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COLLEGE OF HUMANITIES
UNIVERSITY OF GHANA BUSINESS SCHOOL**

**IMPLEMENTATION AND USE OF A DIGITAL LOCATION ADDRESSING
SYSTEM IN THE DEVELOPING COUNTRY CONTEXT OF GHANA: A DYNAMIC
CAPABILITIES PERSPECTIVE**

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INTEGRI PROCEDAMUS

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DECLARATION

I hereby declare that this thesis is my own work produced from research I carried out under supervision. This thesis has not been presented by anyone for any academic award, in this or any other institution. All references to other people's work have been duly acknowledged. I am solely responsible for any shortcomings in this thesis.



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ABSTRACT

Digitalisation has emerged as a pivotal shift, transforming the interaction between societies, organisations, and individuals through the transition from analogue or physical processes to digital ones. This transformation is recognised globally as a strategic imperative for governments, aimed at revolutionising public sector operations to enhance efficiency, accessibility, and responsiveness to citizen needs. At the heart of national-level digitalisation efforts undertaken by public sector organisations is the integration of digital technologies and methodologies across government operations and throughout a country's entire ecosystem, fostering societal and economic advancement. This involves meticulous planning and execution of digital strategies and policies that align with broader governmental objectives and societal needs, motivated by the pressing requirement to meet escalating public service demands, manage constrained budgets efficiently, and bolster government adaptability and resilience.

Among the various facets of national-level digitalisation, the digitalisation of location addressing systems plays a fundamental role in the efficient functioning of numerous economic sectors, including emergency services, delivery and logistics, urban planning, and governance. Accurate and accessible digital location addresses are crucial for precise navigation, streamlined service delivery, and effective resource allocation, underpinning a digitally enabled society. This is particularly critical in developing countries, where challenges such as inadequate infrastructure and limited access to services are more pronounced, positioning the digitalisation of location addressing systems as a catalyst for socio-economic development and inclusivity.

Despite the recognised significance of digital location addressing systems in the narrative of digitalisation, the Information Systems (IS) discipline has not fully explored this area, especially within the context of developing countries. While there is extensive research on digitalisation at both organisational and national levels, focused studies on the digitalisation of location addressing systems and their integration into national digitalisation strategies remain scarce. This gap is evident in the lack of theoretical frameworks within the IS domain addressing the challenges and opportunities presented by the digitalisation of location addressing systems in developing countries. Therefore, this study seeks to bridge this gap by understanding how developing countries implement and utilise digital location addressing systems, focusing on three research questions: 1) What meanings do institutions and firms associate with digital location addressing systems in a developing country? 2) What capabilities enable the implementation and use of digital location addressing systems among institutions and firms in a developing country? and 3) What are the outcomes of implementing and using digital location addressing systems among institutions and firms in a developing country?

To address these questions, this study expands the Dynamic Capabilities Theory (DCT) framework to encompass the complexities of national-level digitalisation in developing countries. By incorporating additional concepts such as legitimising and institutionalising capabilities into the traditional DCT model, which emphasises sensing, seizing, and transforming, the extended framework better captures the operational, regulatory, and societal intricacies of national digitalisation efforts. Adopting an interpretivist approach with qualitative methodologies, the research engages in-depth case studies of four institutions and firms involved in the implementation and use of Ghana's National Digital Property Addressing System (NDPAS). Through thematic analysis of case descriptions and a theory-driven analysis underpinned by the extended DCT, the study uncovers *significant meanings attributed to*

digital location addressing systems by institutions and firms. These systems are interpreted as: 1) catalysts for operational efficiency, socio-economic development, and inclusivity; 2) tools for enhancing the quality of life; 3) revolutionary innovation for economic sectors; 4) vehicles for strengthening state agencies; and 5) reflections of political commitment to national progress. These findings point to a profound synergy between political aspirations and digital initiatives, underscoring the transformative potential of national-level digitalisation projects. Such projects are not merely technological upgrades but strategic tools pivotal for realising socio-economic development goals and fulfilling the promise of national advancement, emphasizing digitalisation's role as a cornerstone in the strategic agenda for societal progress.

The research further identified five key *capabilities that enable the effective implementation and use of digital location addressing systems by institutions and firms.* These are 1) sensing - the ability to identify, interpret, analyse, and respond to external changes; 2) legitimise - the building of credibility and trust through government endorsement and stakeholder engagement; 3) seizing - the ability to capitalise on opportunities by reconfiguring resources and forming strategic alliances; 4) transforming - the continuous renewal of organisational processes; and 5) institutionalising - embedding optimisation and innovation within daily operations. The outcomes of these implementations are far-reaching, enhancing operational efficiency, inclusivity, regulatory oversight, simplifying navigation, and empowering previously underserved communities.

The study contributes significantly to theory, research, practice, and policy in the context of digitalisation. Theoretically, it extends the application of DCT beyond profit-oriented firms to public sector organisations and national digitalisation initiatives. The study innovatively applied DCT to national digitalisation efforts, integrating concepts of legitimising and institutionalising to understand how institutions and firms navigated digital opportunities. This

theoretical extension enriched the discourse on national digitalisation strategies, offering a new lens for examining digitalisation in developing economies. The research enriches the literature by providing detailed insights into the processes, challenges, and strategies involved in digitalising location addressing systems in a developing country setting. The study further delved into the practical implications of digital location addressing systems in Ghana, demonstrating how digitalisation could enhance operational efficiency, regulatory oversight, and societal welfare. It highlighted the complex interplay of capabilities necessary for successful digital adoption and the broader societal implications, contributing valuable insights for similar initiatives in other developing countries. On the policy front, the study underscored the crucial role of government action and policies in supporting the successful implementation and utilisation of digital systems. It advocated for an enabling environment, strategic partnerships, and investments in infrastructure to promote digitalisation, emphasising adaptability to local conditions and the integration of macro and micro-level strategies for effective digital initiatives. The research offered comprehensive policy recommendations to ensure digitalisation efforts were inclusive, sustainable, and aligned with national and local objectives, contributing to the broader goal of socio-economic development in developing countries. Significant contributions of this thesis include the adaptation of the DCT to the national digitalisation context and the publication of findings in two conference proceedings.



DEDICATION

Dedicated to the glory of God.



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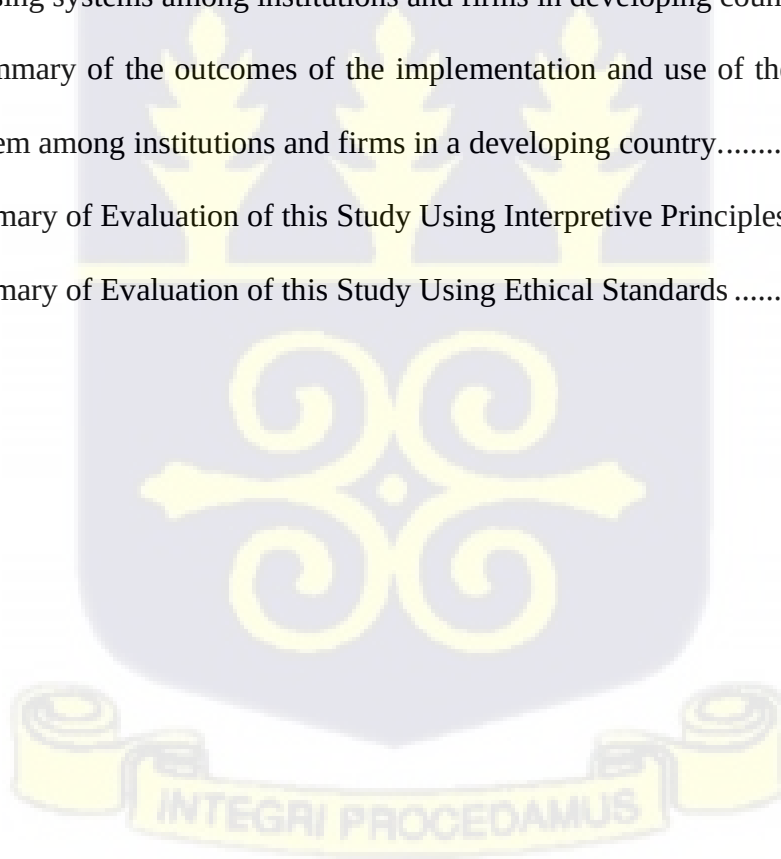
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LIST OF ABBREVIATIONS

APIs	Application Programming Interfaces
DCs	Developing Countries
DC	Developing Country
DCT	Dynamic Capabilities Theory
ECG	Electricity Company of Ghana
EHR	Electronic Health Records
GIS	Geographic Information Systems
GPCL	Ghana Post Company Limited
GWCL	Ghana Water Corporation Limited
GPS	Global Positioning System
HeFRA	Health Facilities Regulatory Agencies
IS	Information Systems
IIOT	Industrial Internet of Things
LPG	Liquefied Petroleum Gas
NDPAS	National Digital Property Addressing System
NGOs	Non-Governmental Organisations
PPP	Public-Private Partnerships
SMOT	Structurational Model of Technology



CHAPTER ONE

INTRODUCTION

1.1 Background

Digitalisation is a multifaceted sociotechnical phenomenon that permeates every layer of society, influencing individual behaviours, organisational processes, and broader societal trends through the adoption and utilisation of digital technologies (Agyei-Ababio et al., 2023; Legner et al., 2017; Soltani Delgosha et al., 2020). Digitalisation is the practice of migrating processes, contents and objects that used to be physical or analogue into digital formats (Fichman et al., 2017; Larkotey et al., 2021). It is deemed as the ways in which different areas of enterprise, government and social life are generally restructured around digital technologies (Delgosha et al., 2021). Digitalisation is increasingly seen as a strategic priority by governments globally, as it offers a pathway to transform public sector operations, making them more efficient, accessible, and responsive to citizen needs (Datta, 2020; Fleron et al., 2022; Lazuardi et al., 2021; Mikalsen & Farshchian, 2020; Ofe & Sandberg, 2023). National-level digitalisation generally undertaken by public sector organisations, encapsulates the transformative integration of digital technologies and methodologies within government operations to enhance service efficiency, accessibility, transparency, citizen engagement and responsiveness (Agyei-Ababio et al., 2023; Fleron et al., 2022; Mikalsen & Farshchian, 2020). It involves the careful planning and execution of digital strategies and policies that align with broader governmental objectives and societal needs motivated by the pressing requirement to meet escalating demands for public services, manage constrained budgets efficiently, and enhance government adaptability and resilience (Mikalsen & Farshchian, 2020). Public-sector digitalisation involves various components, including the establishment of robust digital

infrastructures like high-speed internet and essential hardware, alongside the integration of software solutions to facilitate seamless public service delivery (Benbunan-Fich et al., 2020). It extends to leveraging digital communication platforms for improved citizen engagement and transparency in governmental processes (Adu et al., 2020; Benbunan-Fich et al., 2020). A critical aspect of this digital shift is the development of supportive legislative frameworks that address data protection, cybersecurity, and privacy to maintain public trust in digital services (Adu et al., 2020; Agyei-Ababio et al., 2023). Moreover, digitalisation in the public sector is characterised by fostering innovative partnerships and embracing open government data initiatives, which promote collaboration and information sharing to drive service innovation. Equally important is the emphasis on building human competencies, ensuring both public sector employees and citizens possess the necessary digital skills to navigate and utilise digital services effectively (Halsbenning et al., 2021). Ultimately, successful digitalisation initiatives not only improve public service delivery but also foster a more transparent, inclusive, and digitally empowered society.

Location addressing, widely known across literature as street addressing is a critical element in daily life (Coetzee & Cooper, 2007a, 2007b; Farvacque-Vitkovic et al., 2005; Gakh, 2020b), industrial processes, societal functions, business operations, and national administration (Ahuja et al., 2023; Anand et al., 2023; Chawda & Raj, 2018; Clodoveu et al., 2003; Gakh, 2020b; Ghimire et al., 2021; Hayes et al., 2017; Malaainine & Lechgar, 2021; Moreri et al., 2017; Owusu-Adjei, 2019; Ting-Peng, 2010; Universal Postal Union, 2012; Wei, 2022; Zhou et al., 2010). Its significance extends to the public sector, where efficient and accurate location addressing underpins essential services such as emergency response, public utilities management, and urban planning (Farvacque-Vitkovic et al., 2005; Goldberg et al., 2007; Yildirim et al., 2014). Therefore, the digitalisation of street addressing becomes a critical

endeavour within public sector digitalisation efforts. By adopting digital tools and platforms for street addressing, the public sector can enhance service delivery, improve operational efficiency, and support socio-economic development, aligning with broader digital transformation goals that aim to create more connected, accessible, and efficient public services (Gakh, 2020b, 2021).

Digital technologies are revolutionising this domain, offering heightened efficiency, accuracy, and convenience (Gakh, 2021). At the individual level, digital location addressing, such as Global Positioning System (GPS) coordinates, simplifies tasks like navigation and social media use, and enhances personal safety (Gah et al., 2018; Goodchild, 2009; Imieliński & Navas, 1999; Maurya et al., 2012; Pandey et al., 2021; Reynolds et al., 1990; Roick & Heuser, 2013; Wijaya et al., 2013). In the business sector, digital location addressing is transforming logistics, delivery, and e-commerce (Ahuja et al., 2023; Anand et al., 2023; Chawda & Raj, 2018; Hayes et al., 2017; Malaanine & Lechgar, 2021; Owusu-Adjei, 2019; Ting-Peng, 2010; Universal Postal Union, 2012; Wei, 2022; Zhou et al., 2010), with companies like Amazon and Uber leveraging advanced algorithms and GPS data to streamline their operations (Ahuja et al., 2023; Anand et al., 2023; Hayes et al., 2017; Soto-Acosta, 2020). Societally, location addressing is essential for services like emergency response and municipal services, with digitalisation enhancing the effectiveness of these services (Awal, 2023; Coetzee & Cooper, 2007a; Njoh, 2010; Owusu-Adjei, 2019). Applications such as Google Maps and Waze provide not just navigation but also traffic updates, accident alerts, and optimal route suggestions (Cheng et al., 2020; Grover, 2022; Gutiérrez-Soto et al., 2022; Pereira et al., 2017). The implementation of E911 in the United States has significantly improved the speed and accuracy of emergency response services (Koohikamali & Peak, 2015; Kumar et al., 2023; Parmar & Rao, 2023). In industries like real estate, construction, and utilities, digital location addressing reduces errors,

saves time, and helps streamline operations like routine maintenance, fault detection, and customer service (Abebrese, 2019; Gakh, 2020b; Zandbergen, 2008). At the national level, digitalised location addressing facilitates effective governance, law enforcement, national security and public service delivery (Gakh, 2020b; Kutnjak, 2021). Initiatives like the Universal Postal Union's Global Postal Code System exemplify efforts to establish a unified, universally accessible digital location addressing system (Universal Postal Union, 2012).

The digitalisation of location addressing holds immense potential for enhancing public service efficiency and accuracy. However, it introduces complex challenges, necessitating an understanding of diverse socio-economic and cultural contexts. This process requires adept management of human and technological resources to ensure inclusivity and meet various population needs (Parusheva & Aleksandrova, 2021). The impacts of digitalisation extend beyond operational improvements to influence governance, economic development, and societal interactions. Focusing on developing countries, this study explores the capabilities necessary for implementing digitalised location addressing, offering insights into overcoming challenges and harnessing digitalisation's full potential within unique developmental contexts.

1.2 Research Problem

The widespread adoption of digital technologies across industries, societies, and governance structures has facilitated far-reaching transformations, prompting researchers from diverse fields to examine its multifaceted impacts (Addo & Senyo, 2020; Bharadwaj, 2013; Matt et al., 2015; Parusheva & Aleksandrova, 2021). The integration of technology into the fabric of societal infrastructure, especially within developing countries, has led to significant advancements across various sectors, including but not limited to e-justice (Nurkey et al.,

2022), procurement (Mikalsen & Farshchian, 2020), e-revenue (Agyei-Ababio et al., 2023), e-health (Bygstad & Hanseth, 2016; Grisot & Vassilakopoulou, 2015; Vassilakopoulou & Marmaras, 2013), sports (Xiao et al., 2017) and e-transportation (Haraldson, 2015; Ofe & Sandberg, 2023). These digitalisations have been pivotal in streamlining services and improving access for the populace. However, a glaring deficiency remains in studies that explore the digitalisation of location addresses with the Information Systems (IS) discipline. A discernible research gap from the review of digitalisation efforts in African countries in other research disciplines is the insufficient detailed examination of the systemic approaches, operational challenges, and adaptability strategies involved in the national-level implementation and utilisation of digital addressing systems in developing countries. While initiatives in countries like Botswana (Ditsela et al., 2011; Moreri et al., 2017), Kenya (Muinde, 2017), and Uganda (Jernbeck, 2018) highlight the progressive adoption of digital addressing, there is a lack of comprehensive understanding regarding how these countries navigate the complexities of integrating these systems within their existing socio-economic and infrastructural landscapes. This gap signifies the need for an in-depth exploration of the multifaceted processes that underlie the adoption and effective use of digital addressing systems, including the identification of factors that facilitate or impede their successful implementation. Such research could offer critical insights into best practices, policy implications, and technological innovations necessary for optimising digital addressing systems to meet the unique needs of developing countries, thereby enhancing their socio-economic development and global digital integration.

Existing studies on geocoding, the challenges of manual addressing systems, and the application of location-based technologies have primarily been conducted outside the IS discipline and have often lacked a theoretical foundation (Abebrese, 2019; Dao, 2015; Demir

et al., 2017, 2018; Demir & Raskar, 2018; Farvacque-Vitkovic et al., 2005; Gakh, 2020b, 2020a, 2021; Ofori-Atta, 2015; Olayinka et al., 2020; Seok & Lee, 2016; Yildirim et al., 2014; Zandbergen, 2008, 2011). This gap highlights a multidisciplinary research opportunity to explore digital location addressing systems from an IS perspective, particularly in the context of developing countries. Furthermore, the process of digitalising location addressing systems—from inception to full implementation—remains under-theorised, with scant literature addressing national-level digitalisation beyond adoption or policy-focused studies and firm-level analyses.

The lack of theoretical frameworks in existing literature has impeded the ability to systematically analyse and understand the complexities and nuances associated with the implementation of digital location addressing systems. This gap is particularly evident in the transition from manual to digital systems, where the implications span technological, socio-economic, and policy domains. Furthermore, the body of research that does address the digitisation of public sector services at a national level tends to focus narrowly on policy implications (Mendhurwar & Mishra, 2021; Pappas et al., 2023), and socio-economic implications (Kitsios et al., 2023; Ramadani et al., 2022), with few studies examining the holistic process of digitalisation through a theoretical lens. Dynamic Capabilities Theory (DCT) has traditionally been applied to firm-level analysis, focusing on how organizations build, integrate, and reconfigure internal and external competencies to address rapidly changing environments, often with the aim of achieving competitive advantage, profit, and rent-seeking motives (Finau & Prasad, 2014). However, the argument for DCT's applicability extends beyond for-profit firms to encompass non-profit organizations and institutions seeking public good, particularly in the context of national-level digitization efforts (Finau & Prasad, 2014; Iannacci et al., 2019; Kalkipsakis et al., 2019; Senshaw & Twinomurinzi, 2018). The

foundational premise of DCT, the need to adapt to and shape changing environments, is as relevant to public sector and non-profit organizations as it is to private firms. Non-profits and governmental entities also operate in dynamic environments and must navigate technological, regulatory, and societal changes. Battleson et al. (2016) argue that the essence of dynamic capabilities is the strategic management of resources in response to external and internal shifts, a necessity not confined to the private sector. Additionally, the application of DCT to national digitization initiatives can be justified through the lens of strategic renewal and transformation, which are critical for public institutions in the digital era. Teece (2007) extended DCT to encompass not just competitive advantage but also the capability to innovate and transform in response to technological advancements. This perspective aligns with the needs of non-profit and public sector organizations, which must continually adapt their strategies and operations to leverage digital technologies for the public good, enhancing service delivery, accessibility, and efficiency. Studies by Klievink et al. (2017) and Senshaw and Twinomurinzi (2018) illustrate how dynamic capabilities facilitate organizational and societal transformation in public sector entities, enabling them to better meet their mission of public service in the face of digital disruption. These capabilities include the ability to orchestrate resources and partnerships, cultivate innovation ecosystems, and leverage technology for social impact, demonstrating DCT's applicability beyond profit-oriented firms.

Moreover, DCT emphasises innovation and agility as crucial for enabling firms to adapt to swiftly evolving environments. The significance of DCT extends beyond individual organizations, touching on societal innovation and digital inclusivity at the national level. Finau and Prasad (2014) underscore the state's pivotal role in propelling innovation and technology adoption, positioning it not just as a regulatory body but as a proactive agent in sculpting the innovation ecosystem. DCT provides a valuable framework for nations to develop capabilities

that nurture a digital ecosystem conducive to inclusivity and capable of tackling societal challenges. This broader perspective of DCT underlines its utility in guiding not only business strategy but also national policies towards creating more inclusive and innovative societies. While the DCT originated within the context of firm-level analysis with a focus on competitive advantage and profitability, its principles are equally applicable and valuable for non-profit organizations and national digitalisation efforts (Senshaw & Twinomurinzi, 2018). The theory provides a robust framework for understanding how entities across sectors can navigate the complexities of national-level digitalisation, emphasizing the strategic management of resources, innovation, and adaptability. This broader applicability underscores DCT's relevance in guiding public institutions and non-profits organisations in harnessing digital technologies to achieve societal goals and public good. Yet, the application of this framework in the context of digital location addressing systems in developing countries remains largely unexplored.

This research, therefore, seeks to bridge this significant gap by applying the DCT to the study of digital location addressing systems in developing countries. It aims to move beyond the a-theoretical nature of existing studies by not only mapping the digitisation process of location addressing systems from a theoretical perspective but also by examining how developing countries can leverage digital technologies to transform their addressing systems comprehensively. This approach will enable a more nuanced understanding of the challenges and opportunities associated with digitalisation in the public sector, particularly in the context of developing economies where such systems are not just beneficial but essential for socio-economic development.

Addressing these gaps necessitates an in-depth interpretive case study of Ghana's transition to a digital location addressing system. This research seeks to inductively examine the utilization

of dynamic capabilities during this comprehensive digitalisation effort. It illuminates the unique challenges and opportunities presented by this digitalisation, providing insights for researchers, practitioners, and policymakers (Awori et al., 2022; Dang-Pham et al., 2022; Meyerhoff Nielsen, 2019; Osmundsen et al., 2018). Ghana was selected for this study because of its recent digitalisation in location addressing, which necessitated the collaboration of multiple heterogeneous actors with diverse roles and stakes as well as the demonstration of differing yet complementary dynamic capabilities across stakeholder groups.

1.3 Research Purpose

The purpose of this research is to understand how developing countries implement and use digital location addressing systems.

1.4 Research Questions

To achieve the purpose, the study will address three key questions as follows:

- a. What meanings do institutions and firms associate with the digital location addressing systems in a developing country?
- b. What capabilities enable the implementation and use of digital location addressing systems among institutions and firms in a developing country?
- c. What are the outcomes of the implementation and use of digital location addressing system among institutions and firms in a developing country?

To answer these questions, this study employed interpretivist research paradigm, qualitative methodology, case study method, and DCT to understand how DCs leverage dynamic capabilities to digitally transform and use location addressing system.

1.5 Research Context

This section presents the research context in terms of the subject, theory, and setting. Positioned within the framework of Dynamic Capabilities Theory (DCT), this study focuses on the digitalisation of location addressing systems as its subject, with Ghana serving as the setting. Consequently, the research phenomenon explores the capabilities that enable the digitalisation and use of location addresses, specifically within the context of a DC.

1.5.1 Digitalised Location Addressing System

This study investigates the digitalisation of location addresses, a critical resource for conveying geographic locations and positions within urban and rural settings alike (Davis & Fonseca, 2007; Zandbergen, 2008). Despite the ubiquity of address usage, deriving clear and unambiguous location information from various address formats frequently poses significant challenges (Hong, 2008). A robust location address system is pivotal for societal and economic benefits, including improved emergency response, efficient delivery services, and enhanced governance (Davis & Fonseca, 2007; Farvacque-Vitkovic et al., 2005; Mennecke & West Jr, 2001). However, many developing economies face hurdles in establishing accurate and current location addressing databases, hindered by high costs related to their generation and maintenance (Dumedah, 2017; Dumedah & Eshun, 2020).

The emergence of pervasive technologies like the internet, GPS, aerial photography, low-cost satellite imagery, and portable digital devices (e.g., smartphones, cameras) has revolutionised the collection, representation, and dissemination of geographic information, offering new, cost-effective channels for managing location data (Goodchild, 2004). Various efforts have aimed to make location information universally accessible (Demir et al., 2018; Demir & Raskar, 2018; Seok & Lee, 2016; Yildirim et al., 2014), with disciplines such as tourism, agriculture, geography, transportation, and urban studies extensively exploring the integration of digital technologies with geographic data (Drake et al., 2015; Emmanuel et al., 2018; Goniewicz et al., 2020; Haraldson, 2015; Hong, 2008; Igbokwe et al., 2016; Joshi & Kohli, 2020; Lei & Jiang, 2021; Mantey et al., 2012; Nazarov et al., 2019; Neene & Kabemba, 2017; Oluwadare, 2014; Walden-Schreiner et al., 2018; Yang et al., 2016). Nonetheless, the body of research within the IS discipline has predominantly concentrated on location-based services, privacy concerns, and location determination techniques (Ahmad & Gal, 2021; Burmeister et al., 2021; Chin & Siau, 2012; Hossein et al., 2011; Mardoukhi & Kordzadeh, 2016; Naous et al., 2019; Schmidt et al., 2021; Yu et al., 2016; Zhengchuan et al., 2005), largely overlooking the transformative effects of digital technologies on the conception and utility of physical location addresses. Conversely, while literature from other disciplines has documented the digitalisation of location addresses in developing countries, these accounts often lack a solid theoretical foundation (Demir et al., 2017; Demir & Raskar, 2018; Farvacque-Vitkovic et al., 2005; Yildirim et al., 2014).

Conducted in Ghana—a West African middle-income country characterised by its constitutional democracy and a population of approximately 29 million as of 2018—this research addresses the aforementioned gap. Historically, Ghana grappled with an inadequate location addressing system, which impeded socioeconomic progress. In 2017, the situation

changed significantly with the digitalisation of its location addressing system, a pivotal move that facilitated the generation and retrieval of digital location addresses, thereby streamlining navigation across the country. This case study focuses on key private and public entities pivotal to the implementation or utilisation of the digitalised location addressing system, including the Ghana Post Company Limited (GPCL), Vokacom Ghana Limited, Health Facilities Regulatory Agencies (HeFRA), and ConGas. Selection of participants was informed by their direct or indirect roles in the digitalisation process, offering valuable insights into the system's implementation and its operational impact. Through this focused examination, the research aims to understand the dynamics behind how developing countries implement and use digital location addressing systems. By investigating the capabilities that empower the case organisations in this study to navigate this transformative process, this research aims to provide a deeper insight into how digitalisation can drive socio-economic development in emerging economies.

1.5.2 Dynamic Capabilities Theory

The theoretical context of this study, Dynamic Capabilities Theory (DCT), originates from management research, focusing on how organisations adapt their resources amidst rapidly changing conditions (Helfat & Raubitschek, 2018; Karimi & Walter, 2015; Teece, 2007). Although originally applied to individual firms, DCT's principles have been found to have broader implications, including their utility in guiding macro-level digitalisations and adaptations within public sector environments. This is especially relevant in DCs, where such principles can significantly contribute to fostering growth and development (Senshaw & Twinomurinzi, 2018; Yunis et al., 2014). This broader applicability also highlights a critical

gap in the current adaptation and application of micro/meso-level digitalisation theories and frameworks to national-level efforts, underscoring a pressing need for research that extends these theories to address the complexities of digitalisation at a national scale (Kar et al., 2019).

DCT is distinguished by three core capabilities - sensing, seizing, and transforming that are pivotal for governments embarking on digitalisation initiatives (Senshaw & Twinomurinzi, 2018). Sensing involves the identification of technological opportunities and threats, which is crucial for governments to recognise and exploit digitalisation prospects (Masmali & Miah, 2021; Senshaw & Twinomurinzi, 2018; Teece, 2018b). The seizing capability entails the strategic mobilisation of resources to capitalise on these identified opportunities, transforming insights into actionable digital strategies (Warner & Wäger, 2019; Yunis et al., 2014). Lastly, the transforming capability enables the ongoing renewal and integration of digital technologies into existing systems, balancing innovation with effective governance and collaboration management (Teece, 2018b). These capabilities empower nations to navigate the rapid innovations in digital technology, fostering agility, creating new value, and achieving operational excellence (Teece, 2018b). In today's rapidly changing global environment, DCT offers valuable insights into how nations can align their strategies with both domestic and global trends, enhancing resilience and ensuring sustainable growth.

The relevance of DCT to the study of national level, such as the digitalisation of location addressing system, is particularly insightful. It provides a lens through which to examine how nations adapt and reconfigure their resources and competencies in response to rapid technological changes. Focusing on innovation and the consolidation of resources for large-scale digitalisation, DCT sheds light on the strategic actions' nations can undertake to effectively implement and sustain national-level digitalisation efforts (Senshaw & Twinomurinzi, 2018). This perspective highlights the importance of dynamic capabilities in

navigating the complexities of digitalisation, offering a robust framework for understanding and driving the digitalisation and use of location addressing system in developing countries like Ghana.

1.5.3 National Level Digitalisation

This study is situated within the context of national-level digitalisation, a concept that encapsulates how digital technologies are harnessed across government operations and public services to bolster efficiency, enhance service delivery, and fuel economic growth (Lazuardi et al., 2021; Soltani Delgosha et al., 2020). Ghana, as a DC in West Africa, emerges as an ideal setting for investigating the intricacies of such large-scale digitalisation efforts given its recent digitalisation initiatives launched by its government across various public sectors.

National level digitalisation epitomises a comprehensive shift in the integration and coordinated application of digital technologies across various sectors of a nation, encompassing government services, public infrastructure, and economic systems (Kitsios et al., 2023; Ramadani et al., 2022). It weaves into the fabric of a nation's political environment, requiring careful navigation of complex and often conflicting interests and values (Mendhurwar & Mishra, 2021; Pappas et al., 2023; Ramadani et al., 2022). It also emphasises Public-Private Partnerships (PPP) that offer a vital mechanism to accelerate progress, enhance inclusivity and ensure that digitalisation efforts align with broader societal needs and values (Lips et al., 2023; Medaglia et al., 2017b). Kar et al., (2019) pointed out the pre-dominant focus of research and policy actions on organisational-level digital initiatives within the IS literature, leaving a pronounced gap in extending these efforts and frameworks to a national scale.

Ghana's recent digitalisation of its location addressing system makes it a suitable setting for this study. This initiative widely known as the National Digital Property Addressing System (NDPAS) underscores Ghana's commitment to leveraging digital solutions for fostering socio-economic development and inclusivity, making it an ideal case for investigating the impact of national-level digitalisation in a DC context. Additionally, Ghana's distinctive political environment, marked by the tendency for shifts in project continuity with changes in political leadership, offers a unique opportunity to examine the resilience and adaptability of national level digitalisation initiatives in fluctuating political environment. Studying Ghana's experience provides valuable insights into how DT can be sustained and managed effectively despite political changes, emphasising the importance of resilient strategies in the face of governance challenges.

Conducting this study in Ghana offers an opportunity to investigate and understand the complexities of implementing large-scale digitalisation initiatives in a developing country. Ghana's unique blend of economic, political, and social contexts provides a rich empirical setting to investigate the transformative impacts, challenges, and strategies of national-level digitalisation, contributing valuable insights to the broader discourse on digitalisation in DCs.

1.6 Chapter Outline

The following section outlines the thesis organisation. Chapter One serves as the introduction that encompasses the research background, problem statement, study context, purpose, and research questions.

Chapter 2 presents an in-depth literature review, exploring the domain of national level digitalisation. This chapter also delves into the theoretical underpinnings of digitalisation studies, placing a particular emphasis on literature related to location addressing, in line with this research's focus on the digitalisation of location addressing systems. Reflecting the empirical context of this study, it includes a discussion on studies of digital location addressing conducted in developing countries, specifically highlighting Ghana.

Chapter 3 focuses on the theoretical foundation of this research. It comprehensively examines DCT, discussing its core concepts and principles. This chapter also explores the application of these theories in IS, providing justification for their adoption as an analytical framework. Additionally, the limitations of DCT are addressed to provide a balanced perspective.

Chapter 4 is centred on the research paradigm and methodology. It includes a discussion on the philosophical assumptions, research methods, and techniques for data gathering and analysis employed to answer the research questions. The chapter further explores and chooses the interpretive, qualitative case study approach. It explains the rationale behind selecting specific case studies, details the fieldwork procedures, and outlines the data collection and analysis techniques used.

Chapter 5 presents an exposition of the case study findings. To provide context for the empirical research on the digitalisation of location addressing systems in a developing country, the chapter describes the study's setting, specifically Ghana. It draws findings from the focal point of the case study, the NDPAS, to address the research questions. The cases are presented in a chronological order, encompassing the pre-digitalisation, digitalisation, and post- digitalisation phases, along with the resulting outcomes for selected cases. Consequently, the chapter

provides detailed findings from each case, laying the groundwork for both individual and cross-case analysis to be conducted in Chapter 6.

Chapter 6 involves a theory-based analysis of the case findings. The principles and concepts of DCT, as discussed in Chapter 3, along with additional themes emerging from the data, guide this analysis. The chapter includes a cross-case analysis of the cases detailed in Chapter 5 and concludes with a summary of the findings.

Chapter 7 provide answers to the research questions introduced in Chapter 1 by discussing and interpreting the study's findings in the context of the literature reviewed in Chapter 2 and the theoretical foundations presented in Chapter 3. Additionally, it incorporates the researcher's reflections on the phenomenon, drawing on both theory and literature.

Finally, Chapter 8 offers a summary and conclusion of the study. It reviews the research purpose and questions and outlines the study's contribution to knowledge, focusing on national level digitalisation of location addressing system and the application of DCT to IS macro-level digitalisation research. This chapter also details the study's implications for both research and practice. It presents the evaluation criteria for this interpretive work, the study's limitations, the overall conclusions, and directions for future research.



CHAPTER TWO

NATIONAL LEVEL DIGITALISATION AND LOCATION

ADDRESSING SYSTEMS

2.1 Introduction

The introductory chapter of the thesis provided an overview of the background, research problem, research context, and research questions addressed in the study. This chapter focuses on reviewing the relevant literature related to national-level digitalisation, location addressing systems, and digital location addressing systems. The chapter commences by defining the concepts of national-level digitalisation, location addressing systems, and digital location addressing systems. It continues with a comprehensive examination of the conceptual and theoretical approaches utilised in previous research on national-level digitalisation. Additionally, the chapter explores the conceptual and theoretical approaches employed in researching location addressing systems. Following that, the chapter discusses the identified gaps in these approaches. The chapter then concludes with a summary of the key points covered.

2.2 National Level Digitalisation

National-level digitalisation represents a transformative journey aimed at harnessing digital technologies across all sectors within a country, aiming to enhance efficiency, accessibility, service delivery, and foster economic growth and innovation (Lazuardi et al., 2021; Park & Choi, 2019; Soltani Delgosha et al., 2020). This process transcends the public sector, affecting multiple economic and private sectors, emphasising the transformation of a nation's entire

ecosystem for societal and economic advancement (Eaton et al., 2017; Saman & Haider, 2013; Soltani Delgosha et al., 2020; Xiao et al., 2017). Given the comprehensive scope of national-level digitalisation, it is essential to delve into public sector digitalisation and e-government concepts to gain a nuanced understanding. These concepts are critical areas of the broader national-level digitalisation discourse, with public sector digitalisation focusing on the adoption of digital technologies within government operations and services (Al-Sebae & Abu-Shanab, 2022; Dahl-Jørgensen & Parmiggiani, 2020; Faro et al., 2022; Goh & Arenas, 2020; Khisro, 2021; Kitsios et al., 2023; Roztocky et al., 2022; Shibambu & Ditsa, 2017), and e-government targeting the provision of government services online to enhance accessibility and engagement (Ali et al., 2018; Ashaye & Irani, 2019; Das et al., 2017; Halsbenning et al., 2021; Hashemi et al., 2013; Kassen, 2022; Larkotey et al., 2021).

