovation Center, Worcester, MA.
- Ampadu, S. K. and B. Abdul-H (2022)**. A historical overview of Western medicine and health in Ghana in the twentieth century. Retrieved from <https://www.tmrjournals.com/public/articlePDF/20220616/252af8d12e1758ccedf0b5d3828b3210.pdf>
- Andtfolk, M., Nyholm, L., Eide, H. et al. Attitudes toward the use of humanoid robots in healthcare – a cross-sectional study. AI & Soc (2021)**. <https://doi.org/10.1007/s00146-021-01271-4>
- Anselmsson, J. and Johansson, U. (2009)**, "Retailer brands and the impact on innovativeness in the grocery market", *Journal of Marketing Management*, Vol. 25 Nos 1-2, pp. 75-95, doi: 10.1362/026725709X410043.
- Asset. (2020, 1 7)**. 5 Big Brands that Uses RFID Technology in Business Smartly. Retrieved 9 1, 2022, from <https://www.assetinfinity.com/blog/big-brands-uses-rfid-technology>
- Baden-Fuller, C. and Morgan, M.S. (2010)**, "Business models as models", *Long Range Planning*, Vol. 43 Nos 2-3, pp. 156-171, doi: 10.1016/J.LRP.2010.02.005.
- Bagherian, H. & Sattaric, M. (2022)**. Health Information System in Developing Countries: A Review on the Challenges and Causes of Success and Failure. *Medical Journal of The Islamic Republic of Iran*. Retrieved from <https://www.ncbi.nlm.nih.gov/pmc/articles/PMC9700424/>
- Baiyere, A., Salmela, H. and Tapanainen, T. (2020)**, "Digital transformation and the new logics of business process management", *European Journal of Information Systems*, Vol. 29 No. 3, pp. 238-259, doi: 10.1080/0960085X.2020.1718007.
- Balocco, R., Cavallo, A., Ghezzi, A. and Barbegal-Mirabent, J. (2019)**, "Lean business models change process in digital entrepreneurship", *Business Process Management Journal*, Vol. 25 No. 7, pp. 1520-1542, doi: 10.1108/BPMJ-07-2018-0194.
- Bashshur, Rashid L., Timothy G. Reardon, and Gary W. Shannon (2000)**. "Telemedicine: a new health care delivery system." *Annual review of public health* 21, no. 1 (2000): 613-637.
- Batocchio, A. and Ghezzi, A. (2016)**, "A method for evaluating business models implementation process", *Business Process Management Journal*, Vol. 22 No. 4, pp. 712-735, doi: 10.1108/BPMJ-08-2015-0117.

- Berger Abi, "The Impact of New Technologies in Medicine", *British Medical Journal*, Vol 318: 314.1999. <https://doi.org/10.1136/bmj.318.7180.346>
- Blanco, N. E. (2022). The current and potential role of blockchain-based technology in managing medical records in Africa. University of Johannesburg.
- Blaschke, M., Cigaina, M., Riss, U.V. and Shoshan, I. (2017), "Designing business models for the digital economy", in Oswald, G. and Kleinemeier, M. (Eds), *Shaping the Digital Enterprise*, Springer International Publishing, Switzerland, pp. 121-136, doi: 10.1007/978-3-319-40967-2_6.
- Blaya, Joaquin A., Hamish SF Fraser, and Brian Holt. "E-health technologies show promise in developing countries." *Health Affairs* 29, no. 2 (2010): 244-251. <https://doi.org/10.1377/hlthaff.2009.0894>
- Botchwey O.A.C., (2022). The Challenges Confronting Computerized Health Records System Performance of the Pentecost Hospital, Accra: A Qualitative Study *European Scientific Journal*, ESJ, 18 (3), 112GhanaDE4ALOWRes.pdf
- Brad, S. and Brad, E. (2016), "Directed innovation of business models", *International Journal of management, Knowledge and Learning*, Vol. 5 No. 1, pp. 97-119.