While interconnected—with national-level digitalisation encompassing public sector digitalisation and e-government initiatives serving as key aspects—these concepts vary in scope and focus. National-level digitalisation seeks a holistic transformation across all sectors, public sector digitalisation aims at modernising government operations, and e-government concentrates on improving online service delivery. This section will review relevant literature across all three levels to enrich the discourse and, ultimately, identify gaps in the study area of national-level digitalisation, examining its defining characteristics, driving forces, challenges, theory applications and the broad spectrum of outcomes anticipated from such expansive efforts.



2.2.1 Drivers of National-Level Digitalisation

Countries around the world are increasingly investing in information systems and embracing digital technologies (Kitsios et al., 2023). The push towards national-level digitalisation, often led by technological advancements, present opportunities for enhanced efficiency and innovation. This movement is driven by several key drivers including the quest for economic competitiveness, societal demands for improved transparency and service delivery, and the strategic imperative to harness digital advancements for public good (de Armas Garc'ia & Cruz Gutiérrez, 2013; Dwarakish & Salim, 2015; Kar et al., 2019; Kitsios et al., 2023; Park & Choi, 2019; Vassilakopoulou et al., 2017). Global competitiveness, in an increasingly interconnected world, further nudges nations towards digitalisation (Mergel et al., 2019). Socio-economic pressures- such as job creation, economic growth, improved public services, and the mitigation of social inequalities- serve as catalysts for national-level digitalisation (Freeman et al., 2016; Meso et al., 2009; Tarhini et al., 2022). Governmental policies and strategic directives play a pivotal role in initiating and steering digitalisation towards national development goals (Chatfield et al., 2016; Luna-Reyes et al., 2012; Martin & Goggin, 2016; Medaglia et al., 2017b; Winley et al., 2017). Crisis situations, such as pandemics or natural disasters, may necessitate swift digital shifts to maintain the continuity of essential services (Abbu et al., 2021; Datta & Nwankpa, 2021; Gabryelczyk, 2020; Haslam et al., 2021; Kotjoprayudi & Kastaman, 2023; Kudyba, 2020; Soto-Acosta, 2020; Tarhini et al., 2022). The increasing digital sophistication of citizens drives a demand for improved digital services, pushing governments towards digitalisation (Cordella & Bonina, 2012; Cordella & Contini, 2012). International organisations and donors often promote digitalisation as a pathway to achieve sustainable development goals, providing financial and expertise support (Eden et al., 2022; Kombe, 2016). Furthermore, the rising cybersecurity threats in a digital world act as a trigger,

necessitating a national-level digitalisation inclusive of robust security measures (Klotzer et al., 2017; Mendhurwar & Mishra, 2021).

Sector-specific drivers highlight the tailored applications and benefits of digitalisation across various fields, showcasing a broad spectrum of positive impacts. In healthcare, digitalisation efforts aim to improve patient care and data management systems, evidenced by the implementation of electronic health records (EHR) systems (Agarwal et al., 2010; Alsharo et al., 2020; Burton-Jones et al., 2020; Kaushik et al., 2023; Musa, 2012; Ulriksen et al., 2017). In education, digital platforms and e-learning tools have transformed teaching methodologies and learning experiences, making education more accessible and flexible (Adewole & Fakorede, 2013; A. Ali & Mohammad, 2019; Dutta & Burgess, 2003; Fowler & Gilfillan, 2003; Haab & Cramer, 2010; Krishnaveni & Meenakumari, 2010; Sagitova, 2012; Tolmayer, 2019; Wood, 2017; Zornada & Bertok Velkavrh, 2005). The finance sector has witnessed a revolution in digital banking and fintech solutions, enhancing financial inclusion and service delivery (Guo & Liang, 2016; Jang et al., 2021; Kaniadakis & Constantinides, 2018; Kemal, 2014; Kim et al., 2022; Siering et al., 2017; Verbovetska, 2019; Westermeier, 2020). Similarly, digital technologies in agriculture have introduced precision farming, improving productivity and sustainability (Harsh, 1998; Nazarov et al., 2019; Pandey et al., 2021; Prinsloo & de Villiers, 2017; Rafoss et al., 2010; Slavova & Karanasios, 2018). In manufacturing, the adoption of Industry 4.0 technologies has led to increased efficiency and innovation (Abdallah et al., 2022; Gaffley & Pelsner, 2021).

The push towards digitalisation by countries is not merely about adopting new technologies; it represents a holistic transformation that permeates every aspect of public life. This shift reshapes the functioning of governments, the operation of businesses, and the daily lives of citizens, aligning with broader social and economic objectives such as convenience, efficiency,

revenue generation, transparency, anti-corruption efforts, and the overall well-being of society (Merhi, 2022).

2.2.2 Characteristics of National-Level Digitalisation

National-level digitalisation is characterised by the integration of digital technologies into public services and governance, aiming to enhance efficiency, transparency, and public engagement (Delgosha et al., 2021; Effah & Nuhu, 2017; Soltani Delgosha et al., 2020). Central to this endeavour is digitising public services and establishing digital governance frameworks, creating more responsive and service-oriented government structures (Katz et al., 2013; Soltani Delgosha et al., 2020). It emphasises addressing the various dimensions of sustainable development: economic, social, and environmental to ensure comprehensive benefits across all society sectors (Bednar & Welch, 2020; Kar et al., 2019).

National-level digitalisation embodies a comprehensive collaborative effort that unites several stakeholders, including government, private sector, investors, NGOs, academia, and the general public towards common goals (Amankwah-Sarfo et al., 2018; Larkotey et al., 2021). This collective action facilitates the transformation of public services, drives economic growth, and enhances societal well-being through digital means. The government sets the stage with vision, policies, and regulations, while the private sector injects innovation, technology, and investment (Li et al., 2019). NGOs advocate for digital inclusion and literacy, academia contributes research and development for evidence-based decision-making, and cultivates the digital workforce, and the general public's engagement ensures digital services are user-centric and inclusive.

Another defining characteristic of national-level digitalisation is its focus on being citizen-centric, prioritising the creation of accessible and user-friendly digital services to enhance public participation in governance and drive societal innovation. These ensure the extensive benefits of digitalisation democratising access to essential services such as healthcare, education, and legal support and promoting social inclusivity and equity.

National-level digitalisation is also politically sensitive due to its multifaceted impact on policy, regulation, equality, security, economy, governance, international relations, and cultural identity (Ramadani et al., 2022). Park and Choi (2019) underscores the significant role of supportive political and regulatory environments in fostering economic growth through stable usage of digital technologies. Policies regarding digital privacy, security, and accessibility can ignite political debates, reflecting differing ideologies and priorities that require careful navigation of complex and often conflicting interests and values (Delgosha et al., 2021; Mendhurwar & Mishra, 2021; Pappas et al., 2023).

Public-Private Partnerships (PPPs) are a strategic element of national level digitalisation, allowing governments to tap into the private sector's expertise, technology, and financial resources crucial for digital infrastructure and service development. These partnerships highlight the collaborative approach essential for the successful implementation of large-scale digital projects, illustrating the synergy between public and private sectors in achieving the transformative potential of digitalisation at a national level.

2.2.3 Impacts of National-Level Digitalisation

The impacts of national-level digitalisation are profound and multifaceted, offering transformative benefits across economic development, governance, and societal welfare. Economically, digitalisation serves as a catalyst for innovation, attracting foreign investments and creating myriad job opportunities, alleviating poverty thereby stimulating economic growth (Larkotey et al., 2021; Li et al., 2019). In terms of governance, it significantly enhances transparency, accountability, and the efficiency of public services, fostering a more open and participatory form of government (Addo & Senyo, 2020; Amankwah-Sarfo et al., 2018; Wahid & Sein, 2014). Societally, digitalisation extends the accessibility of government services, promoting inclusivity, alleviating poverty and markedly improving the quality of life for citizens (Li et al., 2019; Nguyen, 2023). These advantages highlight the need for a holistic strategy that goes beyond mere governmental actions to include investments in infrastructure, the development of workforce skills, the widespread adoption and use of digital technologies across various sectors and cooperative partnerships with key stakeholders, guaranteeing sustainable advancement and nationwide innovation (Kar et al., 2019; Lazuardi et al., 2021).

National-level digitalisation enables streamlined, user-centric service delivery by governments, leveraging technology to automate tasks and improve service efficiency (Li et al., 2019). This approach not only enhances citizen convenience but also bolsters the overall effectiveness of governmental operations. Moreover, digitalisation on a national scale fosters new revenue streams and optimises existing ones, through mechanisms like e-revenue systems, e-procurement, and digital tax collection systems, while simultaneously reducing administrative costs through efficient data management and automation (Agyei-Ababio et al., 2023).

The openness and transparency afforded by digital technologies implemented on a national level increase governmental visibility, with technologies like blockchain and AI ensuring data integrity and fostering public trust (Kassen, 2022; Ølnes, 2016; Smith & Dhillon, 2017). Additionally, digitalisation is instrumental in combating corruption by minimising manual intervention and promoting secure, transparent systems for real-time monitoring (Addo & Senyo, 2020; Krishnan et al., 2013; Merhi, 2022; Palvia et al., 2017). The deployment of tools like e-procurement, e-clearance, e-justice, and e-revenue systems enhances transparency and reduces corruption risks in bidding processes, legal proceedings, and revenue collection (Addo, 2022; Agyei-Ababio et al., 2023; Mikalsen & Farshchian, 2020).

Despite these optimistic perspectives, Addo and Senyo (2020) presented a counterpoint to the impact of digitalisation efforts in developing countries, particularly concerning entrenched organisational malpractices and corruption. They referenced the persistence of corrupt practices in India, Ghana, and Zimbabwe, despite digital interventions in public distribution and judicial systems (Addo, 2016; Addo & Senyo, 2020; Masiero & Maiorano, 2018; Prakash & Masiero, 2015). These examples illustrate the challenges of addressing the deeply ingrained, complex, and socially networked nature of corruption that resists simplification through digitalisation.

2.2.4 Challenges Inherent in National-Level Digitalisation

The journey toward national-level digitalisation faces a multitude of technical, cultural, political, environmental, and structural challenges that impede its contribution to socio-economic development (Dang & Pekkola, 2016). Resistance to change among users and the necessity for significant process re-engineering create unpredictability in national digitalisation

efforts, while the complexities of stakeholder interactions demand robust coordination and information sharing (Effah & Nuhu, 2017). A pronounced lack of collaboration and communication frameworks across various sectors complicates the implementation and use of national digital strategies (Effah & Nuhu, 2017). Concerns over data privacy and security add to the complexity of digitising government and public services, further aggravated by the digital divide within countries, where disparities in access to digital technologies and internet connectivity hinder inclusiveness (Kar et al., 2019; Mujahid, 2002; Zhao et al., 2023). Kar et al. (2019) stress the necessity of inclusive digitalisation efforts that reach beyond urban centres to rural populations, underlining the importance of digital inclusivity for national development. Bureaucratic obstacles, characterised by entrenched delays and resistance to change, slow national digital initiatives' progress (Larkotey et al., 2021). Moreover, institutional, and socio-cultural barriers pose significant challenges to scaling digitalisation nationally (Effah & Nuhu, 2017). These multifaceted challenges underscore the critical need for comprehensive strategies that encompass not only technological solutions but also address socio-political, cultural, and environmental considerations to achieve sustainable progress and innovation nationwide.

2.2.5 Enablers of National-Level Digitalisation

A successful national-level digitalisation requires a multifaceted approach that encompasses not only the technological aspects but also the socio-political and legislative frameworks. Key enablers identified include the establishment of clear legislation and the provision of concise implementation guidelines, which lay the groundwork for digital initiatives (Larkotey et al., 2021; Weerakkody et al., 2021). Mobilising human resources and fostering collaboration among stakeholders, such as government, private sector, and civil society, are pivotal for the

integration and operational success of national digitalisation efforts (Muhaya et al., 2015). Effective leadership and strategic change management processes are crucial in overcoming challenges and steering digitalisation initiatives toward national goals (Li et al., 2019). Information technology (IT) outsourcing emerges as a strategic tool, offering access to expertise, reducing costs, and potentially serving political objectives.

Moreover, the creation of supportive policy frameworks and governance mechanisms is highlighted as essential for guiding and sustaining national-level digitalisation efforts (Larkotey et al., 2021; Park & Choi, 2019). These frameworks need to address issues of privacy and cybersecurity, ensuring data protection and supporting digital commerce while fostering innovation. The alignment of digitalisation efforts with the broader socio-economic goals of the nation is crucial for ensuring that the benefits of digitalisation are equitably distributed (Kar et al., 2019). Additionally, Addo & Senyo, (2020) pointed out that addressing the complexity of national-level digitalisation requires a comprehensive approach that combines technological innovation with systemic socio-political reforms. This includes the necessity of holistic reforms, strong political will, a stringent legal framework, and the strategic use of technology to limit bureaucratic discretion. Addressing the socially embedded nature of corruption, tackling shadow networks, and implementing comprehensive changes across legislation, business processes, and technologies are critical steps in achieving meaningful national-level digitalisation.

2.2.6 Dominant Themes Explored in IS National-Level Digitalisation Research

The discourse on national-level digitalisation within the IS discipline encompasses a diverse array of themes. These themes range from the strategic underpinnings and policy development

essential for digitalisation endeavours to the nuanced aspects of technology adoption, implementation, and their sector-wide impacts. Notably, studies delve into the adoption and utilisation of digital technologies by governments and countries globally, scrutinising factors that either facilitate or hinder their successful integration and assessing their contributions towards enhancing public service delivery, efficiency, and economic growth (Agyei-Ababio et al., 2023; Aljohani & Chandran, 2021; Alsadjali & Elbanna, 2020; Amankwah-Sarfo et al., 2018; Dyk & Belle, 2019; Effah, 2013; Effah & Nuhu, 2017; Kumar et al., 2018; Larkotey et al., 2021; Lazuardi et al., 2021; Masmali & Miah, 2021; Park & Choi, 2019).

Park and Choi (2019), for instance, explored the relationship between digital technology adoption and socio-economic growth, highlighting the integration of digital technologies with existing industries. Their study adopts the Diffusion of Innovation Theory and the Technology Organisation Environment framework to investigate innovation growth paths at the national level, utilising data from a wide range of countries. Their findings underscore the pivotal role of technological innovation capabilities, human capital, and environmental factors in driving economic impact.

Similarly, Agyei-Ababio et al. (2023) examined the institutional factors influencing digital technology adoption and utilisation for revenue mobilisation in an emerging economy's public sector. Their findings emphasise the critical role of legislative frameworks in governing system usage and realising its benefits.

Another prevalent theme addresses the transformational impact of national-level digitalisation on governance, public administration, society, and the economy (Amankwah-Sarfo et al., 2018; Kitsios et al., 2023; Larkotey et al., 2021; Li et al., 2019; Wahid & Sein, 2014). Studies within this theme typically illustrate how national-level digitalisation fosters inclusivity, transparency,

accountability, citizen engagement, economic growth, corruption reduction, and societal well-being (Eaton et al., 2017; Medaglia et al., 2021; Soltani Delgosha et al., 2020; Wahid & Sein, 2014). The study by Amankwah-Sarfo et al. (2018) focused on the digitalisation of import clearance processes in Ghana, demonstrating how such technological advancements can significantly enhance customs clearance efficiency, augment government revenues, and mitigate corruption associated with port activities. A critical study by Addo and Senyo (2020) however, offered a divergent perspective on the transformational impact of national-level digitalisation, suggesting that these initiatives often produce mixed results especially in the eradication of corruption. Their study uncovered the persistence of corruption, even in the face of the digitalisation of vehicle import clearance process at Ghana's ports, highlighting a complex web of interactions, actors and interests that sustain corrupt practices, alongside the emergence of new opportunities for corruption created by digitalisation efforts.

A third theme focuses on the challenges and barriers encountered in the digitalisation journey. This includes issues related to digital divides, resistance to change within public sector organisations, cybersecurity concerns, and the need for robust policy frameworks to support digital initiatives (Effah & Nuhu, 2017; Fleron et al., 2022; Legner et al., 2017; Ngwenyama et al., 2023; Parviainen et al., 2017). Fleron et al. (2022) explored the instrumental role of digital organisational resilience in overcoming barriers and challenges to successfully drive digitalisation in Denmark's public sector, underscoring resilience as key to sustaining momentum in a national-level digitalisation journey.

Lastly, the theme of innovation and collaboration highlights the significance of creating an environment conducive to technological innovation and the importance of engaging stakeholders and leveraging partnerships for national-level digitalisation (Chen et al., 2013; Faro, 2019; Lips et al., 2023; Medaglia et al., 2017a, 2017b; Mikalsen & Farshchian, 2020).

These dominant themes collectively enrich the discourse on national-level digitalisation within the IS discipline, underscoring its complexity and the varied approaches to studying and understanding its implications and outcomes.

2.2.7 Theory Applications in IS National-Level Digitalisation Research

To effectively apply and utilise a theoretical lens for this study, this section reviews the application of theories in the context of national-level digitalisation within IS, aiming to unearth theoretical gaps crucial for this research. Despite the brevity required by the study's scope, this review attempts to pinpoint where existing theories might not fully encapsulate the intricacies and subtleties of national-level digitalisation, directly addressing these theoretical voids.

The range of theoretical application in studies of national-level digitalisation within the IS discipline is wide. Some studies have bypassed theoretical frameworks in their analysis, indicating a gap between empirical insights and theoretical grounding (Addo & Senyo, 2020; Chatfield et al., 2016; Fleron et al., 2022; Nurkey et al., 2022). This lack limits the depth of analysis and the ability to draw meaningful conclusions that extend beyond specific case studies to inform broader IS discourse. In contrast, other studies incorporate established theories to analyse and interpret the complexities of digitalisation at the national scale. Notably, the Structural Model of Technology (SMOT) emerges as a key framework, adapting Giddens' (1986) theory of structuration as articulated by Orlikowski (1992). SMOT's emphasis on the reciprocal influence between technology and social practices offers a lens through which the interplay of human agency and technological artifacts within organisational settings is examined. Larkotey et al. (2021) utilised SMOT to probe the socio-economic outcomes of e-

government systems, enriching the model by adding a component that broadens the analysis to encompass the extensive impacts of national digitalisation efforts.

Additionally, the boundary object theory has been instrumental in IS studies focused on national-level digitalisation, facilitating insights into stakeholder collaboration and knowledge sharing across diverse interest groups. Originating from Star and Griesemer (1989), this theory's application in studies such as Amankwah-Sarfo et al. (2018) underscores its utility in fostering stakeholder unity and operational efficiency in the digitalisation of import clearance processes in Ghana.

Institutional theory (DiMaggio & Powell, 1983; Scott, 2008), another cornerstone in IS research, probes the pervasive influence of social structures on organisational behaviours within the context of national-level digitalisation (Alzadjali & Elbanna, 2020; Dang & Pekkola, 2016; Effah & Nuhu, 2017; Klecun et al., 2019; Omar & Elhaddadeh, 2016; Wahid & Sein, 2014). This theory, delineating between the roles of institutions and their evolution, has illuminated the interplay between digital technologies and institutional pressures, enriching understanding of government digital initiatives. Omar and Elhaddadeh (2016)'s uniquely combined Institutional and Structuration Theories to explore the challenges in major UK public sector digital transformation projects, offering a nuanced view of the roles played by various actors and structures in the process of institutionalising national digitalisation efforts.

The Activity Theory also provides a rich analytical framework for understanding the complex interactions between human activities and digital technologies (Li et al., 2019; Nehemia & Iyamu, 2023). Originating from Russian cultural-historical psychology (Luria et al., 1980; Vygotsky, 1978), it emphasises the mediation of human consciousness and reality through tools, with Engeström (2015)'s expansion into activity systems offering insights into

purposeful human actions, transformations, and outcomes. Li et al. (2018)'s application of this theory to study the government's role in developing rural e-commerce ecosystems for poverty alleviation in a rural area in China, reflects how Activity Theory can dissect government actions in supporting and regulating digital ecosystems. Their research underscores the theory's utility in revealing the dynamic, systemic nature of digitalisation efforts and their socio-economic impacts, demonstrating its value in IS national-level digitalisation studies, particularly in understanding digitalisation's socio-technical complexities and their potential to address socio-economic challenges.

While these theories share a common focus on understanding the interplay between technology, individuals, and the structural or institutional contexts within organisations, attempting to explain how digital technologies are adopted, used, and integrated within existing social systems, and how these technologies, in turn, influence organisational structures, processes, and outcomes, they struggle to fully encompass the breadth and complexities of national-level digitalisation. Originally designed for micro-level organisational studies, their application to macro-level digitalisation requires significant adaptation or augmentation with other concepts to thoroughly analyse the broader policy, infrastructural, regulatory, socio-economic, cultural, and political dimensions integral to national-level initiatives. Notably, none of these frameworks have been specifically applied to examine the intricacies of digitalising location addressing systems on a national scale.

Moreover, although these theories shed light on the factors influencing technology adoption and the impact of institutional pressures, they fall short of comprehensively addressing how entire countries can dynamically adapt to and harness digital technologies for broader economic and societal benefits. The complexity and scale of national-level digitalisation, particularly within the context of developing countries, necessitate a theoretical framework

capable of accounting for the dynamic capabilities essential for successful digitalisation efforts at a national scale. These gaps are particularly relevant for this study, which seeks to understand the capabilities crucial for the effective implementation and utilisation of digital location addressing systems with such countries. Consequently, there exists a need for research that not only bridges these theoretical gaps but also underscores the essential capabilities required for developing nations to effectively leverage digital.

2.2.8 National-Level Digitalisation in Developing Countries

National-level digitalisation presents a pathway to modernisation and global competitiveness for developing countries, promising to transform various aspects of daily life and national development beyond simple technological adoption (Addo & Senyo, 2020; Agyei-Ababio et al., 2023; Amankwah-Sarfo et al., 2018; Effah & Nuhu, 2017; Kemal, 2014; Larkotey et al., 2021; Lazuardi et al., 2021; Preko et al., 2019; Wahid & Sein, 2014). These studies present a cohesive narrative on the challenges and opportunities of national-level digitalisation within developing countries, across diverse sectors such as customs clearance, vehicle importation, and healthcare.

The study by Amankwah-Sarfo et al. (2018) explored the digitalisation of Ghana's import clearance processes, illustrating the positive impact on customs efficiency, increased government revenue, and the reduction of corruption. This sets a foundational perspective on how targeted digital initiatives can streamline governmental services and enhance transparency, serving as a pivotal step towards broader national digitalisation efforts. Building on the premise of leveraging digitalisation to combat corruption, Addo and Senyo (2020) critically analysed Ghana's digital vehicle import clearance process. They uncovered the

paradox where, despite the initial success in disrupting conventional corrupt practices, digitalisation inadvertently spawns new avenues for corruption. This underscores the complexity of digitalisation, highlighting that technological solutions alone may not suffice to eliminate systemic issues without addressing the underlying social and institutional frameworks. Shifting the focus to the healthcare sector, Preko et al. (2019) assessed the digitalisation efforts in maternal and child health services in Ghana. They emphasise the critical need for interoperability among digital health systems to enhance service delivery and patient care. This examination revealed the broader implications of digitalisation in improving healthcare outcomes, contingent upon the integration of digital systems and the effective use of data. Lazuardi et al. (2021) extended the conversation to Indonesia, examining the digitalisation of maternal and child health (MCH) services. Similar to Ghana, they identified a fragmented ecosystem of health information systems with limited interoperability, highlighting the potential benefits of a unified digital approach to support the continuum of care. This study reinforced the importance of developing a coherent digital infrastructure, standardised data practices, and strong governance to unlock the full potential of digitalisation in healthcare. Despite the potential for significant socio-economic benefits, these countries often encounter obstacles due to limited financial, human, and technological resources, hindering the development of practical digitalisation strategies (Mumtaz, 2024).

Unique challenges such as digital literacy gaps, security concerns, bureaucratic resistance, and policy and regulatory issues, limited financial resources, technical expertise, and infrastructure deficiencies such as internet connectivity are significant barriers, compounded by political challenges and a lack of political will that often impede progress further complicate the digitalisation landscape in developing nations (Alsharo et al., 2020; Jamil, 2021; Kasmi & Zohra, 2022; Mumtaz, 2024).

Successful national-level digitalisation relies on strategic policies, leadership, and inclusive and sustainable growth commitments (Addo & Senyo, 2020). It necessitates investments in digital skills, fostering public-private partnerships, ensuring cybersecurity, and creating conducive regulatory environments. Strategic resource management and collaboration with the private sector are vital for overcoming financial and technological limitations, with global collaboration essential for accelerating development.

Despite these challenges, national-level digitalisation in developing countries is attainable as evidenced in Hafsel et al. (2021)'s study on government digital initiatives to illustrate the importance of value co-creation and cross-jurisdictional networks. These efforts highlight the importance of inter-organisational and cross-sector collaborations in enhancing foundational infrastructures like location addressing systems, crucial for broader economic development and efficient service delivery.

However, national-level digitalisation efforts in developing countries often fail to meet expectations due to the broader political economy and institutional contexts perpetuating corruption (Addo, 2016; Addo & Senyo, 2020; Masiero & Maiorano, 2018; Prakash & Masiero, 2015). Drawing on global best practices and fostering a unified vision, resource management, and productive collaboration, developing countries can navigate the path toward successful national-level digitalisation, revolutionising public services, enhancing economic opportunities, and fostering a more responsive and transparent government. According to Addo and Senyo (2020), successfully implementing national-level digitalisation in developing countries demands an approach that transcends technological fixes to address the broader socio-political and institutional frameworks that underpin corruption, emphasising the necessity of comprehensive systemic and cultural reforms.

Developed countries provide valuable lessons for implementing robust national digital systems, underscoring the importance of comprehensive strategies for the successful digitalisation of public services (Alsharo et al., 2020; Dobson & Nicholson, 2018). China's investment in an advanced technology infrastructure, including high-speed 5G internet and multilingual platforms, coupled with a nationwide digital literacy program, exemplifies effective strategies. The commitment to user-friendly platforms, designed with continuous feedback and the integration of emerging technologies like artificial intelligence and blockchain, showcase proactive and innovative approaches. Additional measures such as public awareness campaigns, strong political support for E-Government initiatives, cross-departmental collaboration, and government investment plans for funding technological advancements emphasise the multifaceted strategy required for successful digitalisation. Stringent data security measures, responsive customer support, learning from global best practices, and encouraging citizen participation further highlight the need for a well-rounded approach. These efforts suggest that recognising and adapting to each nation's specific needs and contexts is critical for overcoming national-level digitalisation challenges (Mumtaz, 2024).

National - Level Digitalisation	
Definition	The strategic integration of digital technologies across all sectors in a country to enhance efficiency, service delivery, and promote economic growth and innovation, involving public sector modernization, economic and social transformation, inclusive access, collaborative efforts across stakeholders, and supportive policies and regulations (Eaton et al., 2017; Lazuardi et al., 2021; Soltani Delgosha et al., 2020).

Drivers	Driven by technological advancements, economic competitiveness, societal demands, strategic imperatives for public good, global competitiveness, socio-economic pressures (e.g., job creation, economic growth), governmental policies, crisis situations (e.g., pandemics), digital sophistication of citizens, support from international organisations, and cybersecurity threats (de Armas Garc'ia & Cruz Gutiérrez, 2013; Kar et al., 2019; Kitsios et al., 2023; Park & Choi, 2019).
Characteristics	Characterised by the integration of digital technologies in public services and governance for enhanced efficiency, transparency, and engagement (Delgosha et al., 2021; Effah & Nuhu, 2017). It emphasises collaborative efforts among government, private sector, NGOs, academia, and the public towards common goals (Bednar & Welch, 2020; Larkotey et al., 2021). Focuses on citizen-centric services, accessibility, and user-friendliness (Alshawhi & Alalwany, 2009; Berger & Hertzum, 2014; Ning & Khuntia, 2019). Politically sensitive, requiring supportive political and regulatory environments (Ramadani et al., 2022). Involves Public-Private Partnerships (PPPs) for leveraging private sector expertise and resources (Medaglia et al., 2017a; Pappas et al., 2018).

Impacts	Provides economic, governance, and societal benefits including innovation, job opportunities, transparency, efficiency in public services, and improved quality of life (Amankwah-Sarfo et al., 2018). Streamlines service delivery, creates new revenue streams, enhances governmental visibility and trust through technology, and combats corruption by reducing manual intervention (Addo & Senyo, 2020; Lazuardi et al., 2021; Nguyen, 2023). However, entrenched organisational malpractices and corruption can persist despite digitalisation efforts (Addo & Senyo, 2020).
Challenges	Faces technical, cultural, political, environmental, and structural challenges, including resistance to change, stakeholder coordination, data privacy concerns, the digital divide, bureaucratic obstacles, and institutional barriers (Dang & Pekkola, 2016; Effah & Nuhu, 2017; Kar et al., 2019). Emphasises the need for comprehensive strategies addressing socio-political, cultural, and environmental considerations for sustainable progress.
Enablers	Successful national-level digitalisation requires clear legislation, stakeholder collaboration, effective leadership, IT outsourcing, supportive policy frameworks and governance mechanisms, alignment with socio-economic goals, comprehensive reforms, and addressing the complexity of digitalisation with technological and systemic socio-political reforms (Larkotey et al., 2021; Weerakkody et al., 2021).

Dominant Themes	Explored strategic underpinnings, technology adoption (Park & Choi, 2019), sector-wide impacts (Amankwah-Sarfo et al., 2018; Kitsios et al., 2023; Wahid & Sein, 2014), governance (Alzadjali & Elbanna, 2017), societal benefits (Aljohani & Chandran, 2021), and challenges/barriers (Fleron et al., 2022; Legner et al., 2017; Ngwenyama et al., 2023) and emphasises institutional factors (Agyei-Ababio et al., 2023), transformative impacts, and the role of innovation and collaboration (Lips et al., 2023; Mikalsen & Farshchian, 2020).
Theory Applications	Studies utilise theories like the Diffusion of Innovation (Park & Choi, 2019), Technology Organisation Environment framework (Park & Choi, 2019), Structurational Model of Technology (SMOT) (Larkotey et al., 2021), boundary object theory (Amankwah-Sarfo et al., 2018), institutional theory (Alzadjali & Elbanna, 2020; Klecun et al., 2019; Omar & Elhaddadeh, 2016), and Activity Theory (Li et al., 2019; Nehemia & Iyamu, 2023). Points to a need for theories that can fully encapsulate the complexities of national-level digitalisation, especially in developing countries.
Studies Conducted in Developing Countries	Study by Amankwah-Sarfo et al. (2018) investigated the impact of import clearance digitalisation on socioeconomic development in Ghana, highlighting improved customs efficiency, increased government revenue, and reduced corruption. Addo and Senyo (2020) studied national-level digitalisation in Ghana, focusing on the digital vehicle import clearance process. They reveal that

	despite efforts to curb corruption through digitalisation, new opportunities for corrupt practices emerge, highlighting the complex challenges within digitalisation initiatives. Preko et al. (2019) explored healthcare digitalisation in Ghana to understand its underlying mechanisms and impact. Lazuardi et al. (2021) investigate the digitalisation of maternal and child health (MCH) services in Indonesia, focusing on the potential for interoperability among various health information systems to enhance care continuity.

Table 2.1 - Summary of Literature Review of National-Level Digitalisation

2.3 The Concept of Location Addressing

Widely referred to as street addressing in literature, location addressing originated as a means of organising cities and simplifying the process of locating specific buildings or sites (Demir & Raskar, 2018; Farvacque-Vitkovic et al., 2005; Gakh, 2020b, 2020a; Olayinka et al., 2020; Seok & Lee, 2016; Yildirim et al., 2014; Zandbergen, 2008). An address is defined as a description or a code for the fixed location of a home, building, parcel of land or other entity using street names as reference points (Owusu-Adjei, 2019; Yildirim et al., 2014). These include unique identifiers for each address and a structured, standardised format, which may encompass components like building numbers, street names, and geographic markers, making them the most significant data used to relate individuals and locations (Yildirim et al., 2014).

A typical addressing system embodies a hierarchical structure that ranges from specific locales such as a house to more general ones say a country.

The concept of location addresses has evolved significantly over centuries, adopting unique formats based on the cultural dynamics, politics, economies, and other long-term processes adopted by the geographical contexts of regions worldwide (Demir & Raskar, 2018). The basic premise involves assigning unique identifiers, often numerical, to segments of streets or individual buildings complemented with geographical identifiers such as street names, districts, or city names. Over time, location addresses have gone beyond their core function of facilitating navigation, performing pivotal roles in postal services, emergency services, urban planning, and various socioeconomic activities (Farvacque-Vitkovic et al., 2005; Gakh, 2021; Ofori-Atta, 2015; Yildirim et al., 2014). Essentially, urban development, economic growth and the provision of basic services are inextricably linked to the existence of sound location address infrastructure, thus governments all over the world have taken to the development and deployment of addressing systems capable of uniquely identifying and locating individuals and property (Clodoveu et al., 2003; Ghimire et al., 2021; Owusu-Adjei, 2019).

Location addressing promises numerous benefits to individuals, organisations, and governments. They are a cornerstone of social, commercial, environmental, legal and political systems since address data are required across all levels of government, and business communities (Malaainine & Lechgar, 2021; NGAC, 2014) and they constitute an underlying infrastructure upon which many other services can be built (Universal Postal Union, 2012). Citizens, businesses, and governments use addresses daily as an understandable description of the location of a specific piece of information to provide essential services (Yildirim et al., 2014). In addition to enabling people locate, situate, and navigate themselves around cities and towns (Farvacque-Vitkovic et al., 2005; Goldberg et al., 2007), addresses are considered a basic

human right because they are part of a person's identity (Universal Postal Union, 2012). Even though they do not include any information about the person inhabiting them, addresses are a central part of people's identification data, such that people are defined by their residential addresses as they are by any other personal attributes or traits (Abebrese, 2019; Farvacque-Vitkovic et al., 2005). Addresses provide people with status (Coetzee & Cooper, 2007b). The lack of address is indeed considered the lack of legal identity and the lack of equal opportunities for employment and social integration, which are often barriers to the enjoyment of rights as citizens (Universal Postal Union, 2012). Citizens can only benefit under the rule of law and exercise their legal rights and obligations if they are accounted for and acknowledged through official addresses. In many cases, segments of the population are excluded from exercising their voting rights because they do not have official address to register with, likewise internationally recognised documents such as passports and visas require individuals to be officially registered.

Whereas, individuals need address to be formally recognised as members of a community, to have access to property, and to take on the rights and obligations attached to their social role (Malaainine & Lechgar, 2021), businesses rely on accurate addressing networks to locate service providers and clients, promote and facilitate access to products and services, deliver goods, send mail, develop new markets and participate more easily in national and international markets (Malaainine & Lechgar, 2021; Universal Postal Union, 2012). For organisations in both the public and private sectors, addresses are collected and used every minute of every day for emergency response; the consumption of commercial goods and services; mail and package delivery; public and private utility management; voting; taxation (Mantey et al., 2012; Neene & Kabemba, 2017); licensing; financial lending and real estate transactions; road maintenance and transit services; market analysis; environmental stewardship; economic development and

land use planning; and many other purposes (NGAC, 2014). Postal and courier businesses require accurate and complete address to provide quality service, so that correspondence, documents, and goods reach their destination as quickly as possible (Abebrese, 2019; Ofori-Atta, 2015; Universal Postal Union, 2012). While enhancing accurate physical presence, location addresses also effectively increase connectivity all around the world (Demir & Raskar, 2018). For instance, financial institutions use customers' address to look up information on real property or insurance information of the customer (Gah et al., 2018), thus making addresses important mechanisms for merging or linking information from different sources (Yildirim et al., 2014). Additionally, an accurate location address system creates a reliable environment for public and private sector transactions, thereby ensuring the protection of investments and the promotion of commerce and economy (Balmforth et al., 2015; Chawda & Raj, 2018). Businesses found in poorly addressed and identified areas are unable to get registered because they lack mandatory address information, hence remain informal and barred from accessing certain financial and banking services (Kemal, 2014).

Location addressing systems are basic techniques adopted by governments for service delivery and effective governance (Owusu-Adjei, 2019). They facilitate the planning and implementation of public policies and services, efficient response to natural disasters and diseases by providing aid and emergency services, and reinforcement of national and international security (Universal Postal Union, 2012). Local and national governments need addresses to help individuals secure legal identity that makes them recognised as part of a nation and enables them take advantage of their rights and obligations as citizens. Accurate and verifiable addressing systems enable the effective and efficient planning and management of cities as their existence facilitates the urgent dispatch of emergency and security services, the efficient collection of revenue and taxes and the efficient management and quick

troubleshooting of breakdowns in electric, water and telecommunication systems (Clodoveu et al., 2003; Farvacque-Vitkovic et al., 2005; Mantey et al., 2012; Mennecke & West Jr, 2001; Neene & Kabemba, 2017; Yildirim et al., 2014; Yildirim & Ural, 2017). Reliable addressing system establishes a framework to standardise the acquisition, storage, processing, and dissemination of many forms of spatially distributed data including census and business-related data, consequently, guaranteeing investment planning, and useful in facilities and infrastructure development and maintenance (Abebrese, 2019; Farvacque-Vitkovic et al., 2005; Yildirim & Ural, 2017). Census data form the foundation of any inventory of a nation's population, assets, and needs, as it illuminates trends, measure important indicators that monitor development goals and identify critical areas of concern. Unidentified and inaccessible areas within a national territory typically suffer from a lack of services or government oversight and offer breeding grounds for crime, insecurity, and violence consequently impeding the integrity of the state and community life. Adequate location of address system can provide government with the ability to identify, locate, access, and understand the characteristics and populations of such marginalised areas to effectively allocate national resources and incorporate them into the nation (Coetzee & Cooper, 2007b; NGAC, 2014; Njoh, 2010; Owusu-Adjei, 2019). Again, data on the spatial organisation of territory and an understanding of the composition of the nation, including knowledge of the population, allows the state to ensure social stability, prepare itself against threats and respond to them (Universal Postal Union, 2012). Well-defined and known incident location data are critical to faster response and initiation of mitigating actions to lessen the potential negative outcomes of the event such as deaths, damages to properties and financial loss, in the event of natural disasters (NGAC, 2014). Maintaining, updating, and managing address data with precision is critical to ensure its reliability and utility across both governmental and private sectors.

While location addressing systems are indispensable for urban navigation and administration, they come with numerous challenges and limitations, particularly for traditional systems. The lack of global standardisation and wide variance in addressing systems from place to place often leads to confusion, particularly for tourists or newcomers, and the constant emergence of new buildings and streets in rapidly urbanising areas poses a significant challenge to maintaining accurate and up-to-date addressing. Other significant challenges include the need for continuous updates and maintenance due to changes in street names and numbers, concerns about privacy tied to data sharing, lack of precision for specific locations within large complexes or rural regions, and difficulties navigating intricate city layouts. These result in more than just a significant increase in operational costs due to missing, incorrect, ambiguous, or challenging to locate addresses—it also leads to duplication of work and the wastage of both time and money. The repercussions include delays and frustration for customers and service providers alike, and potential damage to the reputations of businesses and professionals (NGAC, 2014).

The increasing use of internet-powered, technology-driven services, sometimes necessitating deliveries to specific endpoints (Owusu-Adjei, 2019) combined with globalisation—a catalyst for enhanced interaction and integration among individuals, organisations, and nations (Abebrese, 2019)—emphasises the demand for a robust, standardised, and reliable addressing system that uniquely pinpoint every individual, property, and entity (Njoh, 2010). The emergence of digital addressing systems and geocoding technologies has begun to mitigate some of these challenges, but there remains an ongoing need for consistent research and development to refine and globalise addressing systems.

2.3.1 Evolution of Location Addressing Systems

Physical location addressing systems, reflecting a consistent effort to organise the complexity of urban and rural spaces, have evolved significantly over centuries, tailored to the cultural, political, and geographical contexts of regions (Goodchild, 2004; Yildirim et al., 2014). The development of addressing systems began in Western Europe and China in the eighteenth century, initially involving street names derived from landmarks and later incorporating formalised names and house numbers (Davis & Fonseca, 2007; Tantner, 2009). This evolution aimed at organizing urban spaces more efficiently, contributing to cadastral and fiscal initiatives. The formalised numbering systems akin to modern addressing arose in the 18th century, exemplified by Paris and Philadelphia by implementing odd and even numbering for buildings, a practice that spread globally despite initial resistance from higher social classes in France who disliked the equalization implied by numeric addressing (Clodoveu et al., 2003; Farvacque-Vitkovic et al., 2005; Tantner, 2009). The 19th century witnessed expansion and standardisation, crucial for city administration, mail delivery, and public health; location addressing systems became increasingly sophisticated, particularly in the United States and Europe (Farvacque-Vitkovic et al., 2005). By the 20th century, most developed countries had uniform urban addressing systems, though many developing countries lacked consistency. The metric numbering system, popular in western countries, assigns building numbers based on their metric distance from the start of a street, facilitating an easy approximation of distances between addresses and accommodating urban development (Clodoveu et al., 2003; Farvacque-Vitkovic et al., 2005). The 21st century brought digital innovation with Geographic Information Systems (GIS) (Lee, 2009; Moreri et al., 2017; Neene & Kabemba, 2017; Saro & Ueechan, 2003; Walsham & Sahay, 1999; Yeh, 1999) and Global Positioning System (GPS) (Imieliński & Navas, 1999; Pandey et al., 2021), linking addresses to precise coordinates, and

facilitating global navigation services like Google Maps (Gah et al., 2018; Zhou et al., 2010). Newer systems like what3words provide unique identifiers for every 3-meter square globally, aiding regions without formal addressing (Amitash et al., 2023). In the era of smartphones and smart devices, geolocation technologies have also enabled a plethora of location-based services and applications (Chin & Siau, 2012; Choi et al., 2012; Koohikamali & Peak, 2015; Kumar et al., 2023; Luse et al., 2008; Sukaphat, 2011). From navigation apps like Google Maps and Waze to delivery services like Uber and DoorDash, geolocation technologies have become integral to many aspects of modern life (Hayes et al., 2017; Laor & Galily, 2022; Sun et al., 2023).

The evolution of street addressing systems, thus, has been driven by historical usage, societal needs and technological advancements, profoundly influencing global connectivity. For example, Japan numbers houses by their construction date, while South Korea uses neighbourhood-based numbering within urban sectors. Other methods like decametric numbering combine aspects of sequential and metric systems. Despite the diversity of addressing systems, efforts towards standardization have been limited. Initiatives in South Africa, the United States, Denmark, and the United Kingdom represent some attempts to enhance addressing efficiency through standardization.

2.3.2 Location Addressing and National Development

A high-quality addressing system is a crucial component of a country's socio-economic structure, as it not only improves public services but also facilitates business, trade, and consequently, national development (Farvacque-Vitkovic et al., 2005; Njoh, 2010). The lack of an address system poses a substantial obstacle to delivering essential services like water,

electricity, and sanitation, impacting individual health, dignity, and the broader environment (Clodoveu et al., 2003; Farvacque-Vitkovic et al., 2005). Essentially, superior address data contributes to the smooth and effective functioning of social, environmental, commercial, and political systems, enabling the provision of more services to enhance the quality of life for everyone (NGAC, 2014). Robust location addressing systems serve as a foundation for pivotal national policies with its advantages extending beyond national boundaries, contributing to global welfare (Universal Postal Union, 2012). Implementing such systems for public benefit however requires political will, widespread awareness, and an action plan backed by stakeholders (Gakh, 2021).

2.3.3 Location addressing Systems in Developing Countries

Scholarly literature suggests that the state of location addressing in many developing countries presents a variety of challenges (Abebrese, 2019; Demir et al., 2018; Gah et al., 2018; Olayinka et al., 2020). Often, there are large areas, particularly in rural and informal settlements, that lack formal addresses, rendering people, properties, and businesses essentially "invisible" in terms of location-based services. This severely impacts the delivery of critical services such as emergency response, mail delivery, and utility installation (Demir & Raskar, 2018; Gah et al., 2018).

In many cases, existing addressing systems, where they do exist (major city centres, and high-income and industrial suburbs (Abebrese, 2019; Universal Postal Union, 2012) may be informal or based on local knowledge rather than systematic conventions, making them impractical for wider use. Regulatory issues can also play a part, with non-compliance with building regulations contributing to the problem (Owusu-Adjei, 2019). In Ghana, for example,

rampant disregard for land use regulations leads to a significant number of properties lacking permits and addresses, as they often bypass the governing bodies' approval procedures (Abebrese, 2019). This situation results in a dynamic and mobile population that is inadequately documented and managed (Rossouw, 2012).

Additionally, most developing countries lack a functional and standardised addressing system, which makes navigation difficult, hampers the growth of delivery-based businesses, and complicates the efforts of government services and agencies to reach their constituents. Rapid urbanisation, unplanned growth and creation of informal structures and settlements, outpacing the ability of existing systems to keep up exacerbate this situation (Clodoveu et al., 2003; Demir & Raskar, 2018; Gakh, 2020a; Universal Postal Union, 2012). Consequently, the lack of a comprehensive, precise, and clear national location addressing system poses a major socio-economic challenge for many developing nations, underscoring the importance of establishing such an infrastructure (Universal Postal Union, 2012).

However, many developing nations are actively seeking solutions to these challenges, recognising the economic and social benefits that a comprehensive addressing system can bring. These efforts include the adoption of new digital addressing systems, leveraging geocoding and geospatial technologies, which can assign unique identifiers to specific locations, providing a means of addressing that is independent of traditional street names and numbers. Projects like Ghana's GhanaPostGPS and Ivory Coast's use of the 'what3words' system exemplify such initiatives (Frimpong et al., 2023). Unfortunately, the strive to implement efficient addressing systems, for many developing countries, is saddled with issues of ambiguity due to inconsistent methodologies and approaches. Management of address data is often uncoordinated, with multiple government levels and private industries handling it independently (NGAC, 2014). Numerous institutions gather and maintain this data

independently, lacking the ability to compare and reconcile their records with a verified master address file (NGAC, 2014). These issues pose problems for standardisation in terms of harmonising and interpreting address information within specific areas (Abebrese, 2019; Clodoveu et al., 2003; Farvacque-Vitkovic et al., 2005; Gah et al., 2018; Malaainine & Lechgar, 2021).

2.3.4 Digital Location Addressing Systems

The era of digitalisation has now extended to include location addressing, giving rise to what we know as digital location or street addressing. Digital location addressing systems modernise location identification by employing digital technology to assign unique identifiers to specific spots on earth (Gakh, 2020b, 2020a, 2021). Unlike conventional addressing systems that depend on street names and numbers, digital addressing systems leverage geospatial data, ensuring a precise, globally consistent, and user-friendly way to identify any location, whether in a bustling city or a remote rural area. These systems are designed to integrate seamlessly with digital services and remain adaptable to changes like new constructions or alterations in road infrastructure. The digitalisation of location addressing has facilitated innovative systems like what3words and Google's Plus Codes (Amitash et al., 2023; Ghimire et al., 2021). These systems assign unique identifiers to small geographical locations worldwide, ensuring every location, no matter how remote or previously unaddressed, has a simple and precise address.

The digitalisation of addresses is propelled by geocoding, digital mapping technologies, advanced addressing systems, integration with digital services, data management, and APIs (de Armas Garc'ia & Cruz Gutiérrez, 2013; Goldberg, 2011; Goldberg et al., 2007; Yildirim et al., 2014). Geocoding involves assigning numerical coordinates (latitude and longitude) to

physical locations or addresses, enabling their precise plotting on digital maps. This transition transforms an address from a mere text descriptor to a data point that can be analysed and manipulated in various contexts (Goldberg et al., 2007).

Digital maps, integral to digital mapping technologies, utilise geospatial data to offer interactive and dynamic mapping experiences. These maps, capable of real-time updates, enable users to zoom, navigate, and explore different layers of information (Bastani et al., 2021; Firmansyah & Wahyuni, 2022). Additionally, as part of digital addressing systems, these maps employ geocoded addresses for accurate positioning and routing, significantly enhancing the efficiency and accuracy of location-based services and decisions.

Digital addresses play a crucial role in various online services like e-commerce, ride-hailing apps, delivery services, and emergency response systems (Faye et al., 2018; Laor & Galily, 2022; Moreri et al., 2017; Ofori-Atta, 2015; Sun et al., 2023). These services use digital addresses to locate users, deliver goods, or provide location-specific offerings. With the aid of digital technologies, addresses can be stored in digital databases and manipulated using digital tools. Furthermore, APIs can facilitate interaction between different software and these databases (Ojeda et al., 2021), enhancing the utility of digital addresses.

Developed countries lead in the adoption of sophisticated digital addressing systems, like what3words and Google's Plus Codes which simplifies location sharing through a unique combination of three words, thereby revolutionising location specificity with ease and precision (Amitash et al., 2023; Kotze, 2020).

Digital addressing systems across Africa are pioneering significant improvements in public services, logistics, healthcare, and emergency response, particularly in regions lacking formal infrastructure. These systems, employing innovative technologies and methodologies, are

rapidly becoming crucial tools for socio-economic development and inclusivity (Ditsela et al., 2011; Frimpong et al., 2023; Moreri et al., 2017; Muinde, 2017; Njoh, 2010).

In Nigeria and Ivory Coast, the adoption of the what3words system marks a significant step forward. This innovative digital addressing solution is enhancing logistics, healthcare, and emergency services by providing precise, easy-to-communicate addresses. Such initiatives demonstrate the transformative potential of digital addressing in boosting public service accessibility and operational efficiency (Frimpong et al., 2023).

Kenya's exploration into GIS-based street addressing, as investigated by Muinde (2017) in Machakos town, further highlights the impactful benefits of digital addressing systems on property management and location identification. Despite challenges in effective implementation, particularly in land rate management—a key revenue source for local governments—the study revealed how the codification of streets and assignment of unique identifiers to land parcels can significantly improve revenue management through enhanced property identification and location precision.

The evolution of digital addressing systems in Botswana, as outlined in the "Addressing Botswana Project" (Ditsela et al., 2011; Moreri et al., 2017), adds another layer to the narrative of digital addressing innovation in Africa. This project, a collaborative effort involving stakeholders such as councils, land boards, and Botswana Post, focuses on creating a centralised database of uniquely referenced land parcels and location addresses, regularly updated with postcodes and postal delivery addresses. This initiative reflects a comprehensive strategy to modernise and enhance public service delivery, aiming to streamline postal services and kickstart online purchasing and home delivery services in Botswana.

Additionally, the project underlines the development of a unique address assignment scheme that respects cultural, religious, and traditional nuances, aiming for address interoperability. This scheme, drawing on international initiatives like the ISO 19160 project, proposes a standardised addressing system to improve property management, revenue collection, and service provision across diverse regions (Ditsela et al., 2011; Moreri et al., 2017).

Njoh's (2010) work critically evaluates the challenges of indistinct spatial structures in developing countries, with a focus on Cameroon, proposing digital location addressing systems as a transformative solution. He highlights the inefficacy of current efforts limited to urban centres and calls for a holistic digital approach that accommodates the unique contexts of developing nations. By leveraging geospatial data for precise location identification, digital addressing can revolutionise urban management, enhance inclusivity by reaching remote areas, and integrate with global technologies to improve service delivery. Njoh (2010) recommends developing an unambiguous addressing system aligned with existing administrative frameworks, emphasising collaboration across governmental, local, and international levels. His analysis underscores the significant potential of digital addressing in fostering socio-economic development and global integration, offering valuable insights for implementing such systems in similar contexts.

Jernbeck's (2018) work investigates the significant potential benefits of implementing a digital addressing system in Uganda, a country experiencing socio-economic growth partly due to mobile technology yet lacking in comprehensive national addressing. The study highlights how a mobile-based address system could revolutionise Uganda's trade by enhancing efficiency, access, and service delivery, especially outside Kampala where efforts are nascent. Jernbeck (2018) argues that a sustainable digital addressing system, considering economic, social, and environmental facets, could spur innovation, improve public services, and bridge

developmental gaps. The research underscores the necessity of such a system for optimising infrastructure, facilitating better data collection for development, and contributing to Uganda's sustainable economic growth and inclusivity, suggesting it as a foundational step towards leveraging technological advances for national development.

Location Addressing	
Definition	A description or a code for the fixed location of a home, building, parcel of land or other entity using street names as reference points (<i>Owusu-Adjei, 2019; Yildirim et al., 2014</i>).
Benefits	Enhanced Connectivity - Ensures every individual, property, and entity is uniquely pinpointed, increasing global and local connectivity (<i>Njoh, 2010</i>). Improved Public Services - Crucial for delivering emergency, mail, and utility services efficiently (<i>Clodoveu et al., 2003; Farvacque-Vitkovic et al., 2005</i>). Economic Promotion - Creates a reliable environment for transactions, bolstering commerce (<i>Balmforth et al., 2015; Chawda & Raj, 2018; Mantey et al., 2012; Neene & Kabemba, 2017</i>). Effective Governance - Facilitates public policy implementation and city management (<i>Clodoveu et al., 2003; Demir & Raskar, 2018; NGAC, 2014; Owusu-Adjei, 2019</i>). Legal Identity and Inclusivity - Addresses are part of a person's identity, essential for exercising legal rights (<i>Universal Postal Union, 2012</i>). Precise Navigation - Allows individuals to locate and navigate urban and rural areas accurately (<i>Farvacque-Vitkovic et al., 2005; Goldberg et al., 2007</i>). Investment Planning and Public Health - Aids in facilities development and maintenance, crucial for health initiatives (<i>Abebrese, 2019; Yildirim & Ural, 2017</i>). National and International Security - Enhances the dispatch of emergency and security services (<i>Universal Postal Union, 2012</i>).
Evolution	18th Century Initiation - Initiation of addressing systems in Western Europe and China with street names derived from landmarks (<i>Davis & Fonseca, 2007; Tantner, 2009</i>). 18th Century Formalization - Introduction of odd & even building numbering in Paris and Philadelphia, marking the formalization of addressing systems (<i>Clodoveu et al., 2003; Farvacque-Vitkovic et al., 2005; Tantner, 2009</i>). 19th Century Expansion and Standardization - Sophistication and standardization of addressing systems for improved city administration and public health (<i>Farvacque-Vitkovic et al., 2005</i>).

	20th Century Uniformity - Adoption of uniform urban addressing systems and the metric numbering system in developed countries (<i>Clodoveu et al., 2003; Farvacque-Vitkovic et al., 2005</i>) 21st Century Digital Innovation - Introduction of GIS and GPS for linking addresses to precise coordinates and enabling global navigation services (<i>Gah et al., 2018; Lee, 2009; Moreri et al., 2017; Neene & Kabemba, 2017; Pandey et al., 2021; Saro & Ueechan, 2003; Walsham & Sahay, 1999; Yeh, 1999; Zhou et al., 2010</i>) Modern Geolocation Technologies - Emergence of systems like what3words and widespread use of smartphones for location-based services (<i>Amitash et al., 2023; Chin & Siau, 2012; Choi et al., 2012; Hayes et al., 2017; Koohikamali & Peak, 2015; Kumar et al., 2023; Laor & Galily, 2022; Luse et al., 2008; Sukaphat, 2011; Sun et al., 2023</i>) Efforts Towards Standardization - Global initiatives aimed at standardizing addressing systems for enhanced efficiency (<i>Goodchild, 2004; Yildirim et al., 2014</i>)
National Implications	Improvement of Public Services - Enhances the delivery of essential services such as water, electricity, and sanitation (<i>Clodoveu et al., 2003; Farvacque-Vitkovic et al., 2005</i>). Facilitation of Business and Trade - Supports business operations and trade, contributing to national development (<i>Farvacque-Vitkovic et al., 2005; Njoh, 2010</i>). Impact on Health and Environment - Addresses the delivery of crucial services, affecting individual health, dignity, and environmental conditions (<i>Clodoveu et al., 2003; Farvacque-Vitkovic et al., 2005</i>). Contribution to Socio-economic Systems - Contributes to the efficient functioning of social, environmental, commercial, and political systems, enhancing quality of life (<i>NGAC, 2014</i>). Foundation for National Policies - Serves as a basis for key national policies, with benefits that extend to global welfare (<i>Universal Postal Union, 2012</i>). Requirement of Political Will and Stakeholder Involvement - Implementation necessitates political commitment, awareness, and a stakeholder-supported action plan (<i>Gakh, 2021</i>).
Peculiarities of DCs	Lack of Formal Addresses (<i>Abebrese, 2019; Demir et al., 2018; Gah et al., 2018; Universal Postal Union, 2012</i>). Ambiguity and Inconsistency: Leads to confusion and inefficiencies due to inconsistent methodologies (<i>Abebrese, 2019; Malaanine & Lechgar, 2021</i>). Service Delivery Challenges - Critically affects emergency, mail, and utility services (<i>Demir & Raskar, 2018; Gah et al., 2018</i>). Regulatory Non-Compliance - Leads to properties lacking permits and official addresses (<i>Abebrese, 2019; Owusu-Adjei, 2019</i>). Urbanization and Growth Challenges: Existing systems can't keep up with rapid urbanization and informal settlement growth (<i>Clodoveu et al., 2003; Demir & Raskar, 2018</i>).

	Absence of a National System: Poses socio-economic challenges, affecting national development (<i>Universal Postal Union, 2012</i>). Uncoordinated Data Management: Complicates standardization efforts and increases operational costs (<i>NGAC, 2014</i>).
Digital location addresses	Modernisation of Location Identification - Employing digital technologies for unique identifiers (<i>Gakh, 2020b, 2020a, 2021</i>). Utilisation of Geospatial Data - For precision and global consistency, leveraging geospatial data for development and integration (<i>de Armas Garc'ia & Cruz Gutiérrez, 2013; Goldberg, 2011</i>). Integration with Digital Services - Enhancing efficiency and accessibility (<i>Goldberg et al., 2007; Yildirim et al., 2014</i>). Role in Online Services - Fundamental for e-commerce, delivery services, and more (<i>Faye et al., 2018; Laor & Galily, 2022</i>). Innovation in Addressing Systems - Introduction of systems like what3words and Google's Plus Codes (<i>Amitash et al., 2023; Ghimire et al., 2021</i>). Socio-Economic Development - Pioneering improvements in public services and inclusivity (<i>Ditsela et al., 2011; Frimpong et al., 2023</i>). Enhances Public Service Delivery - Through unique, easy-to-communicate addresses (<i>Frimpong et al., 2023</i>).

Table 2.2 - Summary of Location Addressing Literature Review

2.4 Gaps Found in Literature

The review of the literature on conceptual and theoretical approaches to national-level digitalisation research in section 2.2 and those on digital location addressing systems in section 2.3 above presents some gap issues for this study.

2.4.1 Gaps Found in Conceptual Approaches

First, a review of the IS literature on national-level digitalisation highlights its sector-specific applications across health, tax, transport, manufacturing, procurement, and justice systems. However, there appears to be a significant oversight regarding digital location addressing

systems. Despite their critical importance in emergency services, delivery logistics, urban planning, and e-government services, this area has received limited scholarly attention (Choi et al., 2012; Guan, 2002; Koohikamali & Peak, 2015; Luse et al., 2008). Existing studies often focus on related areas such as GIS and location-based services (Choi et al., 2012; Guan, 2002; Koohikamali & Peak, 2015; Luse et al., 2008), neglecting the comprehensive examination of the broader implications, challenges, and potential impacts of implementing and utilising digital location addressing systems on a national scale. Consequently, there is limited understanding of the rationale, processes, and impacts associated with digital location addressing systems in developing countries, including the necessary capabilities and resources for their digitalisation. This gap indicates a need for in-depth research to identify and understand the capabilities necessary for developing countries to successfully digitalise and utilise location addressing systems. Bridging this research gap is essential for shaping informed policies and strategically steering national digitalisation initiatives in developing countries.

Secondly, research on the digitalisation of location addressing systems predominantly focuses on the technical aspects, such as creating and managing digital databases for addresses, and explores GIS and the effectiveness of location-based services across various applications. However, much of this research is situated outside the IS discipline, concentrating on the development of technologies and methodologies for accurately capturing, storing, and retrieving spatial data, and their integration into broader information systems. This external focus leads to a scarcity of research within the IS discipline that delves into the socio-economic impacts, policy implications, and strategic planning essential for national-scale implementation of these systems. Furthermore, there is a noticeable absence of studies within IS exploring the comprehensive range of issues related to digital location addressing systems, including adoption, implementation, utilisation, evaluation, sustainability, impacts and outcomes, and

policy development, alongside factors influencing success or failure, and tackling challenges related to privacy, data security, and the digital divide. These are critical for the successful adoption and use of digital location addressing systems across societal sectors. This gap underscores the need for IS-focused research that holistically examines these interconnected issues, involving stakeholder engagement, regulatory frameworks, and the significant role digital location addressing systems play in improving public services and economic development. Addressing this gap is crucial for advancing knowledge in research and an understanding and strategic implementation of digital location addressing systems within the national digitalisation framework, particularly in developing countries.

Again, a discernible research gap from the analysis of location address digitalisation efforts in African countries is the insufficient detailed examination of the systemic approaches, operational challenges, and adaptability strategies involved in the national-level implementation and utilisation of digital addressing systems in developing countries. While initiatives in countries like Kenya, Botswana, and Uganda highlight the progressive adoption of digital addressing, there is a lack of comprehensive understanding regarding how these countries navigate the complexities of integrating these systems within their existing socio-economic and infrastructural landscapes. This gap signifies the need for an in-depth exploration of the multifaceted processes that underlie the adoption and effective use of digital addressing systems, including the identification of factors that facilitate or impede their successful implementation. Such research could offer critical insights into best practices, policy implications, and technological innovations necessary for optimising digital addressing systems to meet the unique needs of developing countries, thereby enhancing their socio-economic development and global digital integration.

A combination of these gaps necessitates a study that will delve into:

- i) The rationale behind the implementation and use of digital location addressing systems in developing countries.
- ii) The impacts of the implementation and use of a digital location addressing system in developing countries.

Situating a study on digital location addressing systems within the context of a developing country like Ghana is crucial due to its unique challenges and opportunities, including limited infrastructure and resource constraints, which can offer innovative solutions tailored to such environments. Ghana's socio-economic development stands to benefit significantly from the effective implementation of these systems, impacting public service delivery, emergency services, urban planning, and economic activities. Insights into policy and governance from Ghana's experience can guide other developing countries with similar contexts, enriching IS literature with diverse perspectives and practical models for national-level digitalisation. This approach not only addresses Ghana's specific needs but also contributes valuable lessons to the global discourse on leveraging digitalisation for socio-economic advancement in developing countries.

2.4.2 Gaps Found in Theoretical Approaches

To begin with, the literature review on digital location addressing systems reveals a notable gap in theoretical underpinnings, with many studies adopting a-theoretical approaches to their analyses. This absence of theoretical frameworks limits the depth of understanding and the ability to generalise findings across different contexts or to draw broader implications for the

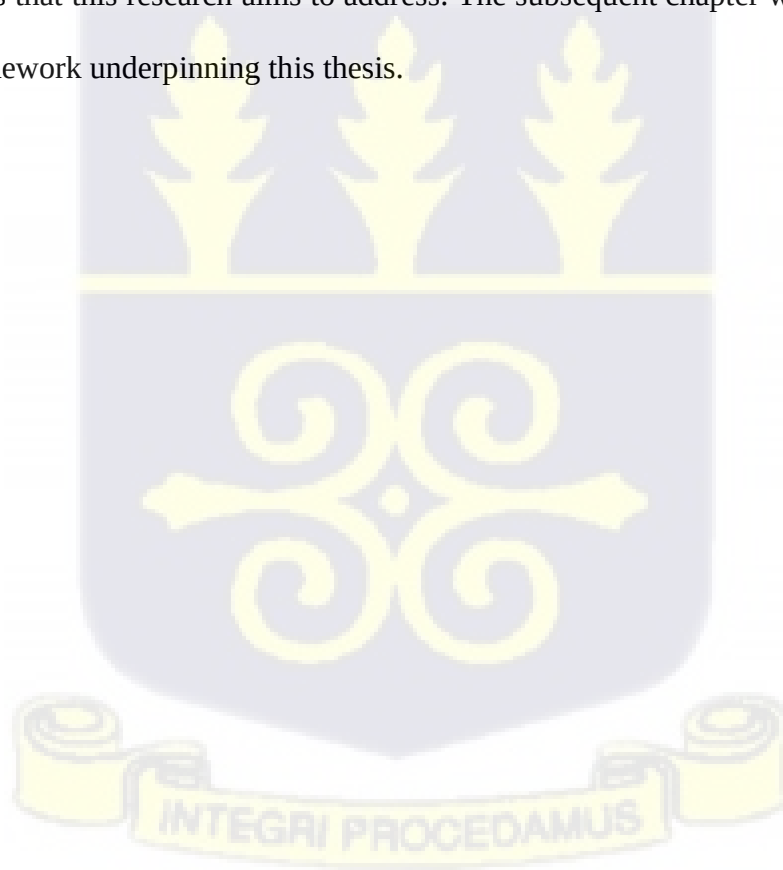
field of IS. It hampers the development of a cohesive body of knowledge that could guide future research, policy formulation, and practical implementation of digital location addressing systems. This gap highlights the need for future research to incorporate robust theoretical frameworks that can provide insights into the socio-technical complexities of digital location addressing systems, their adoption, implementation, and impact on society. Employing theories could enrich understanding of the multi facets of digitalising location addressing, contributing to a more comprehensive and nuanced exploration of this critical area within the digitalisation discourse, particularly in developing countries where such systems have profound implications for socio-economic development.

The theoretical review under section 2.4 revealed that the theories employed in IS research on national-level digitalisation research do not fully capture the agility and adaptiveness required by countries to thrive in the digital era. National digitalisation initiatives highlight the critical need for countries to continuously sense opportunities for development through digital technologies and to adapt and transform their digitalisation strategies to leverage emerging technologies effectively. This adaptability is essential for mitigating risks and seizing new opportunities for efficient governance and socio-economic development. This discussion unveils a research gap in understanding how nations build, reconfigure, and utilise their capabilities and resources to manage the complexities of digitalisation, ensuring they remain agile and responsive to the evolving demands of digital transformation.



2.5 Chapter Summary

This chapter commenced with a comprehensive literature review of pertinent issues related to national-level digitalisation and its implementation within the context of developing countries. It further explored the concept of location addressing, both traditional and digital, underscoring the progress in digitalisation endeavours across various economic sectors. This contrasted sharply with the apparent neglect of research focusing on the digitalisation of location addressing from its inception to the implementation and beyond. This discrepancy underscored the need for further academic investigation in this area, highlighting a significant gap in current research. As such, this chapter sets the groundwork for the thesis by identifying the existing knowledge gaps that this research aims to address. The subsequent chapter will delve into the theoretical framework underpinning this thesis.



CHAPTER THREE

THEORETICAL FOUNDATIONS

3.1 Introduction

The previous chapter provided an overview of the relevant IS literature on national-level digitalisation and digital location addressing systems. This chapter aims to introduce the Dynamic Capabilities Theory (DCT) as the theoretical framework for this research. Initially, it outlines the fundamental concepts and principles of DCT, followed by an examination of its application within IS digitalisation studies. The constraints of DCT are analysed, and the chapter proceeds to demonstrate how DCT is applied in the context of this thesis, elucidating how this application overcomes the theory's inherent limitations. The chapter concludes with a summary.

3.2 Dynamic Capabilities Theory Concepts

As outlined in section 2.2.7, various theories have been examined within IS research to study digitalisation. However, DCT emerged as the most apt framework for this inquiry, as detailed in section 3.5, which provides a comprehensive justification for its selection. DCT is a theory advanced from management research that builds upon the static resource-based view of an organisation (Teece, 2007; Teece et al., 1997). It delves into how firms harness their abilities to integrate, build, and reconfigure internal and external organisational abilities, resources, and functional competencies to adapt to swiftly changing environments (Helfat & Raubitschek, 2018; Karimi & Walter, 2015; Teece, 2007). DCT proposes that organisations need to acquire new resources, modify existing ones, and reconfigure them in response to emerging external

conditions, with the manager playing a crucial role in embedding these capabilities into the organisation's behaviour for optimal configuration (Battleson et al., 2016; Hermawati & Gunawan, 2021; Teece et al., 1997). DCT lays the foundation for how firms can skilfully navigate volatile environments, emphasising the importance to not only possess but also skilfully manage resources to ensure agility and resilience (Abiodun et al., 2022). Dynamic capabilities enable organisations to maintain adaptability and evolutionary fitness, helping them to break free from organisational rigidity and inertia (Mikalef et al., 2021). The theory has three (3) core concepts; namely sensing capabilities, seizing capabilities and transforming capabilities (Teece, 2007, 2018a; Teece et al., 1997). Sensing translates to a company's vigilance in identifying emerging opportunities and threats. Once these are identified, seizing takes over, prompting organisations to strategically harness these opportunities, sometimes requiring an overhaul of entrenched processes in favour of new strategies that bolster market positioning (Koch et al., 2019; Teece, 2014). The third pillar, reconfiguring, embodies the organisation's finesse in recalibrating and fortifying both tangible and intangible assets to ensure sustained competitiveness in ever-evolving market landscapes. This synthesis of sensing, seizing, and reconfiguring underscores the significance of both external adaptability and internal alignment, with a particular emphasis on crafting a harmonious blend of resources, skills, and processes, thereby forging a competitive edge (Ellström et al., 2021; Finau & Prasad, 2014; Qvarfordt & Aadan, 2021).



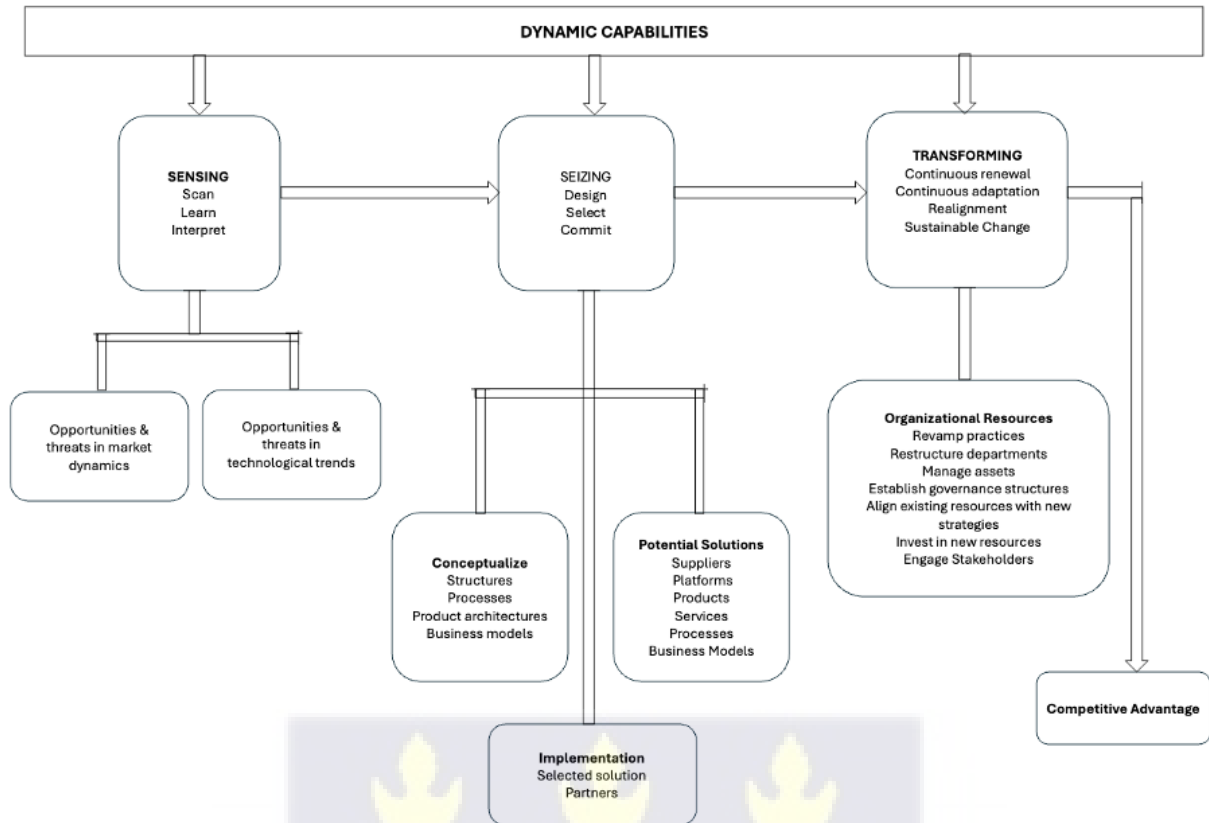


Figure 3.1 - Dynamic Capabilities Framework. Source: Adapted from Ghosh et al. (2022); Teece (2007); Teece et al. (1997); Yeow et al. (2018)

3.1.1 Sensing Capabilities

Sensing capabilities enable organisations to continually scan and interpret external environments for unforeseen trends that could potentially disrupt their operations, focusing on scanning, learning, and interpreting diverse information about shifts in the business landscape to ensure timely responses to technological possibilities (Helfat & Raubitschek, 2018; Teece, 2007, 2018a). Kaushik et al., (2023) defined sensing capabilities as the organisational abilities to keenly observe and understand external environments, actively identifying both potential opportunities and threats, especially those related to market dynamics and technological changes. These capabilities enable organisations to detect emerging trends or challenges,

strategise potential responses, and underscore the importance of proactive and responsive actions to industry shifts. Karimi-Alaghehband and Rivard (2020) drawing from Teece (2007), emphasise the need for continuous exploration and scanning of the business ecosystem to understand current dynamics and identify emerging business opportunities. This entails being both observant and forward-looking, ensuring attentiveness to ecosystem shifts and anticipating novel avenues for growth and innovation.