- Bukachi, Frederick, and Neil Pakenham-Walsh. "Information technology for health in developing countries." *Chest* 132, no. 5 (2007): 1624-1630. <https://doi.org/10.1378/chest.07-1760>
- Calantone, R.J., Chan, K. and Cui, A.S. (2006), "Decomposing product innovativeness and its effects on new product success", *Journal of Product Innovation Management*, Vol. 23 No. 5, pp. 408-421.
- Catherine L, A., & Ritu, A. (2011). The Digitization of Healthcare: Boundary Risks, Emotion, and Consumer Willingness to Disclose, Personal Health Information. Retrieved 06 29, 2022, from EBSCOhost: <https://web.s.ebscohost.com/ehost/pdfviewer/pdfviewer?vid=3&sid=174ee527-4c4b-4839-99f5-043935a53ba1%40redis>
- Cenamor, J., Sjodin, D.R. and Parida, V. (2017), "Adopting a platform approach in servitization: leveraging the value of digitalization", *International Journal of Production Economics*, Vol. 192, pp. 54-65, doi: 10.1016/J.IJPE.2016.12.033.
- Chandrayan, A (2020) How is COVID-19 impacting and transforming the humanoid robot industry? Robotics Tomorrow. Available at: <https://www.robotictomorrow.com/story/2020/06/how-is-covid-19-impacting-and-transforming-the-humanoid-robot-industry/15332/>
- Chesbrough, H. and Rosenbloom, R.S. (2002), "The role of the business model in capturing value from innovation: evidence from Xerox Corporation's technology spinoff companies", *Industrial and Corporate Change*, Vol. 11 No. 3, pp. 529-555, doi: 10.1093/ICC/11.3.529.
- Childers, T.L., Carr, C.L., Peck, J. and Carson, S. (2001), "Hedonic and utilitarian motivations for online retail shopping behavior", *Journal of Retailing*, Vol. 77 No. 4, pp. 511-535, doi: 10.1016/S0022-4359(01)00056-2.
- Crane, C. and Kitchens, F. (2013), "Transforming traditional business models through disruptive technology", *Active Citizenship by Knowledge Management & Innovation: Proceedings of the Management, Knowledge and Learning International Conference 2013*, ToKnowPress, Zadar, pp. 1157-1163.
- Dai, H., Luo, X.R., Liao, Q. and Cao, M. (2015), "Explaining consumer satisfaction of services: the role of innovativeness and emotion in an electronic mediated environment", *Decision Support Systems*, Vol. 70, pp. 97-106, doi: 10.1016/j.dss.2014.12.003.
- De, R., Neena, P., & and Abhipsa, P. (2020). Impact of digital surge during Covid-19 pandemic: A viewpoint on research and practice. Elsevier Public Health Emergency Collection, 102171.
- Dou, R., Li, W., Nan, G., Wang, X. and Zhou, Y. (2021), "How can manufacturers make decisions on product appearance design? A research on optimal design based on customers' emotional satisfaction", *Journal of Management Science and Engineering*, Vol. 6 No. 2, pp. 177-196, doi: 10.1016/j.jmse.2021.02.010.
- Elia, G., Margherita, A. and Passiante, G. (2020), "Digital entrepreneurship ecosystem: how digital technologies and collective intelligence are reshaping the entrepreneurial process", *Technological Forecasting and Social Change*, No. 150, pp. 1-12, doi: 10.1016/J.TECHFORE.2019.119791.
- Eyal, T., Liberman, N., Trope, Y. and Walther, E. (2004), "The pros and cons of temporally near and distant action", *Journal of Personality and Social Psychology*, Vol. 86 No. 6, pp. 781-795, doi: 10.1037/0022-3514.86.6.781.
- Fett Michael, (2000). Technology, Health and Healthcare", *Occasional papers: Health Financial Series*, Vol 5.2000.3
- Foroudi, P., Gupta, S., Sivarajah, U. and Broderick, A. (2018), "Investigating the effects of smart technology on customer dynamics and customer experience", *Computers in Human Behavior*, Vol. 80, pp. 271-282, doi: 10.1016/j.chb.2017.11.014.