Teece (2018a) highlights the significance of sensing capabilities across all organisational levels, emphasising the importance of escalating grassroots insights to top management. Amidst the uncertainties of the digital age, he suggests harnessing dynamic managerial skills, scenario planning, and advanced technologies like AI to enhance these capabilities. Teece (2018a) also introduces the concept of generative sensing, which uses technology to evaluate unexpected trends, emphasising that sensing can extend beyond internal efforts to include co-development with external business partners.

3.1.2 Seizing Capabilities

Seizing capabilities play a pivotal role in how organisations mobilise resources to capitalise on opportunities identified through sensing (Teece, 2018a). These capabilities enable businesses to navigate the delicate balance between risk and reward effectively. Teece (2014) emphasises seizing as a crucial mechanism for organisational alignment, moving beyond mere recognition of new business prospects to the concrete implementation of changes across the organisational structure to seize these opportunities. Seizing capabilities are crucial for turning insights from sensing into actionable strategies. They facilitate the development and implementation of strategic digital initiatives, mobilise necessary resources, and ensure effective coordination

among various stakeholders (Warner & Wäger, 2019). Seizing involves careful analysis, modifying existing structures, and developing new frameworks, allowing firms to adapt to digital advancements and enhance their global competitive position. This capability encompasses three distinct actions: designing, selecting among options, and committing to specific choices (Yeow et al., 2018). Designing involves organisational efforts to conceptualise new structures, processes, product architectures, and business models. Selecting is the process of choosing from various potential solutions, including suppliers, platforms, products, services, or business models, to best capture the identified opportunities (Teece et al., 1997). Finally, committing refers to the organisation's decisions regarding the implementation of these designs and the selection of partners, services, processes, or business models. Through these actions, seizing capabilities enable organisations to act decisively on sensed opportunities, ensuring that they are not only identified but also effectively captured and implemented.

3.1.3 Transforming Capabilities

Transforming capabilities are essential for organisations to continuously renew and realign their resources with new strategies (Kaushik et al., 2023; Teece, 2018a). Teece (2007) and Teece et al. (1997) articulates that transforming entails a comprehensive reconfiguration of organisational resources, including the revamping of routines, restructuring of departments, and management of co-specialised assets, alongside establishing governance and knowledge development structures. This dynamic capability enables organisations to reconfigure existing resources to align with new strategies and to develop or access new resources to fill current organisational gaps, particularly in areas where internal expertise is lacking. As the digital landscape evolves, the necessity for organisations to adapt through strategic renewal becomes

paramount, ensuring they remain competitive and agile in a rapidly changing environment. Transforming capabilities facilitate this by encouraging a proactive and entrepreneurial approach to resource management and adaptation to unforeseen environmental changes (van de Wetering, 2021). Ambrosini and Bowman's (2009) further emphasise the importance of integrating innovation into the organisational fabric for true transformation, suggesting that mere introduction of new systems or ideas is insufficient. Transforming capabilities, in this light, goes beyond the introduction of new ideas or systems to include realignment and orchestration of resources to ensure innovations are harmonised with existing structures and embraced by all stakeholders, underlining the significance of decision-making in maintaining the sustainability of changes (Zamani et al., 2022). Transforming capabilities, therefore, is not just about introducing new ideas but about ensuring these innovations become integral to the organisation, fostering a culture of continuous adaptation and sustainable change (Yeow et al., 2018).

3.3 Principles of the Dynamic Capabilities Theory

The Dynamic Capabilities Theory (DCT) outlines pivotal principles that guide organisations in effectively navigating the intricacies of the fast-evolving digital and business landscape. Central to DCT is the imperative of adaptability, indicating that firms must exhibit agility to proactively respond to market changes (Battleson et al., 2016). This agility encompasses the continuous sensing of external signals and the seizing of emerging opportunities, underlining the criticality of agility not only in recognising prospects but also in capitalising on them efficiently (Ellström et al., 2021; Ghosh et al., 2022; Teece, 2014).

A foundational aspect of DCT is the deliberate development of dynamic capabilities, manifested through identifiable routines. This encompasses proactive engagement with the external environment, perpetual learning and development, and an agile mindset attuned to change (Battleson et al., 2016). Another essential principle is effective resource orchestration, which underscores the importance of strategic alignment and management of resources, be they human, financial, or technological, for optimal value creation (Eriksson, 2014). Eisenhardt and Martin (2000) argue that while dynamic capabilities themselves do not guarantee a lasting competitive advantage, the strategic routines and business processes that emerge from these capabilities are what truly define an organisation's competitive edge.

The principle of continuous renewal advocates for organisations to not merely react but proactively shape external dynamics, positing organisations as architects of change in their environment (Karimi-Alaghehband & Rivard, 2020; Soluk & Kammerlander, 2021). This principle goes beyond adaptability to suggest that firms should actively influence and mold environmental dynamics to ensure sustained competitive advantage. Interlaced with this is the significance of historical awareness, encouraging firms to leverage their distinct pasts as a compass for future strategy formulation, recognising that historical routines and experiences significantly inform dynamic capabilities (Eisenhardt & Martin, 2000; Soluk & Kammerlander, 2021; Teece, 2014).

Moreover, DCT highlights the importance of collaborative engagement and leveraging cross-functional teams (Battleson et al., 2016). It encourages organisations to transcend their traditional boundaries through strategic partnerships and alliances, thereby accessing a broader spectrum of resources and expertise (Karimi & Walter, 2015). This strategic orientation fosters innovative problem-solving and value creation by harnessing diverse expertise and knowledge. Enhanced by robust external communication, this collaborative dynamic ensures a regular

feedback loop and incorporates a plethora of external viewpoints, enriching the organisation's approach to innovation and adaptation (Battleson et al., 2016).

Collectively, these principles demonstrate that dynamic capabilities are not just about internal adaptability but also about how an organisation engages with its broader ecosystem to remain at the forefront of innovation and market responsiveness.

3.4 Application of DCT in IS Digitalisation Research

DCT has gained prominence in IS research in the investigation of organisational adaptability and agility in the digital era (Finau & Prasad, 2014; Karimi-Alagheband & Rivard, 2020). This theory's relevance spans from providing insights into individual organisations' adaptability mechanisms to shedding light on broader, national-level digitalisation efforts, illustrating its broad applicability across various contexts of digital transformation.

Battleson et al. (2016) effectively employed DCT to explore the relationship between cloud computing capabilities and dynamic organisational capabilities. Their approach, which involved a multi-case study, illuminated the essential sense-and-response strategies critical for transformative business processes, thereby enriching the discourse on capability evolution in the context of cloud computing.

Expanding the discourse, Soto Setzke's (2020) research took a closer look at socio-technical inertia in the face of digitalisation efforts. By highlighting the critical role of reconfiguration and sensing capabilities, Setzke's (2020) work revealed distinct patterns of interaction that are intrinsic to dynamic capabilities, thus deepening our understanding of digital adaptability and resilience.

Turning attention to the dynamics within family-controlled firms, Soluk and Kammerlander (2021) shed light on how small and medium-sized family enterprises leverage dynamic capabilities despite resource constraints. This exploration revealed the complex interplay between enablers and barriers in digitalisation efforts, indicating the nuanced challenges and strategies unique to this segment.

Ellström et al. (2021) contributed significantly by identifying key routines critical to digital transformation, offering a roadmap for managers to navigate digital changes effectively. Their research not only bridges significant gaps in the literature but also provides a comprehensive framework for understanding and implementing digital transformation initiatives.

In the industrial domain, Abiodun et al. (2022) delved into the interplay between tangible and intangible assets during digitalisation, highlighting the emergence of "smartness capability" as a critical factor in leveraging technological advancements for value creation.

Further enriching this body of knowledge, Ghosh et al. (2022) focused on the integration of the IIoT by industrial firms. Through interviews with executives from leading multinationals, they developed a novel conceptual framework for digital transformation capabilities, emphasising strategic sensing, seizing, and reconfiguring as key components.

These varied applications of DCT in IS research have not only advanced our understanding of digitalisation's impact on organisations but also highlighted the theory's robustness in framing strategies that resonate with both organisational and national ambitions (Ellström et al., 2021; Warner & Wäger, 2019). Nonetheless, a less traversed domain is its application in national-scale digitalisation, particularly in the context of digital location addressing systems. This study aims to address this gap by examining Ghana's location addressing system's digitalisation through the lens of DCT. By doing so, this research not only makes a theoretical contribution

but also offers practical insights for nations poised at the brink of digitalisation, highlighting its broad relevance and utility in navigating the complexities of digitalisation at different levels and contexts.

3.5 Selection and Justification of the DCT in this Study

This study aims to delve into how developing countries implement and use digital location addressing systems, highlighting the critical need for a theoretical framework capable of addressing the complexities inherent in such national-level digitalisation efforts. The selection and justification of DCT as the theoretical foundation for this study stems from its profound relevance to understanding the adaptation and strategic renewal processes essential for navigating the rapid changes characteristic of the digital era (Senshaw & Twinomurinzi, 2018).

DCT offers a robust lens through which to examine the continuous integration, building, and reconfiguration of internal and external competencies in response to swiftly changing environments (Pekkola et al., 2022; Senshaw & Twinomurinzi, 2020; Yunis et al., 2014). This is a scenario that resonates deeply with the challenges faced by developing countries in their digitalisation journeys. The core tenets of DCT, including sensing, seizing, and transforming capabilities, align closely with the critical steps necessary for successfully deploying digital location addressing systems at a national scale. Sensing capabilities allow nations to identify emerging opportunities and threats within the digital landscape (Masmali & Miah, 2021). By identifying external and internal stimuli related to digital technologies, policies, societal needs, or international trends, national leaders can translate them into opportunities for digitalisation (Senshaw & Twinomurinzi, 2020; Teece, 2018a). Seizing facilitates the strategic harnessing of resources to capture these opportunities (Yunis et al., 2014). Seizing involves careful analysis,

modifying existing structures, and developing new frameworks, allowing a nation to adapt to digital advancements and enhance its global competitive position. These capabilities also drive the adaptation or creation of policies that foster a digital-friendly environment, fast-track the development of essential infrastructure, and champion capacity building within the workforce. Transforming ensures the continual renewal and realignment of a nation's digital assets and infrastructure with national goals and global standards (Teece, 2018a). Transforming capabilities help in seamlessly integrating innovative digital approaches with traditional systems (Warner & Wäger, 2019).

This theory's focus on adaptability and strategic renewal is particularly relevant for DCs, where the digital environment presents unique challenges and opportunities (Senshaw & Twinomurinzi, 2018). DCT provides a framework for analysing how these nations can leverage their existing resources and capabilities to navigate the complexities of digitalisation, emphasising the strategic actions needed to successfully implement and utilise digital location addressing systems.

In adopting DCT for this study, the aim is to delve deeper into the specific capabilities that underpin the digitalisation efforts of developing countries. This theoretical lens not only promises to enhance our understanding of the mechanisms through which these nations can achieve digitalisation but also highlights the strategic imperatives required to leverage digital technologies effectively. By focusing on the dynamic capabilities essential for national-level digitalisation, this research seeks to contribute valuable insights into the processes that enable the successful implementation and use of digital location addressing systems in the context of developing countries.

3.6 Limitations of the Dynamic Capabilities Theory

While Dynamic Capabilities Theory (DCT) offers a robust framework for understanding organisational adaptability and competitiveness in rapidly changing environments, it is not without its limitations, especially when applied to national-level digitalisation in DCs. These limitations impact the theory's effectiveness in fully capturing the complexities of implementing and using digital location addressing systems at a national scale.

Firstly, DCT primarily focuses on organisational agility and competitive advantage, rooted in the context of business enterprises. This focus does not fully encapsulate the broader socio-political, cultural, and economic dimensions inherent in national-level digitalisation efforts. Developing countries face unique challenges such as diverse stakeholder interests, regulatory environments, infrastructure limitations, and digital divides that DCT, in its traditional form, does not adequately address.

Secondly, DCT emphasises the rapid reconfiguration of resources and processes to seize emerging opportunities. However, the pace of change in government and public sector initiatives, especially in developing countries, can be considerably slower due to bureaucratic processes, policy formulation and implementation lags, and stakeholder negotiations. This misalignment between the theory's emphasis on agility and the realities of public sector change processes tend to limit its applicability.

Moreover, the theory's focus on sensing, seizing, and transforming capabilities primarily considers internal organisational factors and external market dynamics. It does not fully account for the intricate collaborations and partnerships essential in national digitalisation efforts, where public-private partnerships, inter-agency coordination, and community engagement play critical roles.

Another limitation is the theory's inadequate consideration of non-market forces. National-level digitalisation in developing countries is often influenced by political, social, and cultural factors that extend beyond market competition and technological capabilities. These influences include policy stability, governance quality, societal acceptance, and cultural attitudes towards digital technologies, which are crucial for the successful implementation of digital systems but may not be directly addressed by DCT.

Furthermore, DCT's application in developing countries' context requires a nuanced understanding of resource constraints and innovative approaches to overcoming these limitations. The theory's principles need to be adapted or expanded to incorporate strategies for leveraging limited resources effectively, fostering innovation within constrained environments, and building digital capabilities from the ground up.

This study acknowledges the strengths of DCT in shedding light on the strategic agility organisations need to navigate change effectively. However, given the distinct challenges encountered in implementing national-level digitalisation in developing countries, there is a compelling need to broaden the theoretical lens beyond DCT's traditional scope. To this end, this research will extend DCT by weaving in new concepts that encapsulate the socio-political, cultural, and economic intricacies inherent in national digitalisation efforts. This augmented framework aims to offer a more nuanced and contextually attuned understanding of the dynamic capabilities required for successful digitalisation at the national level.

3.7 Conceptual Framework for this Study

To address the limitations identified in the previous sections, this study proposes augmenting DCT with the concepts of Legitimising and Institutionalising capabilities. Legitimising is essential in the digitalisation process, especially at the national level, as it involves gaining public endorsement and validation for initiatives (Hinings et al., 2018). This process emphasises actions that establish an initiative's legitimacy and importance, such as participating in demonstrations, attending rallies, making donations, and speaking publicly in favour of the cause. These efforts enhance the public image and acceptance of digitalisation projects, making them more likely to receive sustained resources and support. Suchman (1995) adds depth to this understanding by illustrating that legitimacy is multifaceted and context-dependent, influencing the stability and comprehensibility of organisational activities. This implies that digital initiatives perceived as legitimate by the public and stakeholders are viewed as desirable, proper, or appropriate, thereby fostering continued support and investment. In the context of national-level digitalisation, the Legitimising capability is crucial for entities, particularly government bodies, to create an environment conducive to digitalisation by garnering public and stakeholder support. This underscores the importance of non-market factors such as political stability, which ensures continuity and support for long-term digital projects; governance quality, which ensures efficiency, transparency, accountability, and ethical standards in government institutions involved in digitalisation; and societal acceptance, which reflects the public's willingness to adopt and integrate digital solutions into their daily lives. Avgerou (2013) demonstrates the practical application of legitimising capabilities in creating a supportive ecosystem for digital initiatives, thereby securing their success, and fostering public trust. The study's insight into Brazil's e-voting systems' preparation and execution underscores the paramount importance of political legitimacy and trustworthiness in

adopting digital solutions. This includes a spectrum of preparatory activities designed to maintain public trust, such as approval from parliamentary bodies and legal mandates for the involvement of various social actors in the system's refinement. These measures are pivotal in establishing a politically legitimate environment that assures citizens of trustworthiness. By integrating Legitimising capabilities into the extended dynamic capabilities framework, the study ensures the consideration of essential aspects for creating a supportive ecosystem for digitalisation efforts to thrive in developing countries. This approach involves tailoring legitimising efforts to the unique circumstances of each digital initiative and creating a credible collective narrative that articulates the purpose and rationale behind a digitalisation effort, enhancing its acceptance and effectiveness.

Institutionalising capabilities within both organisational and national contexts are pivotal for embedding long-term changes, practices, or initiatives for sustained effectiveness (Scott, 2005, 2008). This involves the integration of new strategies into existing structures and cultures at the organisational level and the transformation and normalisation of digital practices across governance and societal functions at the national level (Lopes & de Sá-Soares, 2014; Tolbert & Zucker, 1996; Wahid & Sein, 2014). Institutionalising capabilities are crucial for embedding digital innovations into a country's socio-political context, ensuring long-term effectiveness and trustworthiness (Wahid & Sein, 2014). These capabilities are showcased by actions that establish and sustain trust in digital systems through their deep integration into national development and democratic processes (Avgerou, 2013). This comprehensive journey, which also encompasses sensing, legitimising, seizing, and transforming capabilities, ensures that transformations are solidified into organisational culture and systems, thereby facilitating continuous improvement and adaptation to evolving needs. Institutionalising necessitates surmounting challenges such as digital divides and privacy concerns through collaborative

efforts to adapt digital practices. Consequently, national-level digitalisation evolves beyond mere technology adoption, fostering a digital culture foundational to governance and societal development, and ensuring sustained success and progress by aligning changes with legal frameworks and cultural norms for broader acceptance and impact.

Figure 3.2 depicts a framework of the extended DCT for this study.

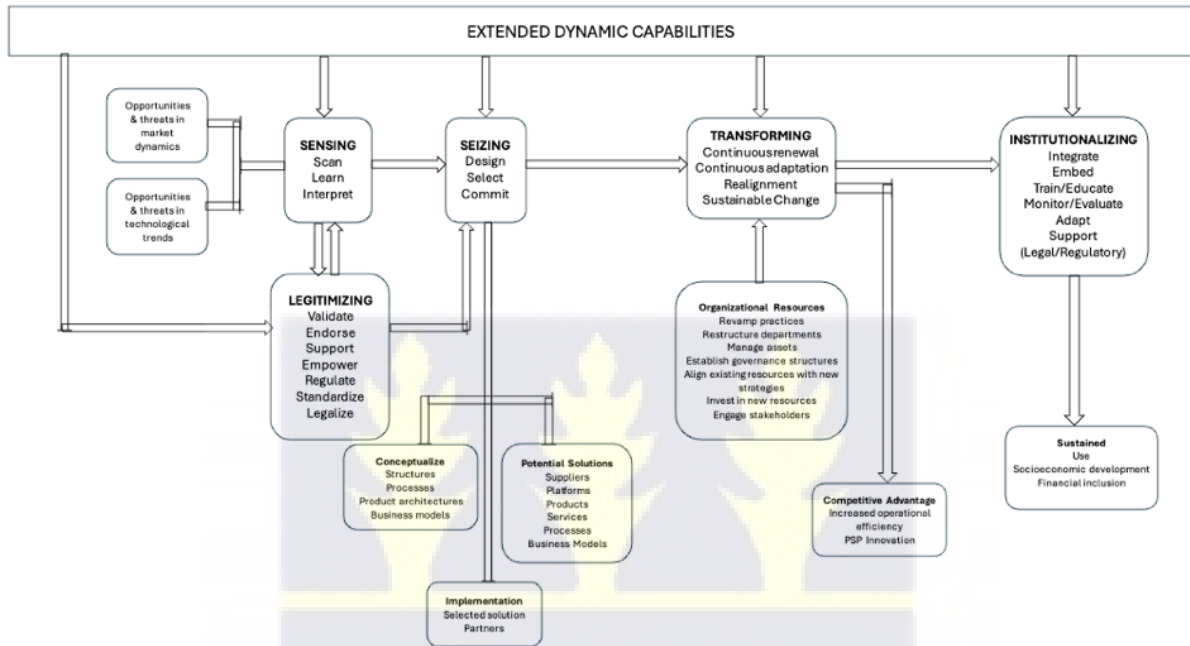


Figure 3.2 - Extended Dynamic Capabilities Theory. Source: Author's Construct

3.8 Chapter Summary

This chapter presented a discussion of the Dynamic Capabilities Theory (DCT), its core concepts, and principles. Further, it explored the application of DCT in IS digitalisation studies, while also delving into critiques of the theory. The chapter also provided a detailed discussion on the rationale for selecting DCT for this research, justified its application, and proposed

methods to address its limitations. The following chapter will outline the research paradigm and methodology adopted for this study.



CHAPTER FOUR

RESEARCH PARADIGM AND METHODOLOGY

4.1 Introduction

The preceding chapter, Chapter Three, presented the Dynamic Capabilities Theory as the theoretical foundation that underpins this research. This chapter introduces the research paradigm and methodology that underpin the study. First, the three dominant research paradigms are discussed. Following that, the choice of the interpretive paradigm as the philosophical orientation for this research is justified. The subsequent section provides a discussion of the methodology adopted for this study, and the justification for using the interpretive case study approach, which is deemed best suited for the inquiry and analysis. Subsequently, the researcher's axiology, or value system, in relation to the research is presented. Thereafter, details of the selected cases for this study are provided. The ensuing sections describe how access to case institutions and firms were obtained, and how data was collected and analysed. The chapter concludes with a discussion on the criteria used for evaluating qualitative interpretive research in Information Systems (IS) and the ethical considerations that guided this study.

4.2 Research Paradigms

Researchers, whether mindful of it or not, maintain deeply ingrained viewpoints and suppositions about the nature of problems they should study, the research questions they pose, and the approach they adopt (Creswell & Poth, 2016). These viewpoints act as guiding principles in their research, shaping what they perceive as reality (ontology), their

understanding of this reality (epistemology), their value position (axiology), and the methods they use in their research (methodology) (Abdul Rehman & Alharthi, 2016; Creswell & Poth, 2016; Hirschheim & Klein, 1989).

These philosophical assumptions often manifest themselves in the research through the use of research paradigms (Creswell & Poth, 2016). Research paradigms embody a set of philosophical assumptions, common beliefs, and consensus among researchers about how problems should be understood and addressed (Kuhn, 1970). Neuman and Robson (2004) describe paradigms as integrated set of assumptions, beliefs, models for excellent research and techniques for data gathering and analysis.

Paradigms provide the conceptual lenses that shape how researchers understand what they know, what they can learn, the means of obtaining this knowledge, and how the resulting knowledge should be interpreted (Mertens, 2010). Hence paradigm constructs define the ontological, epistemological, axiological (ethical) and methodological stances of researchers (Cecez-Kecmanovic, 2011; Guba & Lincoln, 1994; Jokonya, 2016; Kivunja & Kuyini, 2017; Myers & Avison, 2002). Recognising and understanding a researcher's philosophical suppositions can enhance the comprehension of their studies' relevance and significance (Abdul Rehman & Alharthi, 2016).

Ontology examines the nature of reality, what the researcher perceives as real, the attainable knowledge about this reality, and its characteristics (Creswell & Poth, 2016). It scrutinises the reality that exists, establishing whether it is a singular verifiable reality or socially constructed multiple realities bounded by context (Patton, 2002).

Epistemology delves into the nature and forms of knowledge and how this knowledge is gained, validated, and communicated to others (Abdul Rehman & Alharthi, 2016; Blaikie, 2000;

Hirschheim, 1985). It provides a framework for analysing how researchers interpret knowledge about perceived existence (Burrell & Morgan, 1994; Niehaves & Bernd, 2006). Epistemology asks what qualifies as knowledge, how knowledge claims are justified and the relationship between the researcher and the research (Creswell & Poth, 2016). Furthermore, epistemology probes the generalisability, subjectivity, and objectivity of knowledge and whether or not this knowledge is stable or changeable (Ritchie et al., 2013). The ontological position of a researcher guides them to a certain epistemological stance. Thus, if reality is viewed as a singular and verifiable truth, then the researcher must be objective and detached from the phenomenon to be able to discover how things really are and how they work (Guba & Lincoln, 1994). However, a socially constructed multiple realities guides the researcher into getting involved with the research participants and trying to understand phenomena in their social contexts (Abdul Rehman & Alharthi, 2016).

Axiology represents what is valued and considered good (Mingers & Willcocks, 2004). It questions the nature of ethics and evaluates what the researcher views as valuable and ethical. It acknowledges the presence and influence of values in research and encourages researchers to be transparent and critically aware of their own biases (Jokonya, 2016). The acknowledgment of the influence of values, can enhance the rigor and credibility of a study and contribute to a more comprehensive understanding of the research topic.

Methodology refers to the systematic process a researcher adopts to discover knowledge (Myers, 2013). It is an action plan or strategy that dictates the choice and application of specific methods and links these choices to the expected results. This assumption questions the steps taken to accomplish research goals. The research methodology guides the researcher in deciding what type of data is required for a study, the most appropriate methods, and data

collection tools for the purpose of the study and how to analysis data and draw conclusions when conducting research.

There are numerous classifications of research paradigms, (Burrell & Morgan, 1979; Creswell, 2013; Guba & Lincoln, 1994) each offering unique ontological, epistemological, axiological, and methodological perspectives. However, this study will focus on the three dominant paradigms in the Information Systems discipline, as categorised by (Orlikowski & Baroudi, 1991) in the following sub-sections.

4.2.1 Positivist Paradigm

Positivism is a philosophy that aims to explain and ultimately enable the prediction and control of a phenomena (Jokonya, 2016). The positivist researcher conducts a study in a deductive manner to discover causal relationships that form the basis of generalising the knowledge acquired (Paré, 2001).

The ontological perspective of positivism assumes that due to some form of a general cause-and-effect law, there is a single, tangible, objective, and measurable reality, whether the researcher is conscious of it or not (Guba & Lincoln, 1994). In other words, regardless of the researcher, and the object or phenomenon under study, an objective truth of the reality exists that researchers can precisely measure and statistically test (Neuman & Robson, 2004).

The epistemological stance of the positivist is that knowledge is objective, quantifiable and can be replicated, therefore when different studies are conducted on the same phenomena by different researchers at different times, the same results will be recorded (Guba & Lincoln, 1994).

Positivism is guided by the principles of objectivity and assumes that research should be conducted empirically and scientifically. The positivist researcher in terms of axiology is independent in the phenomenon of interest and therefore abandon their biases and values in a quest for objective, empirical and knowable truth (Orlikowski & Baroudi, 1991; Sahay & Robey, 1996).

Positivists hold that, that which cannot be measured cannot be reliably known, hence they usually employ quantitative research methods and techniques such as laboratory experiments, field experiments, surveys, exploratory and analytical models which require objective measurement and analysis of observable phenomenon. In order to identify underlying regularities, they collect large data, which is statistically analysed, so that ultimately research questions and hypotheses can be validated or falsified (Weber, 2004).

4.2.2 Interpretivist Paradigm

The Interpretive paradigm posits that truth about a phenomenon depends on the context in which the phenomenon is being observed (Orlikowski & Baroudi, 1991) and therefore truth is an emergent social phenomenon affected and influenced by subjective lived experiences (Burrell & Morgan, 1994). Reality to the interpretivist is a human construction that can only be understood through subjective and holistic human sense-making approach of a phenomenon as events emerge (Kaplan & Maxwell, 2005; Kroeze, 2011). Hence, interpretive researchers seek to understand human behaviour in given social and organisational contexts through the way research participants interpret, view, and understand phenomena, mainly because of the assumption that participants create subjective meaning through their interactions with these

phenomena whilst the phenomena in turn influence the behaviours of the individuals (Kaplan & Duchon, 1988; Myers, 2013; Orlikowski & Baroudi, 1991; Walsham, 1993, 2006).

The ontological underpinnings of the interpretivism embraces multiple realities and explains the social world from the perspectives of researchers and participants that interact with and are directly involved in the construction and reconstruction of reality (Burrell & Morgan, 1979; Creswell, 2012; Goldkuhl, 2012; Hirschheim & Klein, 1989). The interpretations of realities in interpretive research are likely to shift over as its constituents and circumstances change (Burrell & Morgan, 1979). This is as a result of the transformation, transfer and usage of the meanings.

The epistemological stance of the interpretive paradigm posits that knowledge of reality is based on social construction by human factors and the subjective meanings and values that people assign to their unique context (Andrade, 2009; Kroeze, 2011; Orlikowski & Baroudi, 1991). Goldkuhl, (2012), notes that interpretivism seeks to work with the subjective meanings that already exists in the social world in order to reconstruct, understand, avoid distorting, and using them as a building block for theorising.

The axiological philosophy of interpretivism assumes that the researcher be not detached from the research and therefore the researcher is actively involved in the research (Walsham, 1995b). The researchers' values, intuitions, biases and subjective understanding of a phenomenon in interpretive studies are of the essence as they play a role in the dialog of social construction and influence the researchers' interpretation of data (Creswell, 2012; Guba & Lincoln, 1994).

Since interpretivism assumes that truth about knowledge is dependent on contextual human and social interactions (Myers, 2013), interpretivist argue that participation of researchers in the social setting and engagement with participants is critical to learning and understanding

how the interactions take place. Interpretive researchers tend to employ research methods that engage researchers in the real social setting in generating an interpretive understanding of the research phenomenon and finding answers to their research questions (Orlikowski & Baroudi, 1991). Qualitative research methods, such as case studies, ethnography, phenomenology, grounded theory are preferred research methods for the interpretive researcher as these provide access to participants inner, subjective experiences (Creswell, 2012).

4.2.3 Critical Paradigm

Critical research paradigm assumes that social reality is historically produced and reproduced by people, and it acknowledges the likelihood of the ability of the people to change their circumstances to be limited by various cultural, social and political issues. Critical paradigm thus, is a means by which researchers identify oppositions, contradictions and conflicts that exist in societies and organisations as a result of structural problems, so that the causes of these variations can be accounted for and possibly eliminated (Orlikowski & Baroudi, 1991; Wynn Jr & Williams, 2012). Critical paradigm studies provide in-depth explanations and descriptions for the outcomes of specific social phenomena by taking into account factors which may have played a causal role in their occurrence (Wynn Jr & Williams, 2012). In addition to investigating a phenomenon and proposing theories, critical researchers also critique the status quo of the phenomenon under study and actively effect changes (Orlikowski & Baroudi, 1991).

From an ontological perspective, the critical paradigm, like the interpretive paradigm, acknowledges the existence of an independent social reality constituted and reconstructed by people (Myers, 2013; Wynn Jr & Williams, 2012). The historical biases associated with reality

in the case of the critical paradigm distinguishes it from the interpretive ontological assumption (Myers, 2013).

Epistemological stance of the critical paradigm posits that knowledge is grounded in social and historical practices; thus, a whole phenomenon cannot be studied in isolation of its society and context within which it operates, because of the possibilities of influences of historical, economic, social, and political conditions on the phenomenon (Orlikowski & Baroudi, 1991). Critical paradigm empowers the researcher to go beyond merely describing and explaining current knowledge to challenging existing belief, values and assumptions and drawing attention to misconceptions, that should ultimately lead to emancipation (Orlikowski & Baroudi, 1991).

Axiologically, critical researchers are part of the study since they engage in constant dialog with the participants to understand how the phenomenon under study is influenced by social structures, powers, and politics. Mediations and negotiations, that will bring about transformation in the lives of the people, carried out by critical researchers would not occur if the study was value-free (Guba & Lincoln, 1994).

Whilst there's been arguments about the methodology that best suits the critical paradigm (Avgerou, 2008; McGrath, 2005), critical researchers tend to adopt long-term historical and ethnographic studies of organisational processes and structures (Orlikowski & Baroudi, 1991). Methodologies associated with critical research must focus on change (Guba & Lincoln, 1994) whilst also offering researchers new opportunities to investigate complex organisational phenomenon in a holistic manner through the provision of more detailed causal explanations of the phenomenon (Wynn Jr & Williams, 2012).

4.2.4 Choice of Interpretivism

While no research paradigm is inherently superior to others, their application largely depends on the research's nature and the researcher's philosophical assumptions (Chen & Hirschheim, 2004; Creswell & Poth, 2016; Orlikowski & Baroudi, 1991). In aligning with this study's purpose - understanding how developing countries implement and use digital location addressing system- the interpretive paradigm emerges as a fitting choice. It encourages a comprehensive understanding of the digitalisation process, examining how the endeavour both shapes and is shaped by diverse processes (Klein & Myers, 1999; Walsham, 1993, 1995b).

This research is underpinned by the interpretive paradigm, embracing the ontological and epistemological assumptions of multiple, socially constructed realities and subjective knowledge construction respectively (Kroeze, 2011; Orlikowski & Baroudi, 1991; Walsham, 2006).

The study's alignment with interpretivism stems from its relevance to the research purpose and questions and the researcher's philosophical view (Creswell & Poth, 2016). This paradigm facilitates a nuanced exploration of the national-level digitalisation process in its natural setting, Ghana, thereby allowing an understanding of the unique socio-cultural, economic, and technical influences.

Interpretivism's recognition of socially constructed realities and subjective experiences corresponds to this research's examination of diverse stakeholder perspectives and experiences in the national-level digitalisation process. Moreover, it aids in comprehending the varying impacts these realities have on their interaction with the process (Myers, 2013; Orlikowski & Baroudi, 1991; Walsham, 1995b).

Interpretivism allows for the in-depth exploration of complex processes, considering both the actions and the meanings attributed to these actions by different actors. In line with our aim to understand not just the transformation process but also its impact on public services and socio-economic development, the interpretive paradigm will facilitate an in-depth understanding of the process and its consequences, based on the subjective experiences and interpretations of the stakeholders involved.

Moreover, the interpretive stance values the generation of rich, qualitative data which is conducive to providing nuanced, detailed, and context-specific insights. This is instrumental in formulating practical and relevant recommendations for similar national-level digitalisation initiatives in other developing countries.

In summary, the interpretive paradigm, with its emphasis on context, subjectivity, and depth, provides an appropriate framework for investigating the national-level digitalisation process and its socio-cultural and economic impacts.

4.3 Research Methodology

The specific procedures or techniques adopted by the researcher to identify, select, process, and analyse data about a research topic is the methodology. The research methodology answers two main questions: How was the data gathered or produced? How was it analysed? The research methodology section allows the manuscript reader to critically evaluate a study's overall validity and reliability. Research can be conducted using any one of the following methodologies namely, quantitative, qualitative and the mixed-method approach (Creswell,

2013, 2014). The following subsections present a discussion on the types of research methodologies.

4.3.1 Quantitative Research

The quantitative research, developed in the natural sciences, is a highly structured research methodology that is used for testing objective theories by examining how variables of a natural phenomenon relate (Creswell, 2013). Quantitative research strictly adheres to, from beginning to end, deductive procedures, so that findings of the study can be reliable, generalised, and replicated (Chen, 2011). It is characterised by positivism, objectivity, scientific methods, and experiments (Creswell, 2012). Data collected for a quantitative study is in the form of numbers using predetermined instruments. Quantitative research focuses mainly on deducing, confirming, theory and hypothesis testing, explaining, predicting, and analysing statistics (Johnson & Onwuegbuzie, 2004). Quantitative researchers employ inquiry strategies such as experiments and surveys, and they do not get involved in what is being researched, neither do they bring their own personal interests and values into the study. This approach is suitable for natural phenomena where variables are clearly defined and the phenomena, although very complex, can be broken down and quantified (Chen, 2011).

4.3.2 Qualitative Research

Founded in the social sciences, the qualitative approach to research provides a means for exploring and understanding the interpretations that individuals or groups ascribe to a social or cultural phenomena especially one that is new and less known about (Corbin & Strauss, 2008; Creswell, 2013). The qualitative methodology is appropriate for obtaining details such as

feelings, thoughts, processes, and emotions that research participants associate with a phenomenon which may otherwise be difficult to obtain by other research methodologies (Corbin & Strauss, 2008; Creswell, 2013; Flick et al., 2004). Qualitative research is also laden with subjectivity; the researcher is actively involved in data gathering within the natural setting of the phenomenon and findings of the study tend to be influenced by researchers' interpretations. Qualitative studies do not employ any statistical procedures in finding answers to research questions (Corbin & Strauss, 2008), consequently not suited for generalising findings to a large population using sampling logic (Lee & Baskerville, 2003; Myers, 2013; Yin, 2003). Rather, data is collected in textual forms through interviews, observation, and document analysis using inquiry strategies including action research, grounded theory, ethnography, and case study (Creswell, 2013).

In a nutshell, the defining characteristics of a qualitative research are induction, discovery, exploration, theory generation, the researcher being the primary tool for data collection and the analysis of textual data (Johnson & Onwuegbuzie, 2004).

4.3.3 Mixed-Method research

Mixed method research is a class of research where the researcher combines the qualitative and quantitative research techniques, methods, approaches, and strategies into a single study (Johnson & Onwuegbuzie, 2004). When researchers gain a deep understanding of the strengths and weaknesses of the qualitative and quantitative approaches, they can combine these approaches effectively to result in complementary strengths and no overlapping weaknesses (Johnson & Onwuegbuzie, 2004). Mixed method research is aimed at obtaining findings that are more trustworthy (Cronholm & Hjalmarsson, 2011) because the combination of qualitative

and quantitative approaches provide wholistic understanding to a phenomena than either of the approaches (Creswell, 2013). The inquiry assumption behind this mixed method approach is based on the fact that collecting both numeric and textual data, either simultaneously or sequentially will best provide understanding to the research problem (Creswell, 2013; Kaplan & Duchon, 1988).

4.3.4 Choice of Qualitative Research

The research methodology for this study was selected based on its alignment with the paradigm stance of the study, specifically the interpretive approach of the qualitative strategy. The choice for a qualitative research method is justifiable for several reasons.

Primarily, national-level digitalisation is a complex process, with numerous social, economic, technical, and cultural elements interacting. The qualitative approach, recognised for its emphasis on in-depth inquiry and exploration of phenomena in natural settings, is perfectly equipped to dissect these complexities. Not only does it enable understanding of the 'what' and 'how' of national-level digitalisation, but it also digs into the 'why,' yielding comprehensive insights.

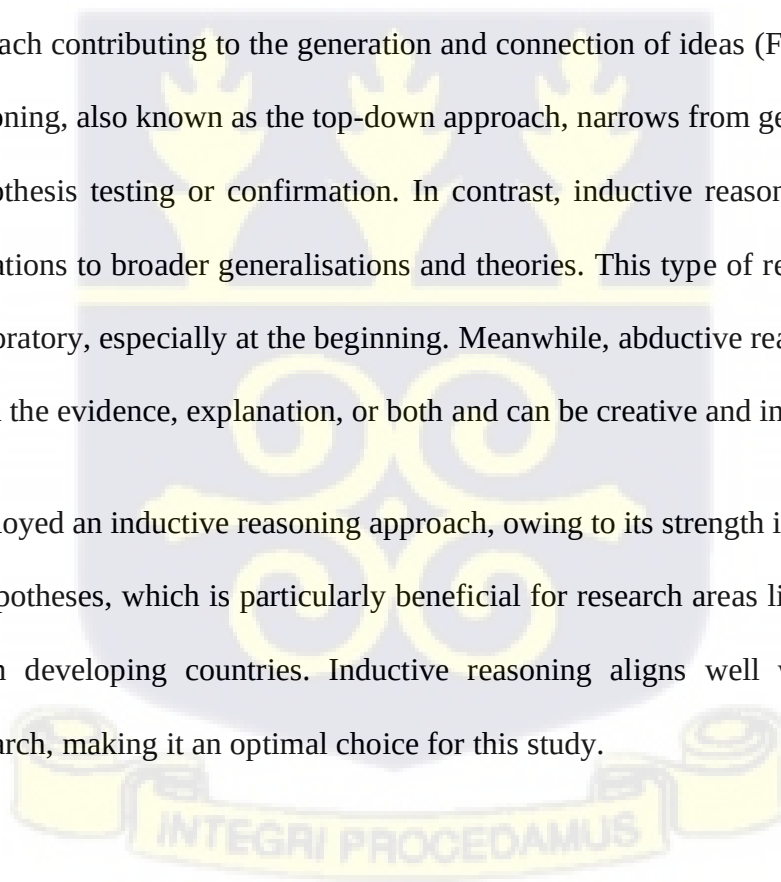
Moreover, qualitative research is proficient at capturing the specific and nuanced experiences within a particular context. This is crucial in a developing country like Ghana, with its unique cultural, economic, and political landscapes. It facilitates an effective exploration of local dynamics, which are pivotal for comprehending the unique challenges and opportunities tied to national-level digitalisation.

Additionally, qualitative research can tap into diverse perspectives of various stakeholders, using tools like interviews and observations. It helps gain insights into the experiences, expectations, and challenges faced by different actors in the national-level digitalisation process, from policymakers to end users, insights that might be missed with a quantitative approach (Kaplan & Maxwell, 2005).

Qualitative research is also adaptable and flexible as it enables modification of research questions and methods to address emerging themes and challenges, keeping the research relevant and timely.

Various research methodologies involve some form of logical reasoning - deductive, inductive, or abductive - each contributing to the generation and connection of ideas (Flick et al., 2004). Deductive reasoning, also known as the top-down approach, narrows from general to specific, leading to hypothesis testing or confirmation. In contrast, inductive reasoning moves from specific observations to broader generalisations and theories. This type of reasoning is open-ended and exploratory, especially at the beginning. Meanwhile, abductive reasoning may lack completeness in the evidence, explanation, or both and can be creative and intuitive.

This study employed an inductive reasoning approach, owing to its strength in generating new theories and hypotheses, which is particularly beneficial for research areas like national-level digitalisation in developing countries. Inductive reasoning aligns well with interpretive qualitative research, making it an optimal choice for this study.



4.4 Research Methods

Research methods denote the strategies used by researchers to gather empirical data about a research phenomenon. This study uses a methodological approach rooted in qualitative research to understand the national-level digitalisation of location addresses in a developing country. It particularly employs an interpretive case study method, drawing on the principles of various research methods, including case study, ethnography, grounded theory, and action research (Myers, 2013).

Case study research serves to examine complex phenomena within their contexts, employing a variety of data sources to illuminate the case (Baxter & Jack, 2008; Yin, 2017). Case studies answer 'why' and 'how' questions of research, especially in situations where the researcher has limited or no control over the phenomena being studied (Yin, 2003). They can be positivist, critical, or interpretive in nature and designed as single or multiple, and holistic or embedded (Myers, 2013). The critical approach questions current practices and assumptions, critiquing the status quo based on one or more critical theories (Myers, 1997a), while the positivist case study research seeks to generate and/or test theories in the real world (Benbasat et al., 1987; Darke et al., 1998; A. Lee, 1989; Yin, 2003). Interpretive case studies, the chosen approach for this study, allow the researcher to be directly involved in the data collection and analysis, helping to create a comprehensive and persuasive explanation about a phenomenon (Guba & Lincoln, 1994; Klein & Myers, 1999; Neuman & Robson, 2004).

Single case studies are suitable when researching a unique situation, testing a well-defined theory, or investigating a rare phenomenon without established common patterns (Yin, 2003, 2017). In contrast, multiple case studies are employed to examine differences and similarities between cases, aiming to replicate findings across various settings and anticipate similar or

contrasting outcomes (Darke et al., 1998; Walsham, 1995a; Yin, 2003). They often serve to accumulate evidence towards theoretical saturation (Carlsson, 2005). Holistic case studies focus on a broad project or organisation, while embedded case studies encompass multiple units of analysis (Yin, 2017). Case studies can further be classified as exploratory, causal, or descriptive (Yin, 2017). Exploratory case studies facilitate data gathering before theory development and question formulation, while causal case studies explore cause-and-effect relationships and seek explanatory theories. Descriptive case studies guide the data collection process with a predefined theory.

Ethnography involves the researcher immersing themselves in the community of study to understand the social world, culture, and beliefs of the subjects (Ritchie et al., 2013; Spencer et al., 2003). Typical ethnographic methods include participant observation, unstructured interviews, and document analysis, often requiring the researcher to spend substantial time in the field to grasp the study's broader context (Klein & Myers, 1999). While ethnography was considered for this study, it was deemed impractical due to the extensive field time it requires and the specific purpose of the research.

Grounded theory is a systematic approach for generating theory from data (Andrade, 2009; M. Myers & Avison, 1997, 2002). It is characterised by the simultaneous data collection and analysis stages, leading to context-sensitive, process-oriented explanations of phenomena (Myers & Avison, 2002).

Action research is a two-phase, cyclical process that involves diagnosing, action planning, action taking, evaluating, and learning specification phases (Baskerville & Myers, 2004; Susman & Evered, 1978). It is inherently collaborative, involving the researcher and subjects

(Myers, 2013). Although useful for facilitating organisational change and studying the process (Babüroglu & Ravn, 1992), it was not selected for this study.

The case study method was chosen for its suitability for the research topic and its alignment with the interpretive tradition of this research, especially as employed in Information Systems studies (Alavi & Carlson, 1992; Orlikowski & Baroudi, 1991). As an interpretive case study, the research focuses on the nuanced descriptions of the phenomena, their processes, and their evolving contexts (Kroeze, 2011; Walsham, 2006). The case study is both descriptive, with the data collection process guided by theory, and embedded, involving multiple units of analysis. The aim is to derive a wide array of evidence from the subunits, each focusing on different crucial aspects of the case.

The study expects to offer a contextual understanding of the digitalisation of location addresses within the developing country context of Ghana, by gathering rich, contextual data and exploring the interplay between the researcher and participants (Myers, 2013; Myers & Avison, 1997). The chosen approach is justified based on the nature of the research phenomenon and the interpretive stance, contending that while other approaches could also answer the research questions, they may not uncover the detailed experiences, expectations, assumptions, and knowledge influencing the processes of change.

4.5 Fieldwork and Case Selection

All fieldwork for this study was conducted in Ghana, a middle-income, developing country in West Africa, known for its constitutional democracy (Abdulai & Crawford, 2010). The process of gaining access to research sites was underpinned by both formal procedures and informal

networks, ensuring ethical research conduct and building trust between the researcher and participants. The research commenced with Vokacom, a private IT firm instrumental in designing and implementing the NDPAS under the mandate of Ghana Post, the public-sector organisation tasked by the government with the digitalisation of Ghana's location addresses.

Access to Vokacom was facilitated through a Ph.D. colleague of the researcher who served as the Head of Operations at the time. This contact set up an introductory meeting with the CEO of Vokacom, who after clarifying the research's intentions and logistics, then introduced the researcher to several key members of his organisation. These individuals were relevant to the study and included four software developers, a data analyst, and the public relations officer. Their insights were instrumental in providing a comprehensive understanding of the research phenomenon.

The introductory meeting with the Vokacom team fostered connections that led to further access to other valuable research sites. Notably, the software developers at Vokacom facilitated an introduction to the Ghana Post's IT staff, who had closely collaborated with the Vokacom team. Subsequently, access to Ghana Post was granted after the researcher presented a formal letter of introduction from her university, accompanied by a detailed proposal outlining the study's background, objectives, research questions, and significance. This dual approach—personal introductions complemented by formal requests—proved to be an efficient strategy in gaining access to necessary resources and personnel, both in-person and virtually.

From May 2018 through January 2019, the researcher actively engaged with participants at both Vokacom and Ghana Post. These interactions fostered a strong rapport with the organisation members and offered valuable insights into the intricate processes driving Ghana's digitalisation of location addressing. This phase was instrumental for concurrent data collection

and analysis, an iterative approach that facilitated ongoing scrutiny and refinement of emerging themes and concepts, thereby providing a robust and comprehensive understanding of the research phenomenon. The researcher later revisited the participants between June 2019 and March 2020 to clarify specific findings.

This research further expanded to include HeFRA and ConGas, two pivotal entities in the healthcare and LPG supply sectors, respectively. Access to HeFRA was facilitated by a personal connection who introduced the researcher to HeFRA's IT manager, who saw the relevance of the NDPAS for HeFRA's oversight responsibilities. HeFRA's participation in the study, following an evaluation of its purpose, shed light on the potential of the digital location addressing system to enhance the regulation and management of healthcare facilities in Ghana. Similarly, ConGas was engaged through direct outreach and networking. The company was independently contacted due to its innovative approach to LPG delivery, utilising digital tools to enhance customer service and operational efficiency. The founder of ConGas, recognising the relevance of the study to exploring the benefits of digitalisation in service delivery, was keen to share insights. This engagement shed light on how the NDPAS has facilitated improvements in customer service and operational innovation within the private sector, offering a distinct viewpoint on the digital system's utility. Between January 2022 and August 2023, data was collected from these organisations to better understand their involvement in the digitalisation process, their application of the NDPAS, and the subsequent impacts.

The choice of the specific organisations for this case study was both strategic and purposeful, designed to provide a comprehensive and multi-faceted perspective on the implementation, utilisation, and regulation of the NDPAS across a variety of sectors in Ghana.

The strategic selection of these organisations provided a comprehensive view of the NDPAS's implementation and utilisation across diverse sectors in Ghana, facilitating a nuanced exploration of digitalisation's impacts from a dynamic capabilities perspective. The enthusiastic participation of stakeholders, driven by the research's potential to influence policy and operational improvements, alongside the researcher's commitment to ethical principles, through strict privacy safeguards and explicit consent procedures, reassuring participants of their rights and privacy being respected, significantly contributed to the study's depth and richness.

4.6 Data Sources and Collection

Data collection in any research study should be closely aligned with the research questions and the epistemological stance of the investigation. For this study, data was obtained from multiple sources, including informal discussions, observations, and semi-structured face-to-face interviews, to ensure a comprehensive understanding of Ghana's location addressing system digitalisation and use. (Chism et al., 2010; Myers, 2013). These varied sources facilitated a thorough exploration into the dynamics of digitalisation. In interpretive studies, interviews are pivotal, allowing to participants' subjective interpretations and uncovering details not immediately apparent (Myers & Newman, 2007; Rubin & Rubin, 2011; Walsham, 1995a).

Primary data were collected through semi-structured interviews with some institutions and firms involved in the digitalisation and use of Ghana's location addressing system, including IT professionals from Vokacom and Ghana Post, HeFRA and ConGas identified via purposive sampling. The interview guideline, informed by dynamic capabilities theory, explored various concepts, themes, and their interrelations. It addressed topics like physical and digital location

addresses, participants' involvement in digitalisation, and observations of impacting phenomena, providing first-hand accounts and diverse perspectives on the digitalisation process, NDPAS use, and its impact (Liu et al., 2011). Interviews were adjusted as new views emerged and audio-recorded with consent, lasting between 45 minutes to 2 hours, continuing until saturation was reached.

Informal conversations and documentary evidence, including project documents and online resources, were also analysed to explore issues raised in interviews and gather additional information on stakeholders, technical aspects, and socio-cultural factors.

Participant observation offered nuanced insights from an insider perspective (Myers, 1997b), observing operations at Vokacom and participating in implementation meetings for a deeper understanding of the digitalisation process.

Additional data were collected via telephone and email exchanges with the study's participants, during and following the period of fieldwork. While the formal data gathering process concluded once saturation was reached—where no new insights or information were emerging—the researcher continued to seek clarity on certain issues. This follow-up data collection was carried out through telephone, email, and informal conversations, allowing for a more comprehensive understanding and addressing any emergent questions following the formal interviews. Table 4.1 presents a breakdown of participants interviewed for this study.

Organisation	Role	No. of Participants
Vokacom	Developers	9
Ghana Post	Custodian/Overseer	15

HeFRA	User	8
ConGas	User	13
	Total	45

Table 4.1- Breakdown of participants interviewed

4.7 Data Analysis

In accordance with the interpretive case study approach adopted for this research, the data analysis process was meticulously designed to extract comprehensive insights regarding the digitalisation of location addressing and the application of the NDPAS in Ghana. Data collection and analysis proceeded concurrently in an iterative manner, guided by the hermeneutic principle, which posits that each phase informs and shapes the other (Braun & Clarke, 2006; Myers, 2013; Orlikowski & Baroudi, 1991; Walsham, 2006). Hermeneutics, the cyclical examination of textual data, was employed to deepen the interpretation and understanding of both the textual content and its contextual significance (Boell & Cecez-Kecmanovic, 2014; Cole & Avison, 2007; Myers, 2013). This approach aligns with qualitative interpretive research and was chosen to capture the meanings attributed to the phenomenon by participants (Orlikowski & Baroudi, 1991).

The analysis began with a thorough review of all collected data, including interview transcripts, field notes, and documents, to achieve a comprehensive understanding. All audio-recorded interviews were transcribed verbatim to preserve the integrity of the information gathered. This immersion in the data (Green et al., 2007) extended to the documentary evidence, assessing its relevance and informing the study's direction. This foundational step ensured a nuanced

understanding of the phenomenon, with careful consideration given to statements from interviews and documents within their context.

Following this initial review, the data underwent coding. This process involved identifying, labelling, and organising significant text segments that related to the research questions and the dynamic capabilities theory, mindful of the interview context (Bryman, 2016). Adopting an inductive approach to coding permitted the natural emergence of themes from the data, without predefining categories. This method emphasised examining both the content and the manner of delivery, including any contradictions, metaphors, and specific terminologies used by participants. Each theme was explored in depth to encompass the diverse perspectives, experiences, and interpretations offered by the participants.

Manual coding was carried out without the aid of software like NVivo, relying instead on the researcher's systematic organisation and analysis. This approach allowed for a hands-on engagement with the data, facilitating a closer connection with the material and a nuanced understanding of the themes and patterns that emerged. Through this meticulous process, the research was able to distil critical insights into the digitalisation of location addressing in Ghana, anchored in the rich, qualitative data provided by the study's participants.

The initial codes were carefully reviewed for patterns and recurring themes. As the analysis progressed, emerging insights about the phenomenon prompted the addition of new codes and a re-examination of previous transcripts, necessitating multiple iterations through the interview data. Throughout this process, the researcher remained reflexive and open to alternative interpretations, diligently checking for any potential biases that might influence the analysis. The findings were then compared and contrasted with existing literature on digitalisation, offering a framework for interpreting the themes within the broader context of the research

field. Table 4.2 outlines the components of the theory and corresponding questions related to the codes.

Themes	Codes	Initial Relevant Inquiries
Pre – Digitalisation Era	Challenges and needs Identification (Sensing)	i. What were the main challenges or limitations of the manual location addressing system that prompted the need for digitalisation? ii. How did you perceive the need for a digital location addressing system prior to its implementation?
	Stakeholder Engagement (Legitimising)	i. Which stakeholders were involved in the initial discussions about digitalising the location addressing system, and what were their contributions? ii. How did the government and other key entities endorse/approve the need for digitalisation among the broader public and stakeholders?
	Policy & Regulation Preparation (Seizing)	i. What were the regulatory and policy landscapes like before the digitalisation initiative, and how did they influence the planning for digitalisation? ii. Were there any specific policy changes or new regulations proposed to facilitate the digitalisation of the location addressing system?
Digitalisation Era	System Design and Features (Sensing)	i. What key features were prioritised in the system's design, and why? ii. How does the system ensure accuracy and reliability in address generation and verification?
	Implementation and Adoption (Seizing)	i. What were the primary technologies and tools utilised in the development of the digital addressing system? ii. How did you decide on the specific technologies and platforms for this system? iii. Which stakeholders were involved in the development process, and what roles did they play? iv. How did you manage stakeholder expectations and requirements during the system's development?
	Infrastructural Development (Transforming)	i. What infrastructural developments were necessary for the successful implementation of the NDPAS?

		ii. How did you assess the technological and infrastructural needs for the digitalisation process? iii. How does the digital addressing system integrate with existing infrastructures or systems? iv. Were there any compatibility issues encountered, and how were they resolved? v. What was the strategy for rolling out the digital addressing system across different regions or sectors? vi. How did you address challenges related to system adoption and user training?
	Training and Capacity Enhancement (Transforming)	i. What training or capacity-building measures were implemented to prepare stakeholders for the transition to NDPAS? ii. How did these initiatives contribute to seizing the opportunities presented by digitalisation?
Post-Digitalisation Era	Outcomes/Impacts (Transforming)	i. In what ways has the digital location addressing system improved operational efficiency and service delivery in your organisation? ii. Can you provide examples of how the digital system has transformed business or governmental processes? iii. How have regulations or policies evolved following the digitalisation of the location addressing system? iv. What role did digitalisation play in enhancing regulatory oversight or compliance?
	Monitoring/Evaluation (Institutionalising)	i. What mechanisms are in place for monitoring the system's performance and user satisfaction? ii. What feedback have you received from users and stakeholders about the digital location addressing system since its implementation?
	Sustainability/Scaling (Institutionalising)	i. How was user feedback incorporated into refining the system? ii. What measures have been taken to ensure the sustainability of the digital location addressing system? iii. Are there plans to scale or expand the system to address additional needs or to cover larger geographical areas? iv. How is the system maintained and updated to meet evolving needs? v. Are there any planned upgrades or expansions for the digital addressing system? vi. What new features or improvements can users expect?

Table 4.2 - Interview questions related to theoretical concepts and research questions

Answering these questions enabled a deeper understanding of how the dynamic capabilities theory is represented in the empirical data. This analysis involved evaluating codes to identify patterns, relationships, and discrepancies between theoretical constructs and the observed phenomena. It revealed the practical application of sensing, legitimising, seizing, transforming, and institutionalising capabilities by the case institutions and firms within the context of digital location addressing systems. The thematic questions were specifically designed to uncover the real-world manifestations of these capabilities, providing insights into their collective role in facilitating the successful implementation and use of digital technologies in a developing country. Through this meticulous examination, the study connected abstract theoretical concepts with concrete organisational actions and strategies, enriching both the academic and practical discourse on digitalisation within complex socio-economic environments.

The hermeneutic circle, a methodological tool for interpreting textual data, was employed to discern relations among words, phrases, and paragraphs, facilitating a deeper understanding of the dynamic capabilities reflected in the empirical data. This interpretative process, emphasising the iterative interaction between the parts of the text and the whole, culminated in a comprehensive case description. Following this detailed analysis, a 'member-checking' process was conducted, where preliminary findings were shared with participants for their feedback. This step was crucial for interpretation and conclusion validation, ensuring the final analysis authentically represented the experiences and perspectives of those involved in the NDPAS digitalisation process and use in Ghana. This methodology underscores the importance of participant engagement in validating research findings, providing a robust mechanism for ensuring the credibility and reliability of the interpretative outcomes.

4.8 Principles for Research Evaluation

This research followed Klein & Myers' (1999) set of principle for evaluating interpretive research also complementing it with the researcher's reflexive account as proposed by Malaurent & Avison (2017) to help achieve rigour and relevance. These principles are applied in the concluding chapter of this study. Overview of the principles is presented next followed by the ethical considerations applied in this research.

4.8.1 Principles for Evaluating Interpretive Research and Application to this Study

The evaluation of interpretive research often incites contention, as some scholars believe that applying predefined criteria infringes upon its intrinsically emergent nature. Nonetheless, researchers like Klein and Myers (1999) have argued that interpretive research does require a standard for assessment. In support of this view, they proposed a set of principles for the evaluation of interpretive research. Furthering this argument, Malaurent and Avison (2017) posited that reflexive accounting could assist in achieving both rigor and relevance while meeting the evaluation criteria. In this study, the principles offered by Klein and Myers (1999) are employed, with the researcher's self-reflexivity serving as an instrumental aid in conducting the research.

The principles developed by Klein and Myers (1999) provide insight into the nuances of interpretivism. These principles include: 1) the hermeneutic circle, 2) contextualisation, 3) interaction between the researcher and participants, 4) abstraction and generalisation, 5) dialogical reasoning, 6) recognition of multiple interpretations, and 7) suspicion. Each of these principles are discussed in the following paragraphs.

The hermeneutic circle, foundational to all other principles, posits that understanding is achieved by an iterative process of examining a phenomenon in its entirety (the whole text), then its individual components (words and phrases), and back to the whole. This process illuminates nuanced analyses and interpretations of the research phenomenon (Myers, 2013). This principle was applied in the study as it alternately examined and interpreted the varied perceptions and interactions of different case institutions and firms with the digital location addressing system, contextualising this within the broader landscape of Ghana's digitalisation initiatives.

Contextualisation enables a comprehensive understanding of the research phenomenon by scrutinising the social, cultural, and historical backdrop of the research setting. It recognises the dynamic nature of the social world, shaped and reinforced by human actions and interactions (Orlikowski & Baroudi, 1991). In the context of this study, the principle guided the exploration of the social, economic, and political milieu within which the digital location addressing system was implemented, incorporating Ghana's development trajectory, digital policies, and the circumstances underpinning its digitalisation of location addressing system.

The principle of interaction between the researcher and subjects underscores the importance of critically reflecting on how data is socially constructed through the researcher's engagement with participants. This principle was brought to bear in the study through validation activities such as cross-checking transcribed interviews and research manuscripts with participants, albeit carefully, to maintain anonymity and confidentiality. The researcher's cognisance of the political sensitivities associated with questions about the perceived benefits and challenges of the digitalisation process was another manifestation of this principle.

The principles of abstraction and generalisation encourage the use of theoretical constructs to understand social actions by connecting detailed data interpretations to broader concepts that depict the essence of the research phenomenon. This was evidenced in the study's comparison of Ghana's digitalisation experiences with those of other countries (both developed and developing) implementing similar systems.

Dialogical reasoning is a principle that alerts the researcher to potential contradictions between the guiding assumptions of the study and the actual findings. When the study's findings diverged from initial assumptions about the use or impact of the digital location addressing system, this principle was employed to reconcile these disparities, thereby fostering a deeper understanding of the phenomenon.

The principle of multiple interpretations heightens the researcher's sensitivity to the subjective interpretations of participants. This sensitivity was exercised in the study by remaining open to diverse perspectives from the different case institutions and firms. For instance, while the government viewed the digitalisation initiative as a vehicle for strengthening state agencies and regulatory oversights, institutions and firms perceived it as a process improvement tool and political tool.

Lastly, the principle of suspicion considers potential biases and distortions in participant narratives. The study was mindful of this, taking into account the unintended consequences of policy decisions on organizational strategies and financial planning. Specifically, it scrutinised the case of GPCL, where the anticipation of additional revenue from API integration with the NDPAS was thwarted by a government directive requiring free integration for organizations. This policy, though aimed at enhancing widespread adoption and utility of the digital address system, inadvertently thwarted GPCL's revenue projections.

These principles offer a robust framework for evaluating interpretive studies, acknowledging the unique nature of interpretivism, which differs from positivism. Therefore, interpretivism cannot be evaluated based on conventional principles of reliability, replicability, validity, and generalisability. For instance, the reliability criterion isn't applicable in interpretive studies, as repeating the data collection process doesn't guarantee identical results (Schwartz-shea & Yanow, 2013). The study concludes by applying the principles outlined by Klein and Myers (1999) for evaluating its conduct and findings.

4.8.2 Ethical Considerations

Ethical considerations in research encompass the adherence to guiding principles that delineate right from wrong across all stages of research, from planning through to the dissemination of findings (Myers, 2013). These ethical norms are critical as they safeguard the interests of the researcher, participants, and the integrity of the affiliated institution (Myers, 2013). Ethical considerations include compliance with institutional ethical standards, protecting participants' rights, and effectively managing any arising conflicts (Myers, 2013; Richards & Schwartz, 2002).

In this study, stringent ethical guidelines were observed concerning the review of literature, interactions with participants, engagements with case institutions and firms, relations within the research community, and the reporting and publishing of findings.

All literature sources consulted for this research were accurately cited to uphold the integrity of knowledge claims and to prevent plagiarism. Participants were fully informed about the

study's objectives, implications of the findings, and their right to withdraw consent at any stage without repercussion (Miller, 1995; Myers, 2013).

To address the imperative ethical considerations of confidentiality and anonymity in interpretive research (Walsham, 2006), a formal introduction letter was procured from the Department of Operations and Management Information Systems at the University of Ghana, affirming institutional endorsement prior to initiating data collection. During data collection, guarantees of confidentiality were provided to participants, ensuring no disclosure of their identities or affiliations in the research documentation. Additionally, recordings of interviews and discussions were conducted only with participants' informed consent, and they were apprised of their right to discontinue participation at any juncture.

The researcher diligently avoided entanglement in any internal organisational politics or power dynamics, ensuring such factors did not skew the data or influence the research outcomes. Lastly, efforts were made to secure organisational consent for the publication of the study's findings, further attesting to the ethical rigor underpinning this research.

4.9 Chapter Summary

This chapter outlined the research philosophy that guided the study, identifying the interpretivist paradigm as the most fitting approach for this investigation. The selection of this paradigm was influenced by several factors, including its suitability for examining complex and emerging phenomena in IS, as proposed by Jain (2003). Additionally, the chapter elaborated on the rationale behind choosing the case study method for this research. It also discussed the data analysis process. Lastly, the chapter reviewed the principles employed to

assess the study's validity. The following chapter will introduce the descriptions of the cases examined.



CHAPTER FIVE

CASE DESCRIPTION

5.1 Introduction

The preceding chapter explored various research methodologies and justified the selection of an interpretive case study as the optimal approach for this research. In this chapter, a comprehensive description of Ghana, the case setting, and four embedded cases detailing pre-digitalisation practices and post-digitalisation outcomes are presented. The first case focuses on the initiation and implementation of Ghana's digital property addressing system delving into the strategic planning, technological deployment, stakeholder engagement, and the challenges and successes encountered during the implementation phase. The second case presents the application and impact of the digital addressing system within both a private and a public organisation highlighting how the newly implemented digital system is utilised in different organisational contexts, illustrating the changes in operational processes, the benefits reaped, and the challenges faced post-implementation. The study adopts a chronological description of the cases to provide a comprehensive understanding of the historical context or antecedent conditions, in addition to detailing the process of digitalisation, its usage and outcomes. The last section presents a summary of the chapter.

5.2 Ghana's location Addressing System

Ghana, situated in West Africa and home to approximately 30 million residents as of 2021, is a democratic country where multiple political parties regularly nominate candidates for quadrennial presidential elections. The country presents a unique context given its ongoing

efforts to modernise its governance and administrative systems and improve the quality of life for its citizens through digitalisation. Amidst the myriad of digital initiatives, one that stands out for its significance and impact is the NDPAS implemented in 2017. The government of Ghana assigned GPCL with the responsibility of overseeing this endeavour, aiming to address the challenges associated with physical location addresses. The launch of the digital address system represents a key facet of the government's grand plan of promoting effective governance through the adoption of a modern and revolutionary approach to allocating addresses within a defined space, leveraging the power of the latest digital technology.

5.2.1 Pre-Digitalisation Era

Before the digitalisation, Ghana's location addressing system was far from robust. The country was heavily dependent on manual, imprecise methods of location addressing. This inefficiency posed significant obstacles to its sustainable socio-economic development.

Addresses were commonly described using landmark-based directions, highlighting their proximity to prominent buildings, junctions, or natural features. Many buildings and homes lacked formal addresses or identifiable numbers, turning their pinpointing into a task of speculation. The impacts of this inefficient system were far-reaching, negatively affecting several critical areas of the country's functionality and growth.

Access to financial services was limited to a mere fraction of the citizenry. For those who managed to avail banking services, obtaining loans was a staggering task, often burdened with higher risk premiums. Financial institutions were hesitant to transact with individuals or organisations due to their potential to become untraceable in the future. This lack of precision

also complicated the ability for businesses to verify customer addresses, affecting the delivery of goods and services. Expansion efforts of financial institutions were further complicated. Additionally, utility companies faced challenges in network management, leading to substantial revenue losses. Overall, the unreliable addressing system significantly impacted business productivity, hampering Ghana's economic growth.

In the context of postal services, post offices assigned P.O. Box numbers to individuals and businesses. However, these numbers did not denote physical locations and provided no specific geographical location information. Consequently, parcels were frequently delivered to incorrect destinations, taking significant time and resources to rectify, ultimately damaging the country's postal services' efficiency and reliability.

The inefficient location system presented enormous challenges to emergency services, delivery companies, and any parties requiring precise locations. With no accurate database of location addresses, delays were inevitable. This inefficiency often led to lost productivity, a decline in customer loyalty, and diminished trust in these essential services. It also created unique challenges for urban planning and infrastructure development, obstructing the nation's progress.

The imprecise addressing system posed hurdles in the allocation of resources during disasters. Relevant agencies struggled to distribute resources effectively to affected individuals due to a lack of statistical data for resource distribution. Crime prevention was another area that suffered. Criminals could evade capture more easily, as law enforcement agencies lacked the means to track them down to their addresses.

With the challenges clearly laid out, it was evident that Ghana needed a more efficient, universally acceptable location addressing system. Acknowledging this, the government of Ghana decided to take decisive steps towards change.

The objective was clear - to overcome the longstanding challenges that had been a significant impediment to the socio-economic development of the nation. By embracing the latest digital technology, the government aimed to put an end to the ambiguity and lack of precision that plagued the existing address system.

By introducing NDPAS, Ghana embarked on a journey of transformation, seeking to resolve inefficiencies and build a more sustainable future for its citizenry and economy. This digitalisation promised to usher in an era of precision, reliability, and efficiency, marking a significant leap forward in the nation's march towards development.

5.2.2 The Digitalisation Era

This implementation of the NDPAS which was a tangible realisation of a political promise made during the 2016 election campaign, made by the then Vice President, was entirely funded by the government. Acting through the GPCL, the Ministry of Communications and Digitalisation, representing the government, provided the project mandate, issuing the call for Expression of Interest, and defining the criteria and guidelines for the digital addressing system. The rigorous evaluation of several proposals led to Vokacom securing the contract for the development and implementation of the NDPAS.

Government involvement extended beyond the inception of the project. High-ranking officials, including the President, Vice President of Ghana, and Heads of various Ministries, particularly

the Ministry of Communication and Digitalisation, played active roles in the demonstration and launch of NDPAS. Their engagement underlined the government's commitment to the project and facilitated its adoption among the public and other stakeholders.

The government also had a significant hand in regulating and overseeing the system's implementation and operation. This oversight ensured the system adhered to set standards and fulfilled its intended purpose.

5.2.3 Outcome of the Digitalisation – The NDPAS

The NDPAS serves as Ghana's official digital location addressing system, covering every inch of the country, and ensuring that every location within its borders is uniquely and digitally addressed. The system uses a grid-based layout, dividing Ghana into 5m x 5m squares. Each square is then assigned a unique address, known as a digital address, utilising GPS technology.

The digital address is a combination of the postcode (including region, district, and area code) and a unique address derived from a GPS location, converted into a user-friendly format. Crucially, the system features an open application programming interface (API), allowing third-party application developers to integrate with the system. This integration facilitates the translation and utilisation of digital addresses, thus enabling the smooth facilitation of various transactions.

The implementation of the NDPAS gave rise to a mobile application named GhanaPostGPS. This tool leverages the open API of the NDPAS to retrieve location addresses across the country. Consequently, it enables everyone in Ghana to easily determine their location

addresses and provides navigation assistance through maps provided by Google, OpenStreets, and ESRI.

Launched in 2017, the NDPAS has become a crucial tool for individuals and businesses across Ghana, enhancing the efficiency of operations countrywide by providing digital addresses. Integrated with the national location registry, the NDPAS allows accurate validation of residential and commercial addresses, transforming how businesses and services operate. The system's broader objectives include expanding Ghana's tax base, promoting financial accountability and inclusion, and reducing operational costs through a streamlined method of location referencing. NDPAS's implementation plays a significant role in Ghana's digitalisation journey, specifically in updating the country's location addressing system.