- Foss, N.J. and Saebi, T. (2017), "Fifteen years of research on business model innovation: how far have we come, and where should we go?", *Journal of Management*, Vol. 43 No. 1, pp. 200-227, doi: 10.1177/0149206316675927.

- Fritze, M.P., Marchand, A., Eisingerich, A.B. and Benkenstein, M. (2020), "Access-based services as substitutes for material possessions: the role of psychological ownership", *Journal of Service Research*, Vol. 23 No. 3, pp. 368-385, doi: 10.1177/1094670520907691.
- Garcia S Eliot, "Science and Technology and their role in Human Health in Developing Countries", Vol 95, Suppl: 5-7, 2000. <https://doi.org/10.1590/S0074-02762000000700001>
- Ghana's Medical Drone Delivery System takes off, Ministry of Health, Republic of Ghana, 2019
- Gillis, A. S. (2022, 6). What is the Internet of things (IoT)? Retrieved 09 1, 2022, from TechTarget: <https://www.techtarget.com/iotagenda/definition/Internet-of-Things-IoT>
- Gruen, T.W., Osmonbekov, T. and Czaplewski, A.J. (2006), "eWOM: the impact of customer-to-customer online know-how exchange on customer value and loyalty", *Journal of Business Research*, Vol. 59 No. 4, pp. 449-456, doi: 10.1016/j.jbusres.2005.10.004.
- Healthcare, G. (2017). Radio-frequency identification technology in healthcare. Retrieved 9 1, 2022, from Medical Device Network: <https://www.medicaldevice-network.com/comment/commentradio-frequency-identification-technology-in-healthcare-5848545/#:~:text=RFID%20helps%20to%20mitigate%20drug,of%20administering%20the%20wrong%20medications.>
- Henfridsson, O., Nandhakumar, J., Scarbrough, H. and Panourgias, N. (2018), "Recombination in the open-ended value landscape of digital innovation", *Information and Organization*, Vol. 28 No. 2, pp. 89-100, doi: 10.1016/J.INFOANDORG.2018.03.001.
- Hoang, D., Kousi, S. & Martinez, L.F. Online customer engagement in the post-pandemic scenario: a hybrid thematic analysis of the luxury fashion industry. *Electron Commer Res* 23, 1401-1428 (2023). <https://doi.org/10.1007/s10660-022-09635-8>
- Hossain, M. (2017), "Business model innovation: past research, current debates, and future directions", *Journal of Strategy and Management*, Vol. 10 No. 3, pp. 1-19, doi: 10.1108/JSMA-01-2016-0002.
- Hwang, J. and Griffiths, M.A. (2017), "Share more, drive less: millennials value perception and behavioral intent in using collaborative consumption services", *Journal of Consumer Marketing*, Vol. 34 No. 2, pp. 132-146, doi: 10.1108/JCM-10-2015-1560.
- Ilevbare, I.M., Probert, D. and Phaal, R. (2013), "A review of TRIZ, and its benefits and challenges in practice", *Technovation*, Vol. 23 Nos 2-3, pp. 30-37, doi: 10.1016/J.TECHNOVATION.2012.11.003.
- Imgrund, F., Janiesch, C. and Winkelmann, A. (2018), "Approaching digitalization with business process management", *Multikonferenz Wirtschaftsinformatik 2018*, March 06-09, 2018, Lüneburg, Germany, pp. 1725-1736.
- ISCOOP. (2022). Internet of Things (IoT) in healthcare: benefits, use cases and evolutions. Retrieved 9 1, 2022, from ISCOOP: <https://www.i-scoop.eu/internet-of-things-iot/internet-things-healthcare/>
- Johnson, M.W., Christensen, C.M., Kagermann, H., 2008 December. Reinventing your business model. *Harvard Business Review*, 50e59.
- Juma, C. and Yee-Cheong, L., 2005. Reinventing global health: the role of science, technology, and innovation. *The Lancet*, 365(9464), pp.1105-1107.
- Katiyar, S., & Katiyar, K. (2022). Recent trends towards cognitive science: from robots to humanoids. Elsevier: *International Journal of Human Computer Studies*.