5.2.4 Post-Digitalisation Era

The implementation of the NDPAS in Ghana sparked significant interest and controversy. Debates about the project's cost and procurement process surfaced, with critics, including the former President of Ghana, questioning the necessity of the expense when similar solutions could be obtained from Google at no cost. This critique fueled allegations of state fund misappropriation, with claims that the NDPAS's implementation served as a means for political leaders to profit from taxpayer money.

In response to these cost concerns, the Vice President provided a detailed breakdown of the project's expenditure. He clarified that the costs were not confined to app development alone but extended to public awareness campaigns, infrastructure set-up, third-party licensing fees, physical embossing of government buildings, training, testing, and intellectual property rights.

Furthermore, he juxtaposed the NDPAS's expenditure with that of similar systems in other countries, positioning Ghana's project as cost-effective.

Alongside financial discussions, concerns about data security gained prominence post-NDPAS launch. The CEO of Vokacom alleviated these worries by assuring stringent data security measures were implemented to protect the system from cyber threats. To further manage data security and protection related to the location infrastructure, a technical committee comprising representatives from multiple organisations like the Ghana Police Service, National Cyber Security, National Security, Ministry of Communication, National Communication Authority, and National Information Agency was established. They proposed hosting the data gathered through the app on a server at NITA.

Given Ghana's history of abandoning unfinished projects initiated by an outgoing administration, the NDPAS's continuity and sustainability in case of a political shift were brought into question. This concern is encapsulated in one respondent's statement:

"...I don't have to call my clients several times just to confirm and verify their locations... I only hope that it [NDPAS] will not be thrown away [discarded] when the opposition [political] party comes to power..."

While promoting NDPAS's adoption among the public and various organisations was a government priority, the task of convincing the system's necessity, especially among rural or technologically less adept communities, proved challenging. However, efforts to educate about the system, its benefits, and provide usage guidelines have played a crucial role in its eventual success.

5.3 Implementation of the NDPAS

This section presents descriptions of the implementing case organisations, GPCL and Vokacom, providing a detailed narrative of their journey from the pre-digital era to the forefront of digitalisation.

5.3.1 The Case of GPCL

GPCL is the state agency responsible for the delivery of postal and courier services in Ghana. It operates under the Ministry of Communications and Digitalisation, providing universal postal services throughout Ghana, and it plays a vital role in the country's communication infrastructure. GPCL played a pivotal role in the conception, development, and implementation of the NDPAS, widely known as GhanaPostGPS. The system was expected to enhance GPCL's operations, particularly addressing the long-standing issues of vague and imprecise addressing that had significantly hampered its courier services.

5.3.1.1 Pre-Digitalisation Era

Before the digitalisation of Ghana's location address system, GPCL relied on traditional methods of location addressing. The pre-digital era was characterised by manual systems and procedures which, while effective at the time, posed a range of challenges and limitations.

GPCL's efficiency and productivity was impacted by the limitations of the traditional addressing systems, straining the company to a near-breaking point, threatening its very survival. GPCL's service quality began to falter due to inaccurate, incomplete, or even non-existent location addresses. Delivery failures increased, and costs spiralled as the company had

to invest more resources into locating correct addresses, particularly in less developed or remote areas. Customer dissatisfaction began to rise, hitting GPCL's reputation hard.

This problem was exacerbated by increased urbanisation and the emergence of unplanned settlements known as Zongo. These areas lacked well-defined street names or house numbers, making them challenging to navigate. Delivery errors soared, and the company struggled to provide prompt service. The situation was so severe that GPCL's operational costs went through the roof, while its service quality plummeted. The firm was teetering on the brink of collapse.

Indeed, the significant surge in e-commerce activities brought about a massive increase in the volume of deliveries. This boom, coupled with the rapid pace of technological advancement, put tremendous strain on GPCL's traditional infrastructure.

The traditional addressing system, on which GPCL relied, proved unable to adapt to this changing landscape. The company's existing resources were stretched to their limits, and the operational structure was buckling under the immense pressure. It was becoming increasingly apparent that GPCL might not survive the mounting challenges.

Moreover, customers began to drift away, turning to private courier firms like DHL that were more adept at leveraging technology to offer reliable and efficient services. This loss of customers further endangered GPCL's viability, causing revenues to dip and operational costs to soar. GPCL came perilously close to extinction.

Faced with these daunting challenges, it was clear that GPCL needed to transcend the limitations of traditional addressing systems. The objective was to bolster operational

efficiency, curtail escalating costs, rejuvenate customer satisfaction, and adeptly meet the demands of the rapidly shifting marketplace.

This period of crisis for GPCL serendipitously aligned with the government of Ghana's launch of several transformative initiatives. The republic sought to formalise and digitalise the economy, paving the way for innovative solutions to the very problems plaguing GPCL.

Among these initiatives were the NDPAS, the National Identification System, and the Interoperable Electronic Payment Platform. The NDPAS promised a viable solution to GPCL's addressing woes, offering a means to locate precise geographic points irrespective of conventional addressing limitations. The digitalisation of Ghana's location address represented an opportunity for GPCL to redefine its operational approach. The confluence of government support and digital innovation provided a lifeline for the company, offering a chance to not only survive but thrive in the digital age.

5.3.1.2 The Digitalisation Era

The process of digitalising location addresses in Ghana commenced in February 2017 after the Vice President of the nation, representing the government of Ghana expressed concern about the problems associated with the existing manual addresses in a speech he delivered. As a result, several committees were formed and tasked to conduct the necessary legal, logistical and financial consultations to design an implementation roadmap with various stakeholders playing key roles. GPCL was charged with the mandate to oversee the implementation of the NDPAS.

In March 2017, GPCL commenced the process of sourcing the right technological partner for the implementation of the NDPAS. The company sent out an open call for expressions of interest, which was responded to by 28 IT firms. The evaluation of these firms was a rigorous process, based on a set of criteria that had been publicised in the newspapers.

Of the initial pool, six firms were shortlisted and asked to purchase tender documents. These documents contained specifics about the project and the detailed requirements that the firms had to fulfill. A panel comprising experts in the field was then constituted to evaluate the detailed bids submitted by the six contenders.

After a careful and thorough assessment of these bids, the panel made a recommendation to the Entity Tender Committee of Ghana Post. The Committee, upon reviewing the panel's submission, concurred with the recommendation. An evaluation report was then prepared and submitted to the Central Tender Review Board of the Ministry of Finance for further scrutiny.

The Central Tender Review Board, after an exhaustive review, gave its approval to the recommendations for the contract award. Following this, the Ministry of Finance issued a certificate confirming the budgetary allocation for the project.

After careful consideration and exhaustive reviews involving aspects like tax clearance, credibility, relevant experience, project duration, cost-effectiveness, and bid security, among others, the contract, valued at \$2.5 million, was awarded to Vokacom.

The signing of the contract took place under the watchful eyes of representatives from the Attorney General's Department, marking the conclusion of an intricate and lengthy selection process and the beginning of a significant phase in the journey towards the digitalisation of location addresses in Ghana.

Working closely with Vokacom and NITA, a public entity responsible for data hosting, GPCL orchestrated the seamless integration of NDPAS into Ghana's existing digital infrastructure. A key aspect of this integration was the incorporation of an open API feature (GhanaPostGPS App) offered by NDPAS, encouraging third-party developers to integrate with the system.

GPCL's pivotal role in overseeing this integration was driven by its mandate to serve the public and align its services with the national digitalisation objectives. By facilitating the integration of NDPAS and encouraging the use of its open API, GPCL ensured that the digital address system not only modernised its own operations, but also served as a versatile tool for the broader digital ecosystem in Ghana.

5.3.1.3 Post-Digitalisation Era

The implementation of NDPAS marked a significant turning point for GPCL, enabling it to surmount the numerous challenges associated with the previously inadequate addressing system and align its operations with rapidly advancing digital communication technologies. The introduction of NDPAS essentially revitalised GPCL, endowing the company with the capability to operate effectively and efficiently at both domestic and international levels.

Post-implementation, GPCL assumed frontline system management responsibilities. Broader oversight and policy guidance were vested with the Ministry of Communications and Digitalisation. GPCL was entrusted with the day-to-day administration and maintenance of NDPAS, ensuring consistent system functionality, rectifying operational issues, and adapting to evolving user needs. Furthermore, GPCL was responsible for vetting and approving companies that sought to integrate with NDPAS using the system's open API feature.

The introduction of the open API feature was indeed a strategic move, fostering a broad spectrum of third-party developers to integrate and leverage the NDPAS in their respective operations. This was a pivotal step, propelling the digital address system far beyond its original scope, encouraging technological innovation, and enhancing interoperability across a multitude of sectors and applications. It was initially projected that these integrations would generate additional revenue for GPCL through fees associated with API usage.

However, in a candid disclosure from a respondent closely associated with the project, it emerged that the API integrations did not result in any extra income for GPCL. Despite the system's widespread integration across public and private sectors, no financial benefit was accrued. The primary reason was that the government, as part of its broader mandate to boost digitalisation, insisted on offering these integrations free of charge, particularly to public-sector entities. While this policy indeed fostered extensive adoption and usage of NDPAS, it did not lead to the projected revenue increase for GPCL.

5.3.2 The Case of Vokacom

Vokacom is a Ghanaian technology and software development company established in 2004. It has been offering products and services in various sectors, ranging from business software development, web services, data management, GIS, mobile application development, among others. Its software solutions cater to the needs of both public and private sectors, and it has gained a reputation for delivering innovative and reliable software solutions.

5.3.2.1 Pre-Digitalisation Era

Before embarking on the high-profile NDPAS project, Vokacom had already carved out a niche for itself in the Ghanaian technology industry.

One of Vokacom's key service areas was custom business software development. The company leveraged its technical expertise to deliver tailored software solutions, which served to optimise business operations, enhance productivity, and refine business processes across a diverse array of sectors.

In addition to software development, Vokacom provided a wide range of web services. From web design and development to search engine optimisation and e-commerce platform development. Vokacom played a pivotal role in helping businesses establish and strengthen their digital footprint.

Another significant aspect of Vokacom's operations was data management. In the age of big data, Vokacom offered a suite of services aimed at helping businesses effectively manage, store, and analyse their data. Through these services, businesses could make informed, data-driven decisions and uncover valuable insights.

Interestingly, Vokacom's involvement with GIS predates the NDPAS project. GIS, which is centred around managing and analysing geographic data, was a significant part of Vokacom's portfolio. The skills and experience gained from this early involvement in GIS proved invaluable in the creation of the digital addressing system.

Vokacom also ventured into the mobile application development space, crafting applications for various purposes and platforms.

To secure the contract for the NDPAS in Ghana, Vokacom embarked on a standardised procurement process. The company thoroughly examined the criteria detailed in the Expression of Interest call issued by GPCL. Subsequently, Vokacom submitted a comprehensive proposal that outlined its strategic plan, proposed technology, implementation timelines, and budget. This proposal underwent a comparative review against others. Following this, Vokacom was shortlisted, leading to a more detailed evaluation of their proposal and negotiations on project specifics with the reviewing authority. Ultimately, it was Vokacom's success throughout these stages that led to the company being awarded the contract to develop the NDPAS.

5.3.2.2 The Digitalisation Era

The implementation of the NDPAS, began with Vokacom utilising its existing digital mapping technology developed for a real estate business. This system had the core functionality of digitally marking physical locations of homes and properties, providing a robust template for NDPAS.

Once the broad blueprint was established, Vokacom embarked on a journey of reconfiguring and enhancing the existing application, then known as Asaase GPS. This process involved rigorous technical upgrades and modifications, which included expanding the capacity of the software to accommodate nationwide data, enhancing the user interface for broader public usability, and integrating robust security measures to protect the sensitive data that the application would handle. This transformation process was meticulous and focused, aimed at meeting national needs and expectations. After significant alterations, the system was rechristened GhanaPostGPS.

In order to gain stakeholder buy-in and demonstrate the capabilities of the newly developed NDPAS, high-profile officials were given a comprehensive presentation. This included the Managing Director of Ghana Post, the Minister for Communications, as well as the President and Vice President of Ghana. In this 90-minute demonstration, officials were walked through the application's functionalities and the manifold benefits associated with it. This demonstration served not only as an informational session but also as an assurance of the system's reliability and efficiency.

The GhanaPostGPS mobile app, apart from generating digital addresses, is endowed with several key features. Notably, it allows users to request emergency services directly from the app, offering a critical tool in urgent situations such as medical emergencies or immediate safety concerns. This feature was aimed at improving public safety and making emergency services more accessible to the public.

Future features were also introduced during the demonstration, demonstrating Vokacom's commitment to continuous improvement and user-centric design. The Fameko navigation feature, to be designed for commercial vehicle tracking to enhance passenger safety, is one such anticipated addition. Another anticipated feature is the integration of a virtual mailbox within the app. This feature would notify users about incoming mail and deliveries, offering a modern, digital solution to traditional postal services.

5.3.2.3 Post-Digitalisation Era

Following the launch of the NDPAS, Vokacom found itself managing both technical and social issues. The controversies surrounding the NDPAS, particularly with respect to the project's

cost and lack of transparency in the bidding process, significantly impacted Vokacom's reputation. The company was compelled to defend its integrity amidst heightened political scrutiny.

While NDPAS was recognised as a progressive initiative, there were recurring concerns about its sustainability, especially in the face of potential political transitions. Some users, seeing no additional value beyond generating a digital address, discontinued using the app after initial use. Addressing these concerns, the CEO of NDPAS admitted to the challenges of sustainability:

"It is a risk, actually... it is a bridge that we are yet to cross as a nation, and we hope that we don't get to the stage where the system will no longer be financially supported or, worse still, abandoned because of politics."

He also emphasised mitigation strategies, which included adding functionalities like emergency service requests, ambulance and fire services,

The CEO of Vokacom explained the rationale behind the continuous expansion:

"...The majority of our efforts are aimed at transforming the app into an everyday tool, similar to WhatsApp. It's a strategy to assimilate the system into Ghanaians' lives, making it difficult for any government to discard it."

Vokacom is committed to ensuring the sustainability of NDPAS. The company plans to enhance user experience, regularly monitor and evaluate system performance, and establish a Research and Development unit to incorporate new digital innovations into the application.

One of the developers highlighted this:

"...we hope to establish a Research and Development unit soon so that we can have people researching other new digital innovations that can be incorporated into the

platform...but we have people out there who report to us how people perceive the system...and we try to address the issues that we can.”

Another challenge that arose was the need for NDPAS to integrate seamlessly with various existing systems. This task was often complicated by the lack of necessary technical competencies among personnel from businesses integrating with NDPAS. Despite these obstacles, the team remains unwavering in its commitment to further develop and integrate the system.

5.4 Usage of the NDPAS

Following its launch in 2017, the NDPAS has seen extensive application across various sectors in Ghana. The subsequent sections delve deeper into the system's impact on two different user groups: a public-sector regulatory agency and a private sector service delivery organisation.

5.4.1 Public Sector Agencies - The case of HeFRA

The implementation of the NDPAS has had profound implications for public-sector agencies in Ghana. This section presents the case of HeFRA. HeFRA is a pivotal entity in Ghana's healthcare system, established under the Health Institutions and Facilities Act, 2011 (Act 829), and is tasked with licensing and overseeing both public and private health facilities, ensuring compliance with stringent care standards. Its fundamental objective is to guarantee that healthcare services are rendered with the utmost quality, equitably and effectively. Such

endeavours by HeFRA are instrumental in significantly elevating the standard of the national healthcare system, ensuring it meets the needs and expectations of the populace.

5.4.1.1 Pre-Digitalisation Era

HeFRA's key responsibility in the Ghanaian healthcare system involves conducting client compliance visits to health facilities across the nation, an essential function for ensuring healthcare standards. Before the digitalisation, HeFRA heavily relied on traditional methods for locating health facilities. However, the traditional location addressing system greatly hindered this responsibility, leading to a myriad of challenges that affected the efficiency and effectiveness of their operations.

Conducting compliance visits was often hampered by the inefficiency of the traditional system, which typically relied on landmarks and verbal directions. This inefficiency was particularly pronounced in rural or new settlements, where health facilities were difficult to locate, leading to delays and increased operational costs. As one HeFRA compliant officer lamented in an interview,

"Finding a facility in the villages and new sites is tedious and time-consuming and so it delays our work...even though sometimes we rely also on local correspondents to take us to the facilities, it meant we would have told them ahead of time, which at times defeat the purpose of our unannounced visits to these facilities because their authorities would have gotten a hint of our coming...and even sometimes in the cities it's a challenge locating certain facilities... you end up going around in circles and burning

a lot of fuel before you reach your destination and you can't even do the work well because you are already tired..."

This inefficiency not only caused operational delays but also escalated costs, impacting the overall inspection schedule.

Planning and scheduling regular compliance visits became a logistical nightmare due to the absence of precise addresses. An administrative staff member shared,

"Organising visits to new facilities without clear addresses was especially tough. This challenge was even more pronounced for complaint officers on their first visit. Every time we had to go somewhere new, we faced a real puzzle. We had to rely on unclear directions and landmarks, which made it hard to plan our route efficiently. Since we weren't familiar with these places, what should have been a simple trip often turned into a long and confusing journey, with a lot of backtracking and uncertainty."

The head of operations also noted that the lack of clear direction affected not just schedules, but also the ability to effectively serve communities.

"We'd find ourselves in situations where crucial time was lost in transit, diminishing the time we could spend at each facility. This inefficiency wasn't just frustrating; it impacted the quality of our oversight. ...the stress of this daily uncertainty weighed heavily on our team, often leaving us exhausted and disheartened."

This logistical challenge was a major roadblock in conducting thorough inspections in a timely manner, thus affecting the regulatory oversight effectiveness.

The situation was even more critical when immediate follow-up visits or emergency responses were required. A senior HeFRA official mentioned,

"In emergencies, every second counts, and the additional time spent locating the facility could have serious implications for patient care. The word-of-mouth location system, didn't just hinder us; it potentially compromised the health outcomes of those we were striving to serve."

Prior to the digitalisation, HeFRA struggled with accurate facility mapping and data management, which are critical for policy formulation. This limitation posed considerable challenges in maintaining an up-to-date and reliable database of healthcare facilities across the nation. An IT officer highlighted the struggle, stating,

"It was really tough mapping healthcare facilities. We kept finding mistakes because the locations in our records often didn't match where the facilities actually were..."

This inaccuracy in facility mapping led to a domino effect in data reliability and policy decisions. Facilities might be listed under vague or non-standardised location descriptions, making it difficult to identify their exact geographical locations, especially in remote or less developed areas. Furthermore, these inaccuracies in the database had significant implications for policymaking. The director of operations expressed this concern:

"Our policies and strategies are only as good as the data they're based on. With so many gaps and uncertainties in our agency's database, we often made decisions in the dark, which is far from ideal in healthcare."

Lastly, the inequity in service delivery was a significant concern. Areas with poorly defined addresses were at risk of being overlooked or underserved, leading to disparities in healthcare service quality. A health facility manager from a rural area reflected,

"We often felt neglected during regulatory oversight, mainly due to our location's vague addressing."

5.4.1.2 Post-Digitalisation Era

Following the digitalisation of Ghana's location address system, HeFRA assumed a pivotal role in leveraging the new system to enhance healthcare regulation and service delivery. The NDPAS represented a significant shift in how HeFRA operated, with improvements in data accuracy, regulatory compliance, emergency response, policy formulation, and stakeholder engagement.

HeFRA is continuously updating its records to include the exact geographical locations of each healthcare facility as the IT personnel mentioned,

"We're actively updating our database with exact locations for each healthcare facility. It's a huge step forward from the old system even though we are far from done. For the ones we have done, we can now actually see each facility's precise location on a map. This has been a game-changer for us in terms of data accuracy and reliability."

This ongoing process is transforming how healthcare facilities, from bustling urban centres to the most remote rural areas, are identified and located. This precision in location data is proving to be invaluable for logistical purposes and is increasingly playing a critical role in enhancing HeFRA's operational capabilities. The director of operations stated:

"...we can plan inspections more efficiently, respond to situations faster, and ensure that all facilities, regardless of their location, are part of our regulatory framework."

The ability to accurately locate healthcare facilities is not just a matter of convenience; it is fundamentally changing how HeFRA fulfils its responsibilities. In urban areas, where facilities are numerous and densely packed, the digital system helps to distinguish between closely situated healthcare providers, allowing for more targeted and efficient regulatory oversight. A compliant officer indicated the following:

"...where there are a lot of healthcare facilities with a particular area, the digital system has made it easier for us to identify and differentiate between them. This allows us to conduct more focused inspections and ensures that no two facilities are mistaken for one another."

In rural and remote areas, where facilities were once challenging to locate, the system is uncovering previously hard-to-reach healthcare services, bringing them into the broader network of regulated healthcare provision. A regional coordinator for HeFRA noted,

"Remote areas, which were once a blind spot for us, are now accessible thanks to the digital system. It's not just about finding these facilities; it's about integrating them into our healthcare network and ensuring they meet the required standards."

The digitalisation has also significantly improved HeFRA's emergency response coordination, which is a crucial development for patient safety and care quality. Moreover, the digital system has had a profound impact on policy development and resource allocation. With reliable data from the digital system, more informed decisions can now be made about where to allocate resources and how to develop healthcare policies.

By providing a means to report defaulting facilities accurately, the digital address system has fostered a more collaborative and efficient approach to maintaining healthcare standards in Ghana. A HeFRA official commented on this development, saying,

“The digital system has opened up new avenues for public involvement in regulatory processes. Now, people can easily report through phone calls and in-person, any non-compliance they observe in healthcare facilities by giving us the precise digital address. This has made our task of monitoring compliance more collaborative and community driven.”

5.4.1.3 Outcomes of the Use of the Digital Addressing System

The digitalisation of Ghana's location addressing through the implementation of the NDPAS has been a transformative step for HeFRA, bringing about extensive improvements in facility mapping, regulatory compliance, resource allocation, stakeholder engagement, and transparency.

The introduction of NDPAS has equipped HeFRA with the ability to accurately locate and map healthcare facilities throughout Ghana. This capability is crucial, particularly in conducting regulatory inspections and monitoring compliance. The precision offered by the digital system is invaluable in both urban and rural settings, allowing for more efficient and targeted oversight.

Moreover, this digitalisation has significantly bolstered HeFRA's ability to enforce regulatory compliance and monitor healthcare standards. With precise location data at their fingertips, inspectors can plan and conduct visits to healthcare facilities more effectively, ensuring a consistent and thorough application of health and safety standards. This advancement has led to a more reliable and comprehensive oversight of healthcare services.

Another critical outcome is the efficient allocation of resources and improved emergency response. The NDPAS provides HeFRA with detailed location information, enabling quicker

and more focused responses in emergency situations, a crucial factor in improving patient safety and care quality. This precise location information also allows for a more strategic and effective allocation of resources, ensuring that they are directed where most needed.

The digital addressing system has also opened up new avenues for stakeholder engagement and public reporting. The ease with which the public can now report non-compliant activities by providing exact digital addresses has empowered citizens, allowing them to play an active role in the regulatory process. This development has not only improved community involvement in healthcare regulation but also fostered a stronger sense of partnership between HeFRA and the communities it serves.

Additionally, the availability of accurate and reliable location data has paved the way for data-driven decision-making and policy formulation within HeFRA. This approach has significantly enhanced the agency's ability to develop policies, plan strategically, and distribute resources effectively, leading to a more responsive and equitable healthcare system.

Increased transparency and accountability in HeFRA's operations are also notable outcomes of the NDPAS. The digital system enables accurate tracking and recording of inspections and compliance activities, fostering greater accountability within the healthcare system. This transparency is vital for building public trust and ensuring the integrity of healthcare services.

Lastly, HeFRA can now identify underserved areas with greater precision, working towards enhancing healthcare accessibility and improving the overall healthcare infrastructure. This leads to better service delivery and a significant improvement in the quality of healthcare services provided to the Ghanaian population. A regional coordinator at HeFRA shared their experience, emphasising the impact of the digital addressing system:

“One of the most transformative aspects of the digital system has been our enhanced ability to identify underserved areas with remarkable precision. Before, it was a challenge to accurately determine which regions were lacking in healthcare services. Now, with the digital system, we can pinpoint these areas and focus our efforts on improving accessibility. This has been pivotal in our efforts to ensure that no community is left behind in healthcare provision.”

The coordinator further elaborated on the broader implications:

“As a result of this improvement in identification, we’ve been able to direct resources and support to where they’re most needed. This has led to better service delivery and a noticeable improvement in the quality of healthcare services. For instance, in certain area where healthcare facilities are scarce, we’ve been able to facilitate the establishment of new ones or enhance existing services. It’s rewarding to see how these efforts are directly benefiting the Ghanaian population, particularly in previously neglected areas. ...we are aware that there’s still a lot more to cover, however we’re tackling it in bits ...”

This response from the regional coordinator highlights the significant strides made in enhancing healthcare accessibility and improving infrastructure as a direct outcome of the implementation of the digital addressing system. It underscores the system's role in not only improving operational efficiency but also in driving tangible improvements in healthcare service delivery across Ghana.

5.4.2 Private Sector Organisations – The Case of ConGAS

ConGas, or Convenient Gas, a small-scale Ghanaian firm established in 2018 as a sole proprietorship, has carved a niche in the liquefied petroleum gas (LPG) supply industry with

its innovative approach to service delivery. Operating in a domain where safety and reliability are paramount, ConGas's mission is to provide LPG securely to residences and businesses, ensuring a consistent and dependable supply of this essential energy source.

At the heart of ConGas's operation is a customer-centric model that prioritises convenience, reliability, and safety, tailored to meet the needs of the Ghanaian market. The company enables LPG procurement through two primary channels that resonate with Ghanaian customers: phone calls and a user-friendly mobile application. This dual-channel approach caters to a wide range of customer preferences and technological access.

When a service request is received, ConGas's agents, trained to handle LPG with utmost care, are dispatched to the client's location. This doorstep service model is particularly significant in Ghana, where transporting gas cylinders poses logistical challenges for many consumers. The agents collect empty cylinders, refill them at the nearest filling stations, and safely return them to the clients' doorstep. This end-to-end service not only enhances convenience for Ghanaian customers but also ensures a safe and efficient process for obtaining LPG.

5.4.2.1 Pre-Digitalisation Era

Before the digitalisation of location addresses in Ghana, ConGas operated under a more traditional and less streamlined system. In this era, clients typically ordered LPG refills via phone calls, using landmarks and descriptive directions to communicate their locations. This method often required detailed explanations from clients, who had to guide ConGas's agents through a series of landmarks and sometimes even provide step-by-step directions over the phone. ConGas's agents would then navigate using these verbal instructions, which could be

quite challenging, especially in areas where landmarks were not well-defined or in newly developed neighbourhoods with less familiar surroundings. This reliance on landmark-based navigation often led to inefficiencies in delivery, including delays and occasional mix-ups in finding the correct addresses. Moreover, this system placed a significant burden on both the clients, who had to effectively communicate their location, and the delivery agents, who had to interpret these directions accurately. The whole process, while functional, was fraught with potential for errors and inefficiencies, hindering growth, underscoring the need for a more precise and reliable method of location identification.

ConGas's agents often found themselves navigating through complex routes, relying heavily on local knowledge and sometimes extensive back-and-forth communication with clients to identify the correct delivery locations. This not only slowed down the process but also increased the risk of errors in delivery, impacting customer satisfaction and operational efficiency. One client shared,

“There was a time I called ConGas for a refill having to explain my location using a nearby shop as a landmark. With all this, the agent still got lost and it took several calls and an extra hour before he finally arrived. It was frustrating and inconvenient.”

Another issue that clients frequently mentioned was the difficulty in communicating their locations to new delivery agents.

“Every time a new agent came, I had to go through the same process of explaining my address. Sometimes, I just wished there was a simpler way to tell them where I lived,” a long-term customer remarked.

This repetitive process was not only tiresome for the clients but also reflected the inefficiencies ingrained in the traditional addressing system.

Moreover, the inefficiency of the traditional addressing system posed challenges in scaling up ConGas's operations. Expanding services to new areas was particularly challenging as unfamiliarity with local landmarks made it difficult to establish reliable delivery routes. This limitation restricted ConGas's growth potential and ability to serve a broader customer base. Potential new customers in areas with poorly defined addresses expressed their reluctance to use ConGas's services.

“I wanted to try their services, but hearing about how hard it was for them to locate addresses in my area made me hesitant,” mentioned one resident.

5.4.2.2 Post-Digitalisation Era

In the era following Ghana's digitalisation in location addressing, ConGas has skilfully combined traditional service methods with the new digital system, creating a comprehensive approach to client management and service delivery. This hybrid model not only caters to the diverse preferences of their clientele but also strategically builds a database for future efficiency and convenience.

Under the traditional system, ConGas continued to accept orders through phone calls, where clients used landmarks and descriptive directions to communicate their locations. Despite the potential inefficiencies of this method, it remained an important option for clients less comfortable with digital technology. During these traditional deliveries, ConGas' agents played a crucial role in bridging the gap between the old and the new. Upon successfully

reaching a client's location, they collected the digital address from the GhanaPostGPS app. This information was then added to ConGas' comprehensive client database. *"Whenever we complete a traditional delivery, we make sure to record the digital address. This has gradually enriched our database, making future deliveries more efficient..."* explained a delivery agent from ConGas. During the conduct of deliveries, especially in response to traditional phone call orders, agents often encounter locations where internet access is limited. The offline functionality of the GhanaPostGPS app allows them to capture and record the digital addresses of these locations without the need for an active internet connection as evident in a delivery agent's response: *"In some areas we can't get internet connection and so we use the offline version of the GhanaPostGPS app. We still collect and save the digital addresses of our clients for future reference, and we do not need to spend money for data...."* For clients, the offline functionality of the app is particularly advantageous, ensuring that they can access the benefits of digital addressing even in areas with limited internet connectivity. This feature is especially valuable for those who might face challenges with internet access or affordability. A client pointed this out in a response, saying, *"I don't have to worry about buying data just to use the GhanaPostGPS app. It's a relief knowing I can still get accurate location services without the extra cost of internet data."*

Simultaneously, ConGas leveraged the capabilities of the digital addressing system for clients who preferred the newer method. These clients placed orders using the ConGas app, where they could easily provide their digital address from the GhanaPostGPS app. This integration streamlined the ordering process and significantly improved delivery precision. *"The digital system has really sped up our delivery process. Clients just share their digital address, and we find them without the hassle of navigating vague directions..."* a ConGas delivery agent commented.

This hybrid approach allowed ConGas to cater to a wider range of customer preferences and needs. The company effectively used technology to enhance its service delivery while not alienating clients accustomed to traditional methods. Over time, as the digital addresses collected during traditional deliveries were integrated into ConGas' database, the overall efficiency and accuracy of the delivery process were further enhanced. The CEO of ConGas noted, *"This combination of traditional and digital operations has not only helped us maintain our client base but also prepared us for a more technology-driven future in our operations."*

5.4.2.3 Outcomes of the Use of the Digital Addressing System

The introduction of Ghana's digital addressing system brought about significant changes for ConGas, and its clients. This shift, while streamlining certain processes, also presented notable downsides, particularly in adapting to a technology-centric model of operation and service delivery.

For ConGas, the move to a digital addressing system has greatly enhanced operational efficiency. The precise location data from the system has streamlined the delivery process, allowing for quicker and more accurate identification of clients' addresses. A ConGas delivery manager emphasised this benefit, noting,

"The digital addresses have definitely sped up our delivery times and reduced the errors we used to face with traditional addresses."

However, the reliance on this technology has introduced a unique set of challenges. The primary downside has been the need for both ConGas staff and clients to adapt to the use of a smartphone. This shift has not been seamless for everyone involved. Some employees,

particularly those accustomed to traditional methods of navigation and communication, have found the transition to digital technology challenging. An employee shared,

“I had to buy a smartphone to keep up with our new digital system at work. It was expensive for me and took a big chunk out of my budget. It was necessary for my job, but it wasn't easy to afford it.”

From the clients' perspective, while many have embraced the convenience of the digital system, it has also created a divide among users. Clients who are less familiar or comfortable with smartphone technology have struggled with this new method of communication. An older client of ConGas expressed their concerns, saying,

“I’ve always ordered my gas via phone call, using landmarks. Switching to a digital address that requires a smartphone has been quite difficult for me, I am however committed to learning and using this new system”.

Moreover, the accuracy of the digital system heavily relies on the correct input of the digital address by clients. Errors in inputting these addresses have led to mis-deliveries, causing inconvenience and frustration for both ConGas and its clients. A customer recounted an incident where a simple mistake in the digital address led to their gas being delivered to the wrong location, underscoring the potential for human error in this new system.

While the digital addressing system has brought efficiency and accuracy to ConGas' LPG delivery services, it has also highlighted the challenges of adapting to a technology-driven operation. These challenges underscore the need for ongoing training, support, and potentially more inclusive approaches to accommodate all clients, ensuring that the benefits of digitalisation are accessible to everyone, regardless of their comfort with technology.

5.5 Chapter Summary

This chapter described four cases in the implementation of the digital location addressing system and its use by both public-sector and private-sector organisations in Ghana. Each case detailed the digitalisation process for the respective organisations, covering the period before the digitalisation, the emergence of the digital address system, its deployment, usage, and the resulting outcomes. The next chapter will analyse the case descriptions using the extended DCT as the analytical lens



CHAPTER SIX

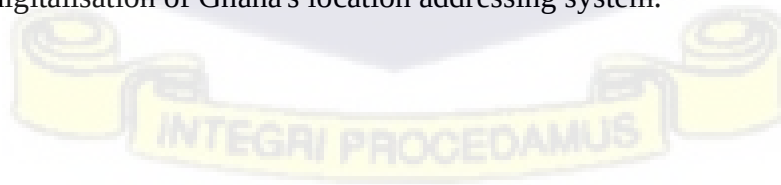
CASE ANALYSIS

6.1 Introduction

The previous chapter detailed four selected case studies, which encompassed two organisations implementing the digital address system and two organisations utilising it within the research context. This chapter undertakes an analysis of these case studies to understand the capabilities that enabled the implementation and use of Ghana's digital location addressing system. This analysis is grounded in the concepts and principles of an extended DCT, as outlined in Chapter Three. It commences with an analysis of the dynamic capabilities demonstrated in the implementation of the digital addressing system and its use for the cases presented in Chapter Five. Subsequently, a comparative analysis of the cases is presented. The chapter concludes with a summary.

6.2 Analysis of Digital Addressing System Implementation

This section offers an analysis of the dynamic capabilities that enabled both a public sector institution and a private sector firm collaborating as implementing organisations to effectively implement the digitalisation of Ghana's location addressing system.



6.2.1 The Case of GPCL

This section offers an analysis of the dynamic capabilities that enabled both a public sector institution and a private sector firm collaborating as implementing organisations to effectively implement the digitalisation of Ghana's location addressing system.

6.2.1.1 Analysis of the Era before Digitalisation

The pre-digitalisation era for GPCL was marked by an array of challenges that were deeply rooted in an outdated manual location addressing system. This system, reliant on landmark-based directions, was not just ineffective but had become an impediment to socio-economic development, affecting service delivery and growth prospects. GPCL faced significant challenges due to the manual and outdated addressing system, which resulted in delivery failures and increased costs, causing customer dissatisfaction. The rise in e-commerce and the presence of unplanned urban areas compounded these issues, pushing GPCL towards a potential collapse as customers moved to tech-savvy private couriers, impacting revenues. Recognising the need for change amidst a national push for digitalisation, GPCL viewed the NDPAS as essential for revitalising its operations and embracing digitalisation for long-term sustainability.

The opportunities and threats inherent in this manual system are the increasing operational costs, declining service quality, and growing customer dissatisfaction due to the inefficiency of traditional addressing methods. The system's inability to meet the rising demands of e-commerce and the complexities posed by rapid urbanisation highlighted significant threats to GPCL's operational viability. However, these challenges also presented opportunities through

the government's digitalisation agenda. Thus, based on this assessment, it became evident that the nation's traditional location addressing system required digitalisation to address these pressing issues and seize emerging opportunities.

6.2.1.2 Analysis of the Digitalisation Era

The digitalisation journey of Ghana's location addressing system, under GPCL's supervision began by the institution undertaking a comprehensive process to identify a suitable technological partner for the NDPAS initiative, Vokacom, which eventually initiated the meticulous implementation of the NDPAS into Ghana's existing digital infrastructure. A crucial aspect of this implementation was the inclusion of an open API feature, facilitating third-party development and ensuring GPCL's pivotal role in not just transforming its own operations but enhancing the broader digital ecosystem in Ghana.

The government's significant interest in implementing a digital location addressing system in Ghana, driven by its potential to revamp the financial sector and stimulate economic growth, created an environment that facilitated the legitimisation of the digitalisation initiative. This endorsement by the government not only underscored the critical opportunities and risks associated with the initiative but also established it as a national priority. As a result, GPCL was entrusted with the supervisory responsibilities for the initiative, reflecting the government's confidence in GPCL's ability to lead this transformative project. This government support provided GPCL with access to essential resources, streamlined navigation through legal and bureaucratic landscapes, secured funding, and subsidies, and allowed for the utilisation of public infrastructure and data. GPCL capitalised on the identified opportunities presented by the digitalisation of location addressing system through several strategic actions. By selecting

Vokacom as the technology partner, GPCL leveraged expertise in digital solutions to develop the NDPAS, addressing the inefficiencies of the manual system. The integration of NDPAS into Ghana's digital infrastructure ensured the transition from an imprecise, landmark-based addressing system to a precise, GPS-enabled digital system, effectively mitigating the threat of continued operational inefficiencies and customer dissatisfaction. Also, the introduction of an open API feature in the NDPAS that allowed for third-party development and integration, expanded the system's utility beyond postal services to support various sectors, including emergency services, financial services, and e-commerce. This action not only transformed GPCL to not only improved its operations through the implementation of the digital addressing system, but also emerged as a vital component of Ghana's expanding digital ecosystem. This transformation has led to increased customer engagement and the formation of new partnerships. Recognising the political landscape in Ghana, where projects initiated by previous administrations are often discontinued, GPCL acknowledged the importance of ensuring the digital addressing system's continuous refinement and advancement to promote sustained use. To achieve this, GPCL implemented strategies to integrate the system into daily operations and encourage widespread adoption across various institutions and firms, thereby solidifying its indispensability and reducing the likelihood of its discontinuation. The following sections provide a discussion of the capabilities that enabled the implementation of the digital addressing system.



6.2.1.3 Analysis of Sensing Capabilities that Enabled the Implementation of Digital Location Addressing System

GPCL recognised the diminishing effectiveness of its traditional addressing methods, noting escalating operational costs eroding profitability and sustainability, along with declining service quality evidenced by delivery delays, misdeliveries, and other logistical challenges, culminating in rising customer dissatisfaction. This heightened awareness went beyond mere identification of problems to grasp their underlying causes and future implications. GPCL understood that its outdated location addressing system not only hindered efficient service delivery but also risked market share loss in an increasingly competitive landscape due to negative customer experiences. Furthermore, the institution acknowledged that maintaining the status quo was unsustainable and could hinder seizing new opportunities in a digitally evolving era, particularly amidst urbanisation and e-commerce growth. By taking on the NDPAS, GPCL recognised both the technological challenges and opportunities, including complexities in data management, system integration and user adoption and adaptation.

Aligning with the government's vision for a modernised Ghana, GPCL leveraged the national digital agenda as a catalyst, further honing its sensing capabilities. This alignment enabled GPCL to not only address internal challenges but also contribute to the broader national digitalisation journey. Through this alignment, GPCL sharpened its awareness of technological challenges and opportunities, better preparing for the NDPAS implementation demands. Additionally, GPCL extended its sensing capabilities to assess the technological readiness of governmental departments and organisations integrating NDPAS, facilitating customised implementation plans to ensure seamless integration.

6.2.1.4 Analysis of Legitimising Capabilities that Enabled the Implementation of Digital Location Addressing System

The legitimising capabilities that facilitated the digitalisation of location addressing in Ghana through the GPCL reflect the crucial role of government support in enabling national digitalisation projects. The process began with the Vice President's public acknowledgment of the inefficiencies in the existing manual addressing system, setting the stage for a national digitalisation initiative. This public endorsement by a high-ranking government official not only highlighted the project's importance but also legitimised the need for a modernised addressing system as a national priority, thereby creating a conducive environment for GPCL's digitalisation efforts.

Moreover, this endorsement transcended verbal affirmation to tangible financial and logistical support, equipping GPCL with the essential tools and endorsement to spearhead the digitalisation endeavour. By delegating the mandate to oversee the NDPAS implementation to GPCL, the government effectively empowered the company to steer this transformative project. This empowerment included the authority to source technological partners, integrate the digital addressing system into national infrastructure, and ensure its widespread adoption and use. The involvement of various governmental bodies in the approval and oversight processes, such as the Entity Tender Committee of Ghana Post and the Central Tender Review Board of the Ministry of Finance, reflects the regulatory measures undertaken to ensure compliance with established legal and financial protocols.

6.2.1.5 Analysis of Seizing Capabilities that Enabled the Implementation of Digital Location Addressing System

Analysis of the seizing capabilities that enabled the implementation of the digital location addressing system reveals GPCL's ability to leverage opportunities for digitalisation. The institution effectively capitalised on the government's NDPAS initiative, aligning its operations with national priorities to address internal inefficiencies and enhance operational efficiency. Through meticulous partner selection, GPCL demonstrated its commitment to securing the most suitable collaborator, Vokacom, based on rigorous evaluation criteria, and the signing of a contract that signified formal commitment, ensuring the project's success. Additionally, GPCL's adept utilisation of budgetary support from the government underscores its ability to seize both technological and financial resources necessary for project execution.

In designing the NDPAS, GPCL displayed extensive planning and collaboration with partners like Vokacom and NITA, ensuring the system met national requirements for accuracy, reliability, and accessibility. The incorporation of features like an open API further highlighted the institution's commitment to foster ecosystem interoperability and innovation. Post-implementation, GPCL flexibly adapted to evolving circumstances such as changes in government policy. Through close collaboration with partners and government oversight, GPCL ensured seamless integration of NDPAS into Ghana's digital infrastructure, solidifying its commitment to project success and national digitalisation goals.

Moreover, GPCL's integration of NDPAS yielded operational efficiencies and potential new revenue streams by improving courier services through technology adoption. This highlights GPCL's ability to seize upon external developments to address internal challenges effectively. By positioning itself as a pivotal player in advancing Ghana's digitalisation agenda, GPCL not

only remedied its operational inefficiencies but also contributed significantly to national digital transformation efforts.

6.2.1.6 Analysis of Transforming Capabilities that Enabled the Implementation of Digital Location Addressing System

GPCL skilfully managed the deployment of the NDPAS throughout Ghana, demonstrating a strategic approach that went beyond mere implementation. Their expertise in logistics was critical in ensuring staff training, technological readiness at various levels, and effective collaboration with partners like NITA and Vokacom. Importantly, GPCL's role evolved to sustain the NDPAS, incorporating feedback mechanisms and performance evaluations to continually refine the system according to emerging needs and challenges. This adaptive strategy aimed not only at achieving immediate objectives but also at securing the system's long-term resilience and adaptability. By utilising insights from the initial deployment, GPCL was able to enhance the NDPAS, marking a significant advancement in Ghana's digital location services. This commitment to continuous renewal, adaptation, and strategic realignment underscores GPCL's dedication to not just resolving current operational challenges but also promoting a sustainable digital ecosystem for Ghana's socio-economic development. This holistic and iterative approach showcases GPCL's dynamic capabilities, reinforcing its crucial role in driving forward Ghana's digitalisation efforts and ensuring the enduring success and scalability of the NDPAS.

6.2.1.7 Analysis of Institutionalising Capabilities that Enabled the Implementation of Digital Location Addressing System

GPCL's institutionalising capabilities were evident in its proactive approach to facilitating the integration of the NDPAS with Ghana's existing digital infrastructure. By actively managing the day-to-day administration and maintenance of NDPAS, GPCL institutionalised a culture of continuous system optimisation and adaptation to meet evolving user needs. This proactive stance ensured that NDPAS remained functional and responsive to user requirements, thereby embedding a commitment to operational excellence within the organisation.

Moreover, GPCL's introduction of an open API feature exemplified its commitment to fostering technological innovation and enhancing interoperability across various sectors. By providing third-party developers with access to the NDPAS platform, GPCL encouraged the development of innovative applications and solutions that leveraged the system's capabilities. This approach not only expanded the reach and utility of NDPAS but also fostered a culture of collaboration and innovation within the broader digital ecosystem.

However, GPCL's experience also underscored the importance of flexibility and adaptation in institutionalising efforts. Despite initial projections of generating additional revenue through API integrations, GPCL had to pivot its revenue model in response to government policies promoting free access to NDPAS for public-sector entities. This required GPCL to re-evaluate its revenue-generation strategies and pivot towards alternative funding sources, revealing agility in responsive decision-making processes, an essential in institutionalising efforts.

6.2.2 The Case of Vokacom

The subsequent section provides an examination of Vokacom, the private sector implementing firm, covering its activities prior to the digitalisation era, during the digitalisation era, and the capabilities that facilitated its implementation of the digital location addressing system.

6.2.2.1 Analysis of the Era before Digitalisation

Vokacom, as a prominent player in the Ghanaian technology industry, had already established a solid reputation before undertaking the high-profile NDPAS project. Specialising in custom business software development, web services, data management, GIS, and mobile application development, Vokacom demonstrated its versatility and technical expertise across various sectors. Leveraging its expertise, the company provided tailored solutions to optimise business operations, enhance productivity, and refine processes. Vokacom's early involvement in GIS thus became relevant, laying the groundwork for its eventual success in the NDPAS project. To secure the contract, Vokacom painstakingly navigated the rigorous procurement process, carefully examining criteria, submitting comprehensive proposals, undergoing comparative reviews, and engaging in negotiations with reviewing authorities. This strategic approach, coupled with its track record of successful project execution, ultimately led to Vokacom being awarded the contract for developing the NDPAS. In essence, Vokacom illustrates a firm grounded in a strong foundation, possessing advanced technical skills, and dedicated to delivering cutting-edge technology solutions with a focus on excellence.

6.2.2.2 Analysis of the Digitalisation Era

The implementation of the NDPAS highlighted Vokacom's technical expertise in repurposing existing technology for new purposes. From the case description, it was clear how the firm leveraged its pre-existing digital mapping technology, initially developed for a real estate business, as the foundation for the NDPAS. This demonstrates the company's ability to adapt and repurpose existing solutions for new purposes, optimising resources and expediting the implementation process. This transformation involved careful reconfiguration and enhancement of the Asaase GPS system, including technical upgrades, user interface improvements, and the implementation of robust security measures, stressing Vokacom's commitment to meeting national needs and ensuring system reliability. Moreover, Vokacom engaged high-profile stakeholders through comprehensive presentations, securing buy-in and providing assurance of the system's capabilities. Beyond digital address generation, the GhanaPostGPS mobile app offers additional features such as emergency service requests, demonstrating Vokacom's dedication to improving public safety. Looking ahead, the introduction of future enhancements, including the Fameko navigation feature and integration of a virtual mailbox, underscores Vokacom's forward-thinking approach and commitment to continuous improvement, aligning with evolving user needs and technological advancements. The next sections present an analysis of the capabilities that enabled the implementation of the NDPAS from the perspective of Vokacom.

6.2.2.3 Analysis of Sensing Capabilities that Enabled the Implementation of the Digital Location Addressing System

Vokacom's adept sensing capabilities, as observed in their involvement with the NDPAS, was rooted in their diverse expertise and nuanced market understanding. Their prior engagement in various sectors, notably in GIS and digital mapping for real estate, provided valuable insights applicable to the national scale of the NDPAS project. Additionally, Vokacom's proactive stance in understanding public sentiment and societal discourse through active environmental scanning enabled them to gather real-time insights into user feedback and broader societal debates. By staying attuned to end-users' voices and societal discussions, Vokacom informed their current strategy to improve upon the digital solution. This capability, spanning from technological insight to societal awareness, underscores Vokacom's robust capabilities in navigating the complexities of the NDPAS project and positioning them as key contributors to Ghana's digitally integrated future.

6.2.2.4 Analysis of Legitimising Capabilities that Enabled the Implementation of Digital Location Addressing System

Several legitimising capabilities can be observed in Vokacom's journey outlined in the case description. Firstly, the firm's track record and reputation in the Ghanaian technology industry before undertaking the NDPAS project underscore its credibility and past successes. This is evident from Vokacom's established niche in GIS and offering innovative and reliable software solutions across various sectors. Additionally, Vokacom's adherence to a rigorous procurement process to secure the NDPAS contract proved its commitment to transparency and fairness in business practices. The engagement of high-profile stakeholders, including key government

officials, through comprehensive presentations further demonstrates Vokacom's efforts to gain buy-in and support, highlighting its legitimacy and trustworthiness. Furthermore, the firm's commitment to continuous improvement and user-centric design, as evidenced by the introduction of future enhancements to the NDPAS, reflects its responsiveness to evolving user needs and technological advancements, contributing to its credibility. Finally, Vokacom's proactive approach to addressing concerns about sustainability and technical challenges, coupled with plans for long-term viability, embodies its commitment to ensuring the success and acceptance of the NDPAS project. These legitimising capabilities underscore Vokacom's dedication to establishing trust, credibility, and acceptance among stakeholders throughout the implementation of the NDPAS.

6.2.2.5 Analysis of Seizing Capabilities that Enabled the Implementation of Digital Location Addressing System

Vokacom demonstrated a range of seizing capabilities in the digitalisation of location addressing through its involvement with Ghana's NDPAS. Foremost among these is its ability to adapt existing technology to meet new demands. Vokacom took its Asaase GPS system and made rigorous technical upgrades and modifications to align it with the objectives of the NDPAS. This adaptability not only highlights the company's technical prowess but also its strategic capability to seize new opportunities that arise in its operational environment.

Additionally, the company's skill in presenting a compelling case for its technology solution, evidenced by a presentation to high-ranking government officials, shows its expertise in strategic communication and stakeholder engagement. Their exhaustive preparation and

presentation can be seen as part of their seizing capabilities, ensuring they were selected for the project over other competitors.

Furthermore, Vokacom's ability to pivot and add new features like emergency service requests exemplifies its capacity to seize opportunities for value creation and customer engagement. Despite facing controversies around the project's cost and transparency, the company has continued to adapt its strategies, exemplified by the CEO's intent to make the app an "everyday tool," thereby ensuring its long-term viability.

Lastly, their broad range of services, from software development to web services and data management, suggests that Vokacom doesn't just identify opportunities; it acts on them effectively, underlining its robust seizing capabilities. The winning of the NDPAS contract was not just a testament to their technical capabilities but also to their ability to strategically align resources and make calculated decisions to seize significant opportunities.

6.2.2.6 Analysis of Transforming Capabilities that Enabled the Implementation of Digital Location Addressing System

Vokacom, a specialist in software solutions, demonstrated its transformative capabilities in the development of Ghana's digital location addressing system in several crucial ways. One of its most impactful contributions was the emphasis on user-friendly design. By developing an intuitive and easy-to-navigate interface, Vokacom significantly facilitated the system's widespread adoption. This was not only a technological milestone but also a transformative change in how end-users interact with digital location services. The user-friendly design

encouraged a broader range of people, including those less technologically adept, to engage with the system, directly contributing to its quick adoption and effectiveness.

Another pivotal contribution was Vokacom's stringent data integrity protocols, involving robust encryption technologies and regular audits and compliance checks. With location data being sensitive, maintaining data integrity is crucial for building trust among diverse end-users, including citizens, businesses, and government bodies. Trust is a key factor for the widespread acceptance and integration of any technology, especially those that deal with sensitive data. Vokacom's efforts have thus significantly strengthened the system's credibility.

The implementation of an offline version of the GhanaPost GPS app further underlines Vokacom's transformative capabilities. This feature makes the app more accessible, especially in rural or less-developed areas where internet connectivity can be poor. This not only addresses technological needs but also tackles socio-economic disparities, making the system more equitable. It also demonstrates the NDPAS's resilience and adaptability, making it a more robust solution for national location addressing. The challenge of maintaining stringent data integrity while offering offline functionality stands as a testament to Vokacom's ability to provide secure and efficient solutions.

Vokacom went beyond mere technical contributions. It transformed user experiences and built a level of trust essential for any public digital infrastructure's widespread and sustained use. The company effectively combined technological innovation with an in-depth understanding of user needs and security concerns, proving its transformative capabilities in creating an effective, secure, and inclusive digital location service for Ghana.

6.2.2.7 Analysis of Institutionalising Capabilities that Enabled the Implementation of Digital Location Addressing System

Vokacom's institutionalising capability for resilience and adaptation in the post-digitalisation era was evident in its proactive measures to address emerging challenges and ensure the sustainability of the NDPAS initiative. By emphasising the transformation of the GhanaPostGPS mobile app into an everyday tool, Vokacom demonstrated its commitment to embedding the digital addressing system into the daily lives of Ghanaians. This strategic move aligns with Vokacom's history of leveraging existing technology and refining it to meet evolving needs, as seen in its earlier ventures into GIS and mobile application development.

Furthermore, Vokacom's plans for ongoing monitoring, evaluation, and research and development underscore its institutionalised approach to continuous improvement. This commitment to refinement and innovation reflects the company's understanding of the importance of adapting to changing circumstances and stakeholder needs. The case highlights Vokacom's proactive stance in addressing challenges such as user disengagement and technical integration issues, demonstrating its ability to institutionalise processes for feedback incorporation and solution development.

In effect, Vokacom's institutionalising capabilities are integral to the sustainability of the NDPAS initiative. By embedding practices for ongoing monitoring, evaluation, and adaptation into its organisational framework, Vokacom ensures that the digital addressing system remains relevant and effective in the long run.

6.3 Analysis of the Usage of the Digital Addressing System

This section analyses the dynamic capabilities that have enabled both public and private sector institutions and firms to effectively leverage digital addressing to meet the evolving demands of their operations.

6.3.1 The Case of HeFRA

The case of HeFRA provides a compelling illustration of the transformative impact of the NDPAS on public-sector agencies. HeFRA, tasked with overseeing healthcare facilities and ensuring compliance with care standards, faced numerous challenges before the digitalisation of Ghana's location address system. However, the adoption of NDPAS ushered in a new era for HeFRA, enabling it to overcome these challenges. This analysis delves into HeFRA's experience with NDPAS, examining how its sensing, legitimising, seizing, transforming, and institutionalising capabilities facilitated the adoption and utilisation of the digital addressing system, ultimately leading to significant improvements in healthcare regulation and service provision.

6.3.1.1 Analysis of the Pre-Digitalisation Era

Before the digitalisation of Ghana's location address system, HeFRA encountered considerable obstacles in its operational processes, as described in the case. The institution heavily depended on traditional methods to locate health facilities, resulting in various inefficiencies and operational challenges. These challenges included delays, heightened operational costs, and

compromised regulatory oversight due to the reliance on imprecise location information. As evidenced in the case, HeFRA personnel faced difficulties in locating healthcare facilities, particularly in rural or new settlements, leading to prolonged and convoluted journeys that impeded their ability to conduct timely inspections. Moreover, the lack of accurate facility mapping, and data management further exacerbated these challenges, hindering HeFRA's capacity for policy formulation and equitable service delivery. The inaccurate facility mapping not only impeded regulatory oversight but also perpetuated disparities in healthcare service delivery, particularly in underserved areas with poorly defined addresses. These insights underscore the need for digitalisation in addressing HeFRA's operational challenges and improving regulatory efficiency and effectiveness.

6.3.1.2 Analysis of the Digitalisation Era

Following the digitalisation of the location address system, HeFRA underwent a profound transformation in its operations. The adoption of NDPAS enabled HeFRA to accurately locate and map healthcare facilities, improving regulatory compliance, emergency response coordination, policy development, and stakeholder engagement. The precise location data facilitated more efficient planning of compliance visits, enhanced emergency response, and enabled data-driven decision-making. By leveraging accurate and reliable location information, HeFRA could strategically allocate resources to areas with the greatest need and develop healthcare policies based on comprehensive and up-to-date data.

6.3.1.3 Analysis of Sensing Capabilities that Enabled Usage of the Digital Location Addressing System

Before the digitalisation era, HeFRA faced significant challenges due to the inefficiencies of traditional location addressing methods. These issues led to operational delays, increased costs, and compromised regulatory oversight. HeFRA's early recognition of the NDPAS as a solution to these problems emphasised its strong sensing capabilities, the ability to identify and respond to external changes and technological advancements.

Understanding the limitations of traditional methods as more than mere inconveniences, HeFRA saw them as significant barriers to fulfilling its mission of ensuring quality healthcare services. The agency's strategic decision to adopt NDPAS was rooted in an understanding of the potential of digitalisation to enhance operational efficiency and regulatory effectiveness. This move illustrated HeFRA's foresight in leveraging technological tools to streamline regulatory processes, improve emergency responses, and ultimately, better serve the healthcare system.

6.3.1.4 Analysis of Legitimising Capabilities that Enabled Usage of the Digital Location Addressing System

The legitimising capabilities of HeFRA during the implementation of the NDPAS facilitated its effective utilisation of the digital location addressing system in several ways. Firstly, the legal authority granted to HeFRA by the Health Institutions and Facilities Act, 2011 (Act 829), established a solid foundation for its role in overseeing healthcare facilities and enforcing compliance with care standards. This legal legitimacy empowered HeFRA to embrace and

enforce the usage of the NDPAS within the healthcare sector, ensuring its integration into regulatory practices with confidence and authority. Secondly, the government's endorsement of the NDPAS initiative as part of broader digitalisation efforts provided further legitimacy to HeFRA's adoption of the system. By aligning itself with a government-backed initiative, HeFRA positioned itself as a proactive and forward-thinking regulatory agency, thereby legitimising its role in leveraging digital innovation to enhance healthcare oversight. Additionally, HeFRA's commitment to transparency and accountability in its regulatory activities serves as a legitimising capability that strengthens HeFRA's authority and credibility, facilitating the adoption and utilisation of the digital location addressing system. By maintaining transparency and accountability, HeFRA enhances its legitimacy as a regulatory authority in the eyes of stakeholders. This legitimacy enables HeFRA to effectively communicate the benefits of initiatives like the NDPAS, garnering support and cooperation for their implementation.

6.3.1.5 Analysis of Seizing Capabilities that Enabled Usage of the Digital Location Addressing System

Seizing refers to an organisation's ability to capitalise on identified opportunities by reconfiguring its resources and operations in alignment with these new possibilities. HeFRA's adoption of the NDPAS for regulatory purposes is a clear demonstration of seizing capabilities. Once the opportunity of digitalisation was identified, HeFRA proactively engaged with the new system. Key actions taken by HeFRA, such as updating its regulatory processes to incorporate digital addresses, initiating digital mapping activities for the precise location of healthcare facilities, training staff to proficiently utilise the new system, and restructuring

internal workflows—including using NDPAS data to plan and schedule inspections more efficiently and optimising routes based on the digital addresses of healthcare facilities—underscore a comprehensive approach to seizing the opportunities afforded by digitalisation. Additionally, HeFRA has encouraged citizens to report issues of non-compliance easily using digital addresses, thereby fostering community involvement in regulatory oversight.

These steps demonstrate that HeFRA has gone beyond mere recognition of the potential of digital addressing; the agency has effectively demonstrated seizing capabilities by actively reconfiguring its operational and organisational frameworks to harness the advantages of the NDPAS. Through these strategic adaptations, HeFRA has skilfully seized the opportunities presented by digitalisation, showcasing a dynamic application of seizing capabilities to enhance regulatory efficiency and stakeholder engagement.

6.3.1.6 Analysis of Transforming Capabilities that Enabled Usage of the Digital Location Addressing System

The transformation of HeFRA's operations through the utilisation of the NDPAS encapsulates its transforming capabilities. This phase involved more than the adoption of new technology; it required a fundamental change in how HeFRA conducted its regulatory activities. By integrating digital addresses into its operations, HeFRA was able to significantly improve the efficiency and effectiveness of its regulatory oversight. This included more accurate location and mapping of healthcare facilities, enhanced planning and execution of compliance visits, and improved emergency response coordination. Furthermore, the digitalisation enabled HeFRA to engage more effectively with stakeholders, including the public, through the easier reporting of non-compliant facilities. The transformation also extended to HeFRA's internal

data management and policy formulation processes, where the availability of accurate location data facilitated more informed decision-making and resource allocation. The agency's ability to continuously update its database with precise geographical locations of healthcare facilities signifies an ongoing transformation process, underpinned by a commitment to leveraging digital capabilities for continuous improvement.

6.3.1.7 Analysis of Institutionalising Capabilities that Enabled Usage of the Digital Location Addressing System

HeFRA's experience with NDPAS exemplifies its institutionalising capabilities in embracing technological innovations and adapting to evolving operational needs. The agency's ongoing efforts to update its database, enhance regulatory oversight, and address community needs reflect its commitment to continuous improvement and adaptation in healthcare regulation.

By diligently updating its database with the precise geographical locations of healthcare facilities provided by the NDPAS, HeFRA not only enhances the accuracy of its regulatory oversight but also streamlines the process of conducting compliance visits. This strategic use of digital location data enables a more efficient allocation of regulatory resources, ensuring that healthcare facilities across the country, regardless of their size or location, meet established healthcare standards.

Moreover, HeFRA's efforts to continuously refine its use of the NDPAS illustrate an adaptive approach to technological integration. This is not merely about adopting a new system but about rethinking and restructuring regulatory workflows to maximise the benefits of digital innovations.

HeFRA's initiative to address community needs through the digital location data further exemplifies its commitment to leveraging digitalisation for broader societal benefits. By making it easier for citizens to report non-compliant healthcare facilities, HeFRA enhances public engagement in the regulatory process, thereby increasing transparency and accountability in healthcare services. This participatory approach to regulation is reflective of the growing emphasis on citizen-centric governance models, where technology is used to bridge the gap between government agencies and the communities they serve.

6.3.1.8 Analysis of Outcomes of the Usage of the Digital Location Addressing System

HeFRA's engagement with the NDPAS showcases its institutionalising capabilities in embracing technological innovations and evolving to meet dynamic operational demands within the healthcare sector. By actively updating its database with precise geographical locations of healthcare facilities, HeFRA demonstrates a proactive approach to improving regulatory oversight and ensuring data accuracy. This commitment to maintaining an up-to-date database underscores HeFRA's dedication to continuous improvement and responsiveness to changing regulatory requirements. Additionally, HeFRA's endeavours to enhance regulatory oversight and address community needs highlight its adaptability in leveraging technology to better serve the public. Through initiatives aimed at improving emergency response coordination, policy development, and stakeholder engagement, HeFRA demonstrated its capacity to evolve and innovate in response to emerging challenges and opportunities within the healthcare landscape.

6.3.2 The Case of ConGas

This section presents an analysis of ConGas' case within the framework of the Extended DCT. It delves into ConGas' operations before and after digitalisation of Ghana's location addressing system and examines its adaptation to technological innovations facilitated by the NDPAS.

6.3.2.1 Analysis of the Pre-Digitalisation Era

In the pre-digitalisation era, ConGas faced several challenges in its operations within Ghana's LPG supply industry. The company operated under a traditional system where clients placed orders for LPG refills via phone calls, providing directions based on landmarks and descriptive explanations of their locations. This method often led to inefficiencies and delays in delivery, as the verbal instructions provided by clients were sometimes unclear or difficult to interpret. ConGas's delivery agents navigated through complex routes, relying heavily on local knowledge and back-and-forth communication with clients to identify the correct delivery locations. As a result, the delivery process was often slow, prone to errors, and frustrating for both clients and delivery agents. Moreover, the reliance on traditional addressing methods posed challenges in scaling up ConGas's operations to new areas, as unfamiliarity with local landmarks made it difficult to establish reliable delivery routes. Potential customers in areas with poorly defined addresses expressed reluctance to use ConGas's services, further hindering the company's growth potential. Overall, the pre-digitalisation era for ConGas was characterised by inefficiencies in delivery, logistical challenges, and limitations in serving a broader customer base due to the reliance on traditional addressing methods.

6.3.2.2 Analysis of the Era of Digitalisation

In the era of digitalisation, ConGas underwent a transformative shift in its operations, leveraging technological advancements to enhance its service delivery and overcome the challenges faced during the pre-digitalisation era. The company adopted a hybrid model that combined traditional service methods with the new digital addressing system introduced in Ghana. Under this model, clients continued to place orders through phone calls, but ConGas's agents also utilised the GhanaPostGPS app to collect digital addresses during traditional deliveries. This approach allowed the company to gradually build a comprehensive database of digital addresses while still catering to clients less comfortable with digital technology. Additionally, clients who preferred the newer method could place orders using the ConGas app, streamlining the ordering process, and significantly improving delivery precision. The integration of digital addresses into ConGas's database enhanced overall efficiency and accuracy in the delivery process over time. While the digitalisation era brought about operational efficiencies for ConGas, it also presented challenges, particularly in adapting to a technology-centric model and ensuring inclusivity for clients less familiar with smartphone technology. However, despite these challenges, the company successfully navigated the transition to digitalisation, enhancing its service delivery and preparing for a more technology-driven future in its operations.

6.3.2.3 Analysis of Sensing Capabilities that Enabled Usage of the Digital Location Addressing System

ConGas effectively utilised sensing capabilities to adapt and leverage the digital location addressing system, enabling efficient usage of the technology. Firstly, the company

demonstrated keen awareness of the limitations and inefficiencies inherent in the pre-digitalisation era, where reliance on traditional methods led to operational challenges and customer dissatisfaction. Sensing these shortcomings prompted ConGas to seek out and embrace the digital location addressing system as a solution to enhance its service delivery. Secondly, the company exhibited agility in recognising the potential of the new system and quickly adapting its operations to incorporate digital technology. By embracing a hybrid model that combined traditional phone call orders with digital address collection, ConGas ensured inclusivity for all customers while gradually transitioning towards a more technology-driven approach. Additionally, ConGas displayed astute sensing capabilities by understanding the diverse needs and preferences of its customer base. The company recognised that while some customers may readily adopt digital methods, others may prefer traditional communication channels. Therefore, ConGas provided options for both segments, allowing customers to choose the method that best suited their comfort level with technology. This customer-centric approach enabled ConGas to effectively utilise the digital location addressing system while ensuring inclusivity and customer satisfaction. Overall, ConGas's sensing capabilities played a crucial role in facilitating the successful adoption and usage of the digital location addressing system, enabling the company to enhance its service delivery and operational efficiency.

6.3.2.4 Analysis of Legitimising Capabilities that Enabled Usage of the Digital Location Addressing System

ConGas effectively leveraged legitimising capabilities to facilitate its adoption and usage of the digital location addressing system. Firstly, the company established its legitimacy by recognising the importance of safety and reliability in the LPG supply industry and committing

to providing secure and dependable services to its customers. This commitment to safety and reliability established ConGas as a trustworthy player in the market, enhancing its credibility when introducing new technologies like the digital addressing system. Secondly, ConGas capitalised on existing regulatory frameworks and industry standards to legitimise its adoption of the digital system. By adhering to safety regulations and aligning its operations with industry best practices, ConGas demonstrated its commitment to compliance and professionalism, further legitimising its use of the digital location addressing system. Additionally, the company effectively communicated the benefits of the digital system to its stakeholders, including customers, employees, and regulatory authorities. By highlighting how the digital system improved efficiency, accuracy, and customer satisfaction, ConGas garnered support and buy-in for its adoption of the technology, further legitimising its usage. Overall, ConGas's legitimising capabilities, including its commitment to safety, adherence to regulations, and effective communication strategies, played a crucial role in enabling the successful adoption and usage of the digital location addressing system.

6.3.2.5 Analysis of Seizing Capabilities that Enabled Usage of the Digital Location Addressing System

ConGas demonstrated significant seizing capabilities that facilitated its adoption and usage of addresses generated from the digital location addressing system. Firstly, the company exhibited agility and adaptability by recognising the limitations of the traditional addressing system and seizing the opportunity to embrace addresses generated from digital innovation to overcome these challenges. By swiftly recognising the need for a more efficient and accurate method of locating customers, ConGas demonstrated its proactive approach to addressing operational

inefficiencies. Secondly, ConGas displayed a capacity for innovation by integrating the addresses generated from the digital addressing system into its existing service model in a seamless and customer-centric manner. Rather than viewing the digital system as a standalone technology, ConGas integrated addresses generated from it into its operations to enhance customer convenience and streamline service delivery. This innovative approach allowed ConGas to differentiate itself in the market by offering a more efficient and user-friendly service experience. Additionally, the company showed a willingness to invest in technology and infrastructure to support the implementation of addresses generated from the digital addressing system. By providing training and support to employees and ensuring the availability of necessary resources, ConGas demonstrated its commitment to leveraging technology to improve its operations. Overall, ConGas's seizing capabilities, including agility, innovation, and investment, were instrumental in enabling the successful adoption and usage of addresses generated from the digital location addressing system.

6.3.2.6 Analysis of Transforming Capabilities that Enabled Usage of the Digital Location Addressing System

ConGas's adept integration of data from the digital location addressing system into its operations exhibits its remarkable transforming capabilities, highlighting a strategic shift towards enhancing operational efficiency and customer satisfaction. By incorporating the use of data from the GhanaPostGPSApp into its core processes, ConGas refined its service delivery model to cater to a broad spectrum of customer preferences, balancing technological advancement with traditional service methods. This approach not only improved the precision of deliveries but also elevated the customer experience by alleviating the challenges of manual,

landmark-based navigation. Furthermore, ConGas demonstrated a commitment to continuous improvement and adaptation, leveraging the digital system to build a comprehensive client database for future operational enhancements and data-driven decision-making. Through these efforts, ConGas exemplified its ability to navigate the digitalisation dynamics, illustrating its capacity for strategic agility and innovation in response to evolving market demands and technological opportunities.

6.3.2.7 Analysis of Institutionalising Capabilities that Enabled Usage of the Digital Location Addressing System

ConGas leveraged its institutionalising capabilities to effectively integrate digital addresses generated from the NDPAS into its operations. The firm adeptly combined traditional service methods with the new digital system, creating a comprehensive approach to client management and service delivery. By embracing this hybrid model, ConGas catered to a wider range of customer preferences and needs while strategically building a database for future efficiency and convenience. This integration of digital addresses into its service model not only enhanced operational efficiency but also prepared ConGas for a more technology-driven future in its operations.

Under this hybrid approach, ConGas continued to accept orders through traditional phone calls, allowing clients less comfortable with digital technology to communicate their locations using landmarks and descriptive directions. However, the firm's agents skilfully bridged the gap between traditional and digital methods by collecting digital addresses from the GhanaPostGPS

app during deliveries. This dual-channel approach ensured that ConGas could accommodate clients accustomed to both traditional and digital ordering methods, thereby enhancing customer satisfaction and retention. Additionally, the offline functionality of the GhanaPostGPS app enabled agents to capture digital addresses even in areas with limited internet connectivity, further extending the reach and effectiveness of ConGas's service delivery.

While the adoption of digital addresses streamlined certain processes and enhanced operational efficiency for ConGas, it also presented challenges related to technological adaptation. Both employees and clients had to adapt to the use of smartphones and digital addresses, which proved to be a hurdle for some individuals. Furthermore, the reliance on the accuracy of digital addresses introduced the potential for errors in inputting these addresses, leading to misdeliveries and customer dissatisfaction. Despite these challenges, ConGas's institutionalising capabilities enabled the firm to navigate the transition to a technology-driven operation effectively, emphasising the importance of ongoing training, support, and inclusivity in ensuring the successful adoption of digital innovations.

6.3.2.8 Analysis of Outcomes of the Digital Location Addressing System Usage

The use of data from the NDPAS has significantly enhanced operational efficiency, customer satisfaction, and business expansion potential for ConGas. Transitioning from an entirely manual, landmark-based system to NDPAS enabled precise location identification, streamlining delivery processes, reducing logistical errors, and cutting operational costs. This

shift has significantly improved customer experiences by providing reliable and prompt service, thereby strengthening trust and loyalty towards ConGas. Furthermore, adopting digital addressing opened new avenues for business growth, enabling ConGas to access previously inaccessible areas and broaden its market reach. The digital addressing system not only improved ConGas's immediate operational metrics but also positioned it for sustainable growth and innovation in its industry, exemplifying the transformative power of digital addressing in enhancing business efficiency and customer engagement.