- Kemp J, Zhang T, Inglis F, Wiljer D, Sockalingam S, Crawford A, Lo B, Charow R, Munnery M, Singh Takhar S, Strudwick G Delivery of Compassionate Mental Health Care in a Digital Technology -Driven Age: Scoping Review *J Med Internet Res* 2020;22(3):e16263 doi: 10.2196/16263PMID: 32141833PMCID: 7084292
- Khin, S. and Ho, TC (2019), "Digital technology, digital capability and organizational performance: a mediating role of digital innovation", *International Journal of Innovation Science*, Vol. 11 No. 2, pp. 177-195, doi: 10.1108/IJIS-08-2018-0083.
- Kirchmer, M. (2017), *Enabling Innovation through Business Process Management*, [White paper] Accenture, available at: https://www.researchgate.net/publication/259755101_Innovation_through_Business_Process_Management.
- Kombe, C., Sam, A., Ally, M., & Finne, A. (2019). Blockchain Technology in Sub-Saharan Africa: Where does it fit in Healthcare Systems: A case of Tanzania. *Journal of Health Informatics in Developing Countries*.
- Kotarba, M. (2018), "Digital transformation of business models", *Foundations of Management*, Vol. 10 No. 1, pp. 123-142, doi: 10.2478/FMAN-2018-0011.
- Kramp, T., Kranenburg Van, R., & Lange, S. (2013). Introduction to the Internet of Things. *Research Gate*, 1-10.
- Lambert, S. and Montemari, M. (2017), "Business model research: from concepts to theories", *International Journal of Business and Management*, Vol. 12 No. 11, pp. 41-51, doi: 10.5539/IJBM.V12N11P41.

- Lamberton, C.P. and Rose, R.L. (2012)**, "When is ours better than mine? A framework for understanding and altering participation in commercial sharing systems", *Journal of Marketing*, Vol. 76 No. 4, pp. 109-125, doi: 10.1509/jm.10.0368.
- Lii, Y. and Lee, M. (2012)**, "The joint effects of compensation frames and price levels on service recovery of online pricing error", *Managing Service Quality: An International Journal*, Vol. 22 No. 1, pp. 4-20, doi: 10.1108/09604521211198083.
- Livotov, P., Chandra Sekaran, A.P., Law, R. and Mas'udah, R.D. (2019)**, "Systematic innovation in process engineering: linking TRIZ and process intensification", in Chechurin, L. and Collan, M. (Eds), *Advances in systematic Creativity*, Palgrave Macmillan, Cham, pp. 27-44.
- Lowe, B. and Alpert, F., (2015)**. Forecasting consumer perception of innovativeness. *Technovation*, 45, pp.1-14.
- McKinsey (2020)**, "Five fifty: a quick briefing in five-or a fifty-minute deeper dive", available at: www.mckinsey.com/business-functions/strategy-and-corporate-finance/our-insights/five-fifty-the-quickening (accessed 27 August 2020).
- Mia, S. (2021, 08 23)**. Boston Dynamics's humanoid robot Atlas mastered a parkour track. But like a human, it took plenty of practice. Retrieved 08 31, 2022, from Boston.Com: <https://www.boston.com/news/technology/2021/08/23/boston-dynamics-robot-atlas-parkour-bloopers/>
- Micheal Kofi Boachie a, John Agyemang b, Mustapha Immurana c (2022)**. Health sector funding in Ghana: The effect of IMF conditionalities. <https://doi.org/10.1016/j.dialog.2022.100045>
- Ming-Sung Cheng, J., Shih-Tse Wang, E., Ying-Chao Lin, J. and Vivek, SD (2009)**, "Why do customers utilize the internet as a retailing platform?", *Asia Pacific Journal of Marketing and Logistics*, Vol. 21 No. 1, pp. 144-160, doi: 10.1108/13555850910926290.
- Mohlmann, M. (2015)**, "Collaborative consumption: determinants of satisfaction and the likelihood of using a sharing economy option again", *Journal of Consumer Behaviour*, Vol. 14 No. 3, pp. 193-207, doi: 10.1002/cb.1512.
- Munkvold, B.E. (2002)**, *Implementing Collaboration Technologies in Industry - Case Examples and Lessons Learned*, Springer, London.
- Nambisan, S., Siegel, D. and Kenney, M. (2018)**, "On open innovation, platforms, and entrepreneurship", *Strategic Entrepreneurship Journal*, Vol. 12 No. 3, pp. 354-368, doi: 10.1002/SEJ.1300.
- Nguyen, N. T. (2018)**. Design Principles for Health Information Infrastructures in Developing Countries. Retrieved from <https://www.mn.uio.no/ifi/english/research/groups/is/research-library/phd-theses/thesis-final-23.08.2018.pdf>
- Nuri W., and Nasution, R. A., (2019)**. Integrated value co-creation and affective commitment in banking industry. Retrieved from https://www.researchgate.net/figure/Results-of-the-Kaiser-Meyer-Olkin-KMO-measure-of-sampling-adequacy-and-Bartlett's-test_tbl1_337999097
- Odutayo, A. (2015)**. Conditional Development: Ghana Crippled by Structural Adjustment Programmes. Retrieved from <https://www.e-ir.info/2015/03/01/conditional-development-ghana-crippled-by-structural-adjustment-programmes/>
- OECD. (2020)**. 21st century technologies promises and perils of a dynamic future. ResearchGate.
- Ojasalo, J. and Kauppinen, H. (2016)**, "Collaborative innovation with external actors: an empirical study on open innovation platforms in smart cities", *Technology Innovation Management Review*, Vol. 6 No. 12, pp. 49-60, doi: 10.22215/TIMREVIEW/1041.
- Ok, Yong Sik, Scott X. Chang, Bin Gao, and Hyun-Joong Chung. "SMART biochar technology—a shifting paradigm towards advanced materials and healthcare research." *Environmental Technology & Innovation* 4 (2015): 206-209. <https://doi.org/10.1016/j.eti.2015.08.003>**
- Oliver, R.L. (1997)**. *Satisfaction: A behavioral perspective on the consumer*. New York: McGrawHill.
- Osseo-Asare, Abena Dove. "Scientific equity: Experiments in laboratory education in Ghana." *Isis* 104, no. 4 (2013): 713-741. <https://doi.org/10.1086/674941>**
- Osterwalder, A. and Pigneur, Y. (2010)**, *Business Model Generation: A Handbook for Visionaries, Game Changers, and Challenges*, John Wiley & Sons, NJ.
- Ozturkcan, S., & Merdin-Uygur, E. (2021)**. Humanoid service robots: The future of healthcare? *Journal for Information Technology Teaching Cases*, <https://doi.org/10.1177/20438869211003905>.
- Pajaziti, A., Bajrami, X., & Pula, G. (2021, 4 28)**. Communication and Interaction between Humanoid Robots and Humans. Retrieved 08 30, 2022, from <https://www.intechopen.com/chapters/76272>
- Parida, V., Sjodin, D. and Reim, W. (2019)**, "Reviewing literature on digitalization, business model innovation, and sustainable industry: past achievements and future promises", *Sustainability*, Vol. 19 No. 2, pp. 1-18, doi: 10.3390/SU11020391.
- Pathak, Pankaj, et al. "Humanitarian Impact of Drones in Healthcare and Disaster Management." *International Journal of Recent Technology and Engineering*, vol. 7, no. 5, 2019, pp. 201-205.**

- Paunov, C. and Planes-Satorra, S. (2019)**, "How are digital technologies changing innovation? Evidence from agriculture, the automotive industry and retail", OECD Science, Technology and Industry Policy Papers, No. 74, OECD Publishing, Paris. doi: 10.1787/67bbcafe-en.
- Pekuri, A., Pekuri, L. and Haapasalo, H. (2013)**, "Business models in construction—construction managers' viewpoint", Diversity, Technology, and Innovation for Operational Competitiveness: Proceedings of the 2013 International Conference on Technology Innovation and Industrial Management, ToKnowPress, pp. 86-87.
- Petrova, M. (2018, 8 5)**. Disney invented a robotic stuntman that could put human ones out of a job. Retrieved 8 31, 2022, from CNBC: <https://www.cnbc.com/2018/08/03/disney-develops-robotic-stunt-double.html>
- Prentice, C., Dominique Lopes, S. and Wang, X. (2020)**, "The impact of artificial intelligence and employee service quality on customer satisfaction and loyalty", Journal of Hospitality Marketing and Management, Vol. 29 No. 7, pp. 739-756, doi: 10.1080/19368623.2020.1722304
- Prodanov, H. (2018)**. Social Entrepreneurship And Digital . Economic Alternatives,, 123-138.
- Rachinger, M., Rauter, R., Müller, C., Vorraber, W. and Schirgi, E. (2019)**, "Digitalization and its influence on business model innovation", Journal of Manufacturing Technology Management, Vol. 3 No. 8, pp. 1143-1160, doi: 10.1108/JMTM-01-2018-0020.
- Ramdani, B., Binsaf, A. and Boukrami, E. (2019)**, "Business model innovation: a review and research agenda", New England Journal of Entrepreneurship, Vol. 22 No. 2, pp. 89-108, doi: 10.1108/NEJE-06-2019-0030.
- Reinartz, W., Wiegand, N. and Imschloss, M. (2019)**, "The impact of digital transformation on the retailing value chain", International Journal of Research in Marketing, Vol. 36 No. 3, pp. 350-366.
- Rempher, Kenneth J., LTC Caterina EM Lasome, and Terry J. Lasome. "Leveraging palm technology in the advanced practice nursing environment." AACN Advanced Critical Care 14, no. 3 (2003): 363-370.**
- Ryan, C., Hilary, D., Thomas, C. G., & Lee, E. S. (2020)**. Envisioning a Better US. Health Care System for All: Coverage and Cost of Care. American College of Physicians Journal.
- Savransky, S.D. (2000)**, Engineering of Creativity - Introduction to TRIZ Methodology of Inventive Problem Solving, CRC Press, Boca Raton, FL.
- Schiavi, G.S. and Behr, A. (2018)**, "Emerging technologies and new business models: a review on disruptive business models", Innovation and Management Review, Vol. 15 No. 4, pp. 338-355, doi: 10.1108/INMR-03-2018-0013.
- Schmitt, S. (2022, 1 22)**. History of robots: from Heron to Spot to the AI future. Retrieved 8 30, 2022, from <https://mixed-news.com/en/history-of-robotics/>
- Serra-Cantallops, A., Ramon-Cardona, J. and Salvi, F., 2018**. The impact of positive emotional experiences on eWOM generation and loyalty. Spanish Journal of Marketing-ESIC.
- Shetu, S.N., Islam, M.M. & Promi, S.I. An Empirical Investigation of the Continued Usage Intention of Digital Wallets: The Moderating Role of Perceived Technological Innovativeness. Futur Bus J 8, 43 (2022).** <https://doi.org/10.1186/s43093-022-00158-0>
- Simon, A. and Honore Petnji Yaya, L. (2012)**, "Improving innovation and customer satisfaction through systems integration", Industrial Management and Data Systems, Vol. 112 No. 7, pp. 1026-1043, doi: 10.1108/02635571211255005.
- Solaimani, S. and Bouwman, H. (2012)**, "A framework for the alignment of business model and business processes: a generic model for trans-sector innovation", Business Process Management Journal, Vol. 18 No. 4, pp. 655-679, doi: 10.1108/14637151211253783.
- Souchkov, V. (2010)**, "TRIZ and systematic business model innovation", Proceedings of the 10th TRIZ Future Conference 2010, held in Bergamo, Italy, Bergamo University Press, Bergamo, pp. 189-197.
- Souchkov, V. (2010)**, "TRIZ and systematic business model innovation", Proceedings of the 10th TRIZ Future Conference 2010, held in Bergamo, Italy, Bergamo University Press, Bergamo, pp. 189-197.
- Stock, R.M. (2011)**, "How does product program innovativeness affect customer satisfaction? A comparison of goods and services", Journal of the Academy of Marketing Science, Vol. 39 No. 6, pp. 813-827, doi: 10.1007/s11747-010-0215-4.
- Storbacka, K. and Moser, T. (2020)**, "The changing role of marketing: transformed propositions, processes and partnerships", AMS Review, Vol. 10 Nos 3/4, pp. 299-310.
- Sulaiman Abdullahi Bambale, S. A., Kamselen, K. M., Lateef, A. S., Quig, M. N. and Ado, B. A. (2022)**. The Moderating Role of Technological Innovations on The Relationship Between Operational Performance and Patient Satisfaction. Retrieved from https://www.researchgate.net/publication/355796101_The_Moderating_Role_of_Technological_Innovations_on_The_Relationship_Between_Operational_Performance_and_Patient_Satisfaction
- Teece, D. (2010)**, "Business models, business strategy and innovation", Long Range Planning, Vol. 43, pp. 172-194, doi: 10.1016/J.LRP.2009.07.003.

- Tolentino, Randy S., and Sungwon Park.** "A study on U-healthcare system for patient information management over ubiquitous medical sensor networks." *International Journal of Advanced Science and Technology* 18, no. 1 (2010): 10.
- Trenerry, B., Chng, S., Wang, Y., Suhaila, Z.S., Lim, S.S., Lu, H.Y. and Oh, P.H., 2021.** Preparing workplaces for digital transformation: an integrative review and framework of multi-level factors. *Frontiers in psychology*, 12, p.620766.
- Urbinati, A., Chiaroni, D., Chiesa, V. and Frattini, F. (2017),** "The role of digital technologies in the innovation process", XXIV IPDM Conference, Reykjavík, Iceland, 11-13 June 2017, pp. 1-24.
- Verhoef, P.C., Broekhuizen, T., Bart, Y., Bhattacharya, A., Dong, J.Q., Fabian, N. and Haenlein, M. (2021),** "Digital transformation: a multidisciplinary reflection and research agenda", *Journal of Business Research*, Vol. 122, pp. 889-901.
- Warner K. S.R., and Wäger, M. (2018).** Building dynamic capabilities for digital transformation: An ongoing process of strategic renewal. doi.org/10.1016/j.lrp.2018.12.001
- Weingart, Saul N. "Acquiring advanced technology: Decision-making strategies at twelve medical centers." *International Journal of Technology Assessment in Health Care* 9, no. 4 (1993): 530-538.** <https://doi.org/10.1017/S0266462300005456>
- WenJun Huang, Takeyasu Ichikohji (2023).** A review and analysis of the business model innovation literature. Retrieved from <https://doi.org/10.1016/j.heliyon.2023.e17895>
- Westerlund, M., Leminen, S. and Rajahonka, M. (2014),** "Designing business models for the internet of things", *Technology Innovation Management Review*, Vol. 4 No. 7, pp. 5-14, doi: 10.22215/TIMREVIEW/807.
- World Bank Report (2016).** Ghana Digital Economy Diagnostic. Retrieved from <https://thedocs.worldbank.org/en/doc/412821598381054828-0090022020/original/>
- Y. Lee, G. Colarelli O'Connor & Yoo, Y., (2010).** Digitalisation and innovation (No. 10-09). Institute of Innovation Research, Hitotsubashi University.
- Zaki, M. (2019),** "Digital transformation: harnessing digital technologies for the next generation of services", *Journal of Services Marketing*, Vol. 33 No. 4, pp. 429-435.
- Zlotin, B., Zusman, A., Kaplan, L., Visnepolschi, S., Proseanic, V. and Malkin, S.L. (2005),** TRIZ beyond Technology: The Theory and Practice of Applying TRIZ to Non-technical Areas, available at: https://pdfs.semanticscholar.org/93c2/f5334b85f2490192a8b5cbb47ed4aebd72e6.pdf?_ga=2.15044275.484414014.1597136315-391558868.1595939271.