6.4 Cross Case Analysis

In this section, a cross-case analysis synthesising the individual evaluations of the extended dynamic capabilities exhibited by each case study involved in the digitalisation and use of Ghana's location address system is presented. The purpose is to identify similarities and discrepancies across these cases.

6.4.1 Similarities and Differences across Cases Institutions and Firms

A cross analysis of the cases reveal several similarities and differences across their digitalisation experiences, shedding light on common themes that resonate with broader digitalisation efforts. This analysis highlights critical success factors and challenges that are instrumental in understanding the dynamics of integrating digital technologies across different sectors in any national digitalisation endeavour. A key observation is the universal acknowledgment of digitalisation's pivotal role in addressing operational inefficiencies and enhancing service delivery. All four institutions and firms recognised the transformative

potential of digital technologies for modernising operations, improving competitiveness, meeting evolving stakeholder expectations and to address longstanding inefficiencies and open new avenues for innovation and growth. The consensus on digitalisation's importance underscores its role as a fundamental driver of innovation and growth in today's economy.

Another significant similarity among the cases is the crucial role of government support in legitimising and facilitating digital initiatives. Both GPCL and HeFRA benefited significantly from governmental endorsement, which not only provided a conducive environment for the implementation, adoption, and integration of the NDPAS but also helped in overcoming bureaucratic and regulatory hurdles. This support was not limited to public sector institutions; private sector firms like Vokacom also highlighted the importance of government buy-in for the success of national digitalisation projects. Government support manifested in various forms, including policy frameworks, financial resources, and public endorsements, highlighting the government's role as an enabler of digitalisation at a national level.

The cases also demonstrated remarkable adaptability and innovation, with GPCL and Vokacom embarking on comprehensive planning and technological development, while HeFRA and ConGas adapted existing digital tools to meet specific operational needs. This adaptability was key in navigating the challenges associated with digitalisation, which varied across the cases. Public sector institutions faced challenges related to integrating digital systems into legacy operations and gaining public acceptance, while private sector firms like Vokacom and ConGas navigated technological development, market adaptation, and customer engagement challenges.

Despite the acknowledged importance of digitalisation and the support structures in place, all cases faced challenges related to digital adoption and integration. These ranged from

integrating the NDPAS into existing operations and gaining public acceptance in the public sector to navigating market adaptation and customer engagement in the private sector. These challenges underscore the multifaceted nature of national-level digitalisation, which requires addressing technological, organisational, and cultural dimensions to achieve successful integration.

The outcomes across all cases highlight the significant improvement in operational efficiency and service delivery resulting from digital integration. The utilisation of the digital addresses into their workflows led to more accurate and timely deliveries, streamlined service development, improved regulatory oversight, and facility mapping. This underscores the tangible benefits of digitalisation in enhancing organisational performance and customer satisfaction.

Across board, digitalisation was recognised not merely as a technological upgrade but as a strategic necessity for modernising services and meeting the evolving demands of stakeholders. Vokacom and GPCL seized the opportunity to develop and implement NDPAS, contributing to national infrastructure and enhancing operational efficiency. HeFRA and ConGas leveraged NDPAS to address specific challenges in healthcare facility regulation and LPG delivery logistics, respectively, viewing digitalisation as a means to enhance service delivery, improve customer experiences, and expand market reach.

Despite facing many-sided challenges, these institutions and firms demonstrated commitment to improving service delivery through NDPAS implementation and use. However, the specific objectives, strategies, outcomes, and challenges highlight the diverse ways in which national-level digitalisation can manifest and be navigated across different sectors and organisational contexts.

GPCL and HeFRA, representing public sector institutions, primarily focused on leveraging digitalisation to enhance service delivery and operational efficiency within their respective mandates—postal/courier services for GPCL and healthcare facility regulation for HeFRA. Their digitalisation efforts aimed at broader socio-economic benefits, such as improved public service delivery and enhanced regulatory oversight. Vokacom, as a private technology firm, centred its digitalisation efforts on developing and implementing a national digital addressing system, showcasing a focus on technological innovation and project execution. Vokacom's goals were more aligned with enabling digital infrastructure and fostering technological advancement across sectors. ConGas, operating in the private sector, targeted operational efficiency, and customer satisfaction in its LPG delivery service. Its use of digitalisation was primarily aimed at overcoming logistical challenges and expanding market reach, demonstrating a direct link between digital adoption and business growth.

GPCL embarked on a comprehensive process involving the selection of a technological partner and the integration of digital addressing into the national postal/courier system, illustrating a top-down approach to digitalisation that involves extensive planning and system-wide changes.

Vokacom centred on technological development, including the adaptation of existing technology (Asaase GPS) for the NDPAS initiative. This reflects a focus on innovation and technical solutions to national challenges. Both HeFRA and ConGas adapted the NDPAS to their specific needs, revealing a more pragmatic and operational approach to digitalisation. HeFRA used the digital addressing system to improve regulatory oversight and emergency responses, while ConGas leveraged it for more efficient delivery processes.

The challenges encountered by these institutions and firms also differed based on their operational contexts. GPCL and HeFRA navigated challenges related to integrating the

NDPAS into legacy operations, public acceptance, and ensuring stakeholder engagement in a public sector context. Vokacom faced challenges in technological development, stakeholder engagement at a national level, and managing expectations for a project with wide-ranging implications. ConGas dealt with operational challenges, including customer adaptation to new technology and the logistics of integrating digital addresses into its delivery processes.

Additionally, the impact on and approach to stakeholder engagement varied significantly. GPCL and HeFRA had to engage a broad spectrum of stakeholders, from the public to specific regulatory bodies, underlining the importance of building consensus and trust in public sector initiatives. Vokacom's stakeholder engagement was critical at the initial stages, particularly in securing government buy-in and public trust for the national digital addressing system. ConGas's engagement was more focused on its customer base and internal operations, emphasising the need for clear communication and training to ensure smooth adoption of the digital addressing system.

Each case also presented peculiarities in the digitalisation journey. GPCL played a strategic role in not only transforming postal services but also in enhancing Ghana's broader digital ecosystem. Vokacom's technical innovation, particularly its repurposing of the Asaase GPS for the national digital addressing system, underscored the private sector's potential to contribute to public goals. HeFRA's application of digital addressing in healthcare regulation highlighted digital tools' transformative impact on public sector oversight and policy implementation. Meanwhile, ConGas's hybrid approach to digital and traditional methods offered a pragmatic model for digitalisation in contexts with varied technology adoption rates among the population.

6.4.2 Impacts of Digitalised Location Addressing System on Institutions and Firms

The implementation and usage of the digitalised location addressing system in Ghana, as illustrated through the experiences of the selected institutions and firms for this research, offer insightful reflections on the many-sided impacts of digitalisation across different sectors. This cross-analysis reveals the profound impacts of digitalisation on operational efficiency, service delivery, regulatory oversight, and market expansion. Across these diverse sectors, the introduction of the digital addressing system ushered in significant enhancements in operational efficiency and service delivery. GPCL's transformation from a traditional, landmark-based system to a digitalised one, with Vokacom's technical support, notably improved courier service precision and reliability. Similarly, ConGas harnessed the digital addressing system to refine its LPG delivery services, demonstrating the system's utility beyond the public sector. The adoption of digital addresses allowed for more accurate delivery routes, reduced operational costs, and enhanced customer satisfaction by minimising delays and errors. This transformation underscores the digital addressing system's capacity to streamline logistical processes and elevate service standards.

The impact of digitalisation on regulatory oversight is particularly evident in the case of HeFRA. The agency's integration of the digital location addressing system into its operations revolutionised its approach to monitoring and ensuring compliance among healthcare facilities. By facilitating accurate location and mapping of healthcare institutions, the system enabled more efficient planning of compliance visits and improved emergency response coordination. This transition highlights the digital addressing system's role in enhancing regulatory effectiveness and policy development within the healthcare sector, contributing to more equitable and quality healthcare service delivery.

The digital addressing system also played a crucial role in market expansion, especially for private sector firms like ConGas. By overcoming the limitations of traditional addressing methods, the system enabled ConGas to access previously unreachable markets and customer segments. This expansion illustrates the system's potential to open up new business opportunities and drive economic growth, showcasing the broader economic implications of digitalisation.

The varied levels of technology adoption among the population highlighted the importance of inclusivity in digital initiatives. ConGas's adoption of a hybrid service model, blending traditional and digital addressing methods, emphasises the need for digitalisation strategies that accommodate diverse user preferences and technology comfort levels, ensuring broad accessibility and utilisation of new technologies.

A pivotal factor in the successful implementation and widespread adoption of the digitalised location addressing system is government support. The collaboration between public institutions like GPCL and private firms such as Vokacom, facilitated by governmental endorsement and resources, exemplifies the collaborative potential of public-private partnerships in driving national digitalisation efforts. This cooperation not only ensures the system's integration into Ghana's digital infrastructure but also solidifies its role in the country's socio-economic development.

6.5 Chapter Summary

This chapter employed the framework of the extended dynamic capabilities theory to analyse the case institutions' roles in the implementation of the digital location addressing system and

its use by selected firms, as described in the preceding chapter. Through this lens, the analysis scrutinised the specific dynamic capabilities exhibited by each case institution and firm. It assessed their sensing capabilities in recognising the need for digital location addressing systems, their legitimising capabilities in adopting and using these systems, their seizing capabilities in leveraging the opportunities presented by the systems, their transforming capabilities in adapting to technological changes, and their institutionalising capabilities in embedding these systems into their organisational practices and processes. By examining these capabilities, the chapter aimed to provide insights into the strategies and approaches employed by the case institutions and firms to harness digital technologies for addressing system implementation and usage. In the next chapter, the findings from the case descriptions and the analysis in this chapter are discussed in conjunction with the literature review in Chapter 2.



CHAPTER SEVEN

DISCUSSION OF FINDINGS

7.1 Introduction

The previous chapter concentrated on examining the case findings through the lens of an extended dynamic capabilities theory, specifically focusing on the dynamic capabilities that enabled each case organisation contribution to the implementation and/or use of the digital location addressing system. It also included a cross-analysis of these cases to deepen the understanding of dynamic capabilities in action. The current chapter discusses and interprets the study's findings from Chapter 6 in relation to the research questions and the literature review in Chapters 1 and 2 respectively. This chapter begins with a discussion on the meaning the institutions and firms in a developing country ascribe to the digitalisation of location addressing system. The next section explores the capabilities that enable the implementation and use of a developing nation's location address system. Subsequently, the chapter delves into the outcomes of digitalisation in the realm of location addressing systems in DCs. Finally, the researcher's reflections on extending and utilising DCT for this study are presented. The chapter concludes with a summary.

7.2 Meanings Institutions and Firms Associate with the Digital Location Addressing Systems in a Developing Country

The institutions and firms studied in the digitalisation and usage of Ghana's location addressing system ascribe significant meanings and values to the initiative. Operating in a developing country, these entities view digital location addressing systems as possessing transformative

potential for socio-economic development, operational efficiency, inclusivity, and enhanced quality of life. They perceive digitalisation not merely as a tactical response to overcome inefficiencies and modernise operations but as a strategic imperative and a catalyst for widespread socio-economic growth and innovation. This perception is deeply rooted in their first-hand experiences with the limitations of outdated systems and the opportunities presented by the NDPAS. This system has been instrumental in improving service delivery, reaching underserved populations to ensure inclusivity, and streamlining operations across both governmental and business sectors.

7.2.1 Catalyst for Operational Efficiency, Socio-Economic Development and Inclusivity

The digital addressing system is fundamentally viewed as a catalyst for socio-economic inclusivity, aimed at narrowing the gap between served and underserved segments of society. By introducing a precise, GPS-enabled digital addressing framework, the NDPAS has significantly improved the provision of services across various demographics, enhancing business operations and service quality across both public and private sectors, notably benefiting those previously marginalised or overlooked due to the inefficiencies of traditional, landmark-based systems. In an era marked by rapid urbanisation and the rise of unplanned urban areas, Ghana's manual and outdated location addressing system had become a major obstacle to socio-economic development, negatively impacting service delivery and growth prospects in critical sectors like e-commerce, healthcare, and public administration, where precise location identification is key.

The NDPAS was developed as a strategic solution to these challenges, utilising digital technologies to ensure every citizen is recognised, valued, and effectively served, regardless of

geographic location. This initiative significantly enhanced GPCL's operational efficiency by facilitating precise location identification, which led to reduced delivery failures and operational costs, thereby revitalising GPCL's postal and courier services. Findings from Hafselde et al. (2021), revealed similar efficiency gains in the Norwegian Public Roads Administration's digitalisation project, with focus on renewing driver's licenses through digital means, shares the NDPAS's aim of making essential services more accessible and efficient, indicative of a larger trend in governmental digitalisation aimed at socio-economic inclusivity and operational efficiency underscoring the universal benefit of digital solutions in enhancing service delivery. In Ghana's case, the ability to accurately identify locations allowed GPCL to extend its services to previously underserved areas, increasing its customer base and revenue streams. Consequently, GPCL's improved efficiency and expanded services have contributed to socio-economic development by broadening access to more affordable courier services across Ghana.

Vokacom, as the developer of the NDPAS, saw business growth by demonstrating its technological expertise and contributing a vital component to Ghana's digitalisation efforts. The successful implementation of the NDPAS reinforced Vokacom's reputation, enhanced its credibility, and opened international opportunities. This project highlighted Vokacom's innovation capabilities in digital mapping and addressing, significantly expanding its service portfolio. This success not only solidified Vokacom's market position but also attracted new businesses, fostering job creation in the tech sector, and playing a pivotal role in advancing Ghana's digital economy. The NDPAS's success illustrates the capacity of local firms to lead major digital infrastructure initiatives, spurring further technological investment and innovation.

ConGas leveraged the NDPAS's digital addressing to optimise its LPG delivery service, resulting in shorter delivery times and lower costs. The system's precise location identification rectified inefficiencies associated with ambiguous addresses. Enabled by digital addressing, ConGas expanded its service reach, markedly enhancing customer satisfaction through more reliable and efficient LPG delivery, particularly benefiting those in remote or difficult-to-access areas. Improved operational efficiency and service expansion by ConGas have positively influenced the local economy by providing safer and reliable access to LPG.

Furthermore, the NDPAS enabled HeFRA to more effectively plan and conduct healthcare facility inspections by offering precise location data. This improvement in regulatory oversight ensured the uniform application of healthcare standards across Ghana. Accurate location data also improved HeFRA's ability to coordinate emergency responses, enhancing patient care and safety. Additionally, access to reliable location data allowed HeFRA to make informed decisions on healthcare policies and resource allocation, leading to a more equitable and efficient healthcare system in Ghana.

These findings corroborate the substantial body of scholarly work that emphasise the pivotal role of government-led digital initiatives in the advancement of social inclusion (Hafseld et al., 2021; Ramadani et al., 2022; Xiao et al., 2023). The digitalisation project spearheaded by the Norwegian Public Roads Administration (NPRA), as investigated by Hafseld et al. (2021), aligns with the socio-economic development goals similar to those of Ghana's NDPAS. Both initiatives utilised technology to streamline and enhance public service delivery. The NPRA project, with its focus on renewing driver's licenses through digital means, shares the NDPAS's aim of making essential services more accessible and efficient, indicative of a larger trend in governmental digitalisation aimed at socio-economic inclusivity and operational efficiency. The study on NDPAS emphasises the significance of such transformations in promoting socio-

economic development by integrating digital solutions into public sector services, as evidenced by the NPRA's efforts and collaboration among various government agencies. Similarly, Soltani Delgosha et al.'s (2020) study underscores the importance of digitalisation for economic sustainability and socio-economic development, highlighting the need for improved digital skills and business integration within digital platforms. These findings parallel the objectives of Ghana's NDPAS, which utilises digitalisation to foster socio-economic inclusivity and development. The study suggests that enhancing digital infrastructure accessibility, such as internet and mobile services, is crucial for sustainable development, a principle reflected in the NDPAS's efforts to improve public service delivery and civic engagement.

Furthermore, Ramadani et al. (2022) contribute to this discourse by exploring the interplay between centralised and decentralised strategies in ICT-enabled national development. Their study, set within the context of health information systems in Indonesia, reveals that hybrid strategies combining both centralisation and decentralisation can effectively address socio-economic challenges in developing nations. This notion of operational efficiency as a driving force behind digital transformation initiatives is echoed in the broader literature. Xiao et al. (2023) for instance, corroborate this perspective in their work. They discuss how the integration of digital technologies in government operations streamlines processes, automates routine tasks, and eliminates redundancies, leading to faster processing and reduced bureaucratic hurdles. Xiao et al. (2023) further emphasise the optimisation of resources, noting how digital tools enable more effective resource allocation and cost savings. They also highlight the role of data-driven decision-making in enhancing the capacity to identify inefficiencies and improve service delivery. Moreover, their study points out that digitalisation fosters enhanced communication and collaboration within government agencies and with external stakeholders, thereby contributing to greater operational efficiency. Thus, Xiao et al. (2023) research

supports the findings of the NDPAS study, demonstrating that digitalisation not only reduces operational costs but also significantly improves the quality and effectiveness of public service delivery, ultimately increasing citizen satisfaction and trust in government. The study by Schirmacher et al. (2019) on Singapore's transition to electronic payments in traditional retail environments serves as another compelling instance illustrating how operational efficiency motivations drive national-level digitalisation initiatives. In this case, the Singaporean government's decision to implement electronic payments in hawker centres and coffee shops was rooted in a desire to enhance efficiency in everyday transactions. This move streamlined the payment process, making transactions faster and more secure, thereby greatly improving the operational efficiency of these establishments. The simplification of financial management and the generation of valuable transaction data for better policy and business decisions further exemplify how such digitalisation are strategically employed to optimise public services. This initiative not only modernised a traditional sector but also aligned with broader objectives to advance the digital economy, demonstrating how operational efficiency is a key factor motivating governments to undertake comprehensive digitalisation efforts. This finding is particularly relevant to initiatives like the NDPAS, as it highlights the importance of flexible, integrated approaches in digitalisation to achieve inclusive socio-economic development.

7.2.2 A Tool for Enhancing Quality of Life

The implementation and use of the NDPAS in Ghana is a testament to the impactful role of national-level digitalisation in enhancing the quality of life for citizens. This system has been universally recognised by institutions and firms alike for its ability to improve service delivery's accessibility, efficiency, and inclusivity. Specifically, the NDPAS has played a pivotal role in

transforming the daily experiences of Ghanaians, from simplifying access to essential services like banking and healthcare to improving emergency response times and making daily life more convenient through optimised courier and LPG delivery services.

Vokacom, the developer of the NDPAS, underscores the system's success in affording residents' clear identities, thereby streamlining access to critical services and significantly diminishing navigation challenges. This enhancement has led to a boost in productivity and an overall uplift in living standards. Similarly, GPCL has leveraged the NDPAS to expand its reach to underserved areas, thereby democratising access to its courier services, and directly impacting the citizens' quality of life.

The NDPAS's role in healthcare, as utilised by HeFRA, illustrates its contribution to improved healthcare standards and emergency response coordination. This ensures a healthier population with better access to quality healthcare services, demonstrating the system's far-reaching benefits on public health.

Supporting this practical evidence, literature findings further illustrate the transformative potential of national-level digital initiatives. The study by Toth et al. (2022) highlights how digital solutions, particularly in public transportation, can significantly improve urban residents' quality of life, aligning with Smart City initiatives aimed at leveraging technology for urban improvement. Similarly, Kitsios et al. (2023) emphasise the government's role in facilitating a digital society that enhances living standards by streamlining services, simplifying processes, and reducing bureaucratic hurdles. These studies collectively affirm the critical importance of government involvement in digitalisation for societal benefit.

Moreover, the work of Ramadani et al. (2022) on health information system projects in Indonesia, aimed at enhancing citizens' quality of life, reveal the necessity of local engagement

and adaptability of ICT strategies to local needs and conditions. This adaptability is deemed to be crucial for improving the accessibility and effectiveness of essential services like healthcare, directly impacting the well-being of citizens. The dual focus on integrating macro-level strategies with micro-level actions ensures that national digital initiatives are both strategically sound and practically relevant, thereby genuinely enhancing the quality of life for citizens.

In essence, the case findings and related literature findings converge on a vital insight: national-level digitalization initiatives are instrumental in enhancing the quality of life for citizens. By facilitating improved access to essential services, streamlining processes, and ensuring adaptability to local needs, these initiatives underscore the government's pivotal role in spearheading digital advancements for the greater societal good.

7.2.3 Broad Impact Across Sectors

The findings from this study underscore the extensive benefits of digitalisation across various sectors in developing countries, advocating for its adoption as a strategic approach to development.

Specifically, Ghana's NDPAS demonstrated the profound sector-wide impact of digitalisation, emphasising its transformative potential. For instance, GPCL witnessed enhanced operational efficiency and expanded service reach, revitalising its postal and courier services. This development mirrors the operational improvements and governance efficiency gains highlighted by Toth et al. (2022) and further demonstrates how digitalisation can modernise operations and foster socio-economic inclusivity.

Vokacom's role in developing the NDPAS not only elevated its business profile but also significantly contributed to the growth of the digital economy through local technological innovation. Similarly, HeFRA's application of the NDPAS for healthcare facility oversight improved regulatory compliance and emergency responses, directly benefiting public health. ConGas utilised the NDPAS to enhance its LPG delivery services, improving accuracy and efficiency, which in turn enhanced customer satisfaction.

The broad impact of such digitalisation initiatives parallels findings from Schirmacher et al.'s (2019) study on Singapore's transition to electronic payments in traditional retail environments. This move towards digital payments in hawker centres and coffee shops exemplifies how government-led digitalisation efforts can modernise key sectors of the economy, streamline transaction processes, and foster financial inclusivity. The comprehensive impact of digitalisation, as evidenced by the NDPAS in Ghana and electronic payments in Singapore, underscores its capability to modernise traditional operations, spur economic development, and enhance the quality of life, marking a significant stride towards the broader development of a digitally empowered society and economy.

7.2.4 Vehicle for Strengthening State Agencies

The digital location addressing system is perceived as a pivotal vehicle for strengthening state agencies, underpinning a broad spectrum of advancements in governance, economic development, and public service delivery.

The government's vision for the NDPAS is to fortify state agencies, notably GPCL. Research by Xiao et al. (2023) underlines the significant impact of digital technologies on government operations, asserting that such integration can substantially boost operational efficiency and service delivery. This notion is in tandem with the expected advantages of the NDPAS for GPCL, a pivotal institution in Ghana's communication and logistics sectors. The NDPAS is anticipated to rejuvenate GPCL's operations by streamlining processes, automating routine tasks, and cutting down on operational redundancies, reflecting the transformative nature of digitalisation as found in Xiao et al. (2023) analysis.

This digitalisation effort is aimed at refining GPCL's service offerings, making them more efficient and suited to the demands of a digital economy. The expected increase in efficiency and service quality, as highlighted by Xiao et al. (2023), directly correlates with the projected outcomes for GPCL. The implementation of the NDPAS within Ghana Post's operations is set to enhance the agency's competitive edge in the digital domain, mirroring Xiao et al. (2023) observations regarding the role of digital technologies in boosting competitiveness and optimising resources.

Beyond enhancing GPCL's operations, the NDPAS serves critical functions in urban planning, infrastructure development, national security, and law enforcement. It provides essential data for informed decision-making in resource allocation and urban growth management, crucial for sustainable development in rapidly urbanising areas. For law enforcement and national security, the NDPAS aids in crime mapping, incident response, and surveillance, ensuring accurate property and individual identification, pivotal for public safety. Abebrese (2019) and Malaainine and Lechgar (2021) highlighted the necessity for functional addressing systems amidst rapid urban growth and increased global integration, noting the indispensable role of such systems in sustainable urban development, national security, and socio-economic

inclusivity. Malaainine and Lechgar (2021) discussed the importance of adaptability and local context in addressing systems, corroborating Abebrese (2019)'s observation of the urgent need for comprehensive and standardised addressing solutions due to the challenges posed by rapid urbanization and globalization. Furthermore, advancements in geo-spatial technologies and location-based applications underscore this need, positioning the NDPAS as a pivotal innovation for enhancing operational efficiency, public safety, and the management of urban territories. Thus, the NDPAS's contributions to Ghana reflect a broader understanding and implementation of digital addressing systems as essential infrastructure for navigating the complexities of modern urban governance and development.

The NDPAS also advances transparency and accountability in governmental operations, especially concerning land and property transactions, thereby reducing fraud and corruption opportunities. According to Richter and Georgiadou (2016), the implementation of digital addressing systems has been instrumental in creating a more transparent framework for property identification and ownership verification, which inherently diminishes the avenues for fraudulent activities and enhances the integrity of land transactions. This assertion is further supported by Yildirim and Ural (2017), who highlight the role of digital addressing in streamlining governmental operations, noting that such systems facilitate the seamless sharing of accurate property data across various governmental departments, leading to improved coordination and efficiency in projects related to environmental management, public health, and infrastructure development. Its interoperability across government departments fosters enhanced coordination on projects spanning environmental management, public health, and infrastructure development, improving public service delivery quality.

Moreover, the interoperability feature of the NDPAS allows for a holistic integration of data and services across different government sectors, significantly improving the quality of public

service delivery. This cross-departmental synergy not only optimises resource use but also enhances the government's ability to respond swiftly and effectively to the needs of its citizens, thereby fostering a more dynamic and responsive governance model. Thus, the NDPAS not only fortifies the structural backbone of land and property management systems but also propels forward the government's capacity for delivering high-quality public services, as evidenced by Goniewicz et al. (2020) and Yeh (1999).

The NDPAS initiative's potential to enhance the GPCL's efficiency and profitability aligns with scholarly assertions, such as those by Xiao et al. (2023)'s, that digitalisation leads to significant cost savings and better resource allocation, thereby bolstering the financial sustainability of government agencies. This is further supported by Patel and Singh (2024) and Akinyemi and Olorunfemi (2022), who highlight the operational benefits and potential for increased revenue streams through the integration of digital technologies in courier services. The NDPAS exemplifies the government's commitment to digitalisation, underscoring its strategic approach to ensuring the success and sustainability of key state institutions like the GPCL. Through reducing operational inefficiencies and opening up new avenues for service enhancement, the NDPAS initiative showcases the transformative potential of digital initiatives in elevating the economic viability and relevance of government agencies in the digital era, resonating with academic discussions on the impact of digitalisation in the public sector.

In effect, the NDPAS is envisioned as a powerful vehicle for strengthening state agencies, enhancing their operational efficiency, and ensuring their services are more adaptable to the needs of a modern, digital economy. This initiative underscores the government's commitment to leveraging digital solutions to improve governance, public service delivery, and economic development, illustrating a strategic approach to digital transformation in the public sector.

7.2.5 Political Commitment to National Progress

The implementation and use of the digital addressing system by case institutions and firms can be perceived as a manifestation of political commitment to national progress. This perspective aligns with the broader discourse in scholarly literature on the critical role of governmental policies in steering the course of digitalisation towards achieving political, social, and economic objectives (Chatfield et al., 2016; Luna-Reyes et al., 2012; Martin & Goggin, 2016; Medaglia et al., 2017b, 2017a; Winley et al., 2017).

For these organisations, the NDPAS is more than a digital infrastructure project; it symbolises a government's pledge to harness digital technology for the betterment of society. This interpretation is consistent with Winley et al. (2017), who observed that national IT policies, like Thailand's, are frequently motivated by political agendas aimed at transforming societies into knowledge-based economies. Ghana's NDPAS shares this ethos, rooted in political aspirations to leverage digitalisation in fulfilling electoral campaign promises and addressing the citizens' demands for transformative change.

The political backing of the NDPAS provided these institutions and firms with a unique opportunity to contribute to Ghana's digital landscape. For GPCL, it represented a commitment to modernising postal services and expanding reach, while for Vokacom, it was a testament to the government's confidence in local tech firms to drive significant national projects. ConGas and HeFRA viewed the NDPAS as government's assurance to improve utility delivery and healthcare services through digital means. This collective perception underscores the NDPAS as a strategic endeavour by the government to not only advance technological infrastructure but also to solidify its reputation as a progressive administration committed to national development.

The political dimensions of the NDPAS, as highlighted in the literature by Chatfield et al. (2016) and Luna-Reyes et al. (2012), resonate with the Ghanaian context, where digital government initiatives serve not only to enhance operational efficiencies but also to fulfill political commitments. These initiatives bolster government transparency, responsiveness, and citizen engagement, echoing the NDPAS's role in Ghana.

The Ghanaian government's launch of the NDPAS, deeply interwoven with its political goals, reflects a strategic move to align digitalisation efforts with broader national development plans. This strategy is indicative of a global trend where digital government initiatives are increasingly employed to deliver on political promises, foster government-citizen engagement, and project an image of forward-thinking governance.

The case and literature findings clearly demonstrate that the digital location addressing system exemplifies how digitalisation, supported by strong political commitment, can act as a catalyst for comprehensive national progress. The synergy between political aspirations and digital initiatives highlights the transformative potential of national-level digitalisation projects in achieving socio-economic development goals. This reinforces the notion that digitalisation is a strategic tool for fulfilling the promise of national advancement.

7.3 Capabilities that Enable the Implementation and Use of digital Location Addressing System in Developing Countries

The digitalisation journey of Ghana's location address system offers a comprehensive real-world application of the concepts of the extended dynamic capabilities adapted from Teece

(2007). Delving into the NDPAS initiative through the lens of these capabilities, and comparing them with academic literature, presents a rich tapestry of strategic adaptation.

7.3.1 Sensing Capabilities

The study provides a rich context for examining the concept of sensing capabilities within institutions and firms. Sensing capabilities, a critical aspect of dynamic capabilities as theorised by Teece et al. (1997) involve the capacity to identify, interpret, and respond to external environmental changes, particularly those relating to opportunities and threats. This capability is fundamental in enabling entities to navigate the complexities of digitalisation successfully.

Each case institution and firm, while differing in its operational scope, harnessed sensing capability to identify opportunities, mitigate challenges, and drive the digitalisation journey, mirroring findings in literature on dynamic capabilities. The Ghanaian government demonstrated pronounced sensing capabilities by identifying the considerable gap in the country's addressing system and recognising the potential of digital technology to bridge this gap. This aligns with Eisenhardt & Martin's (2000) perspective that dynamic capabilities, such as sensing, entail scanning the external environment for emerging opportunities and threats. The government's initiative to digitalise the addressing system was not merely a response to internal inefficiencies, but a strategic move informed by global digital trends and a vision for socio-economic development. This approach echoes the literature on the role of government in driving digitalisation, highlighting how policy-making and strategic intent are pivotal in mobilising technological innovation for national development (Chatfield et al., 2016; Luna-Reyes et al., 2012; Martin & Goggin, 2016).

GPCL's involvement in the NDPAS project further illustrates the application of sensing capabilities in recognising and addressing service delivery challenges through digital innovation. GPCL's acknowledgment of the inadequacies in its operational processes and the subsequent pivot towards digital addressing exemplifies the organisation's ability to sense internal challenges as external threats, prompting a strategic realignment towards digital solutions (Ghosh et al., 2022). This proactive stance towards sensing and addressing inefficiencies through digital means is indicative of the broader discourse on dynamic capabilities, which posits that entities must continuously adapt to and capitalise on technological advancements (Jonathan et al., 2022).

Vokacom, tasked with developing the NDPAS, displayed a sophisticated application of sensing capabilities by leveraging its technical expertise in GIS and digital mapping to sense and seize the opportunity presented by the NDPAS project. This ability to connect past experiences with current opportunities reflects Teece's (2014) assertion that leveraging historical competencies is crucial in identifying and exploiting new technological possibilities. Moreover, Vokacom's engagement with stakeholder feedback and public sentiment during the development process exemplifies a dynamic environmental sensing capability, underlining the importance of being both responsive and anticipatory in adapting to external inputs (Karimi & Walter, 2015).

The usage of addresses generated from the NDPAS by HeFRA stages an exemplary application of sensing capabilities within a regulatory body. HeFRA's early recognition of the NDPAS as a transformative tool for enhancing healthcare oversight illustrates the agency's strategic foresight in identifying digital technologies as pivotal to improving operational efficiency and regulatory effectiveness. This strategic orientation towards leveraging digital solutions for broader organisational goals aligns with Medaglia et al.'s (2017) view on the high-calibre

sensing capabilities demonstrated by entities that not only detect but strategically align technological projects with national or corporate objectives.

ConGas's utilisation of NDPAS underscores an application of sensing capabilities in a private sector context. ConGas adeptly identified the limitations of traditional addressing methods as significant barriers to efficient service delivery. By strategically adopting the digital addressing system, ConGas demonstrated agility in integrating new technologies to enhance operational efficiency and customer satisfaction. This approach exemplifies sensing capabilities by recognising the potential for digital solutions to resolve operational inefficiencies and improve service delivery. ConGas's hybrid model, accommodating both digital and traditional preferences, showcases an inclusive strategy that ensures customer-centricity while navigating technological transitions. This reflects a deep understanding of customer needs and preferences, highlighting the role of sensing in facilitating not just technological adoption but also in fostering inclusivity and adaptability within service delivery models.

7.3.2 Legitimising Capabilities

The successful implementation and use of the digital location addressing system in Ghana illustrates the vital role of legitimising capabilities in the digitalisation process, aligning with insights from existing literature on dynamic capabilities and digitalisation. High-ranking government endorsement, beginning with the Vice President's acknowledgment of the existing system's inefficiencies, set a strong foundation for the NDPAS initiative. This public validation not only underscored the importance of transitioning to a digital addressing system but also built trust among the Ghanaian populace, firmly established it as a national priority, reflecting the literature's emphasis on governmental support as a catalyst for digital projects (Avgerou,

2013; Suchman, 1995). Avgerou (2013) complements and enriches the understanding of legitimising capabilities' role in national digitalisation efforts. Avgerou (2013) insights into the preparation and execution of e-voting systems underscore the critical importance of political legitimacy and trustworthiness in the adoption of digital solutions. This included a range of preparatory activities, from legal resolutions for technology-centred changes to system enhancements and deployments, all designed to maintain public trust. The activities, including approval from parliamentary bodies, legal mandates for the participation of diverse social actors in the system's fine-tuning, and well-publicised software enhancements, were key in creating a politically legitimate environment that demonstrates trustworthiness to citizens. In case of NDPAS, the government's decision to entrust GPCL with leading this digital transformation, backed by substantial public, financial and logistical support, epitomises the essential legitimising role that governmental bodies play in enabling such initiatives.

Parallely, HeFRA's legal empowerment through the Health Institutions and Facilities Act, 2011 (Act 829), and its alignment with the government-backed NDPAS initiative, showcases how legal and regulatory frameworks provide a legitimising backdrop for adopting new technologies within sector-specific regulatory bodies. This approach mirrors scholarly assertions on the importance of regulatory empowerment in the digitalisation context (Luna-Reyes et al., 2012).

In the private sector, ConGas leveraged legitimising capabilities by adhering to safety regulations and industry best practices, ensuring its adoption of the NDPAS was both credible and compliant. This strategic adherence, coupled with effective stakeholder communication about the NDPAS's benefits, played a crucial role in building legitimacy and trust, aligning with literature that highlights the importance of industry standards and stakeholder engagement in legitimising new technologies (Martin & Goggin, 2016).

Vokacom's journey in developing and implementing the NDPAS further illustrates the importance of building credibility and trust through transparency, stakeholder engagement, and responsiveness to evolving technological and user needs. The company's commitment to a rigorous procurement process and its proactive approach to addressing potential sustainability and technical challenges underscore the multifaceted nature of legitimising efforts required for successful digital initiatives, echoing insights from the literature on the significance of credibility and trust in the digitalisation process (Karimi-Alagheband & Rivard, 2020; Magesa & Jonathan, 2021).

In summary, the NDPAS project demonstrates how legitimising capabilities—spanning government endorsement, legal empowerment, adherence to standards, and the establishment of credibility—are instrumental in facilitating the implementation and use of digital location addressing systems.

7.3.3 Seizing Capabilities

The digitalisation of Ghana's location addressing, culminating in the NDPAS, serves as an exemplary case of seizing capabilities in action, within a framework that emphasises strategic alliances, resource mobilisation, and cross-functional collaboration. This initiative, underscored by the active participation of entities such as GPCL, Vokacom, and various governmental bodies, illustrates the multifaceted approach to seizing opportunities through dynamic capabilities, as discussed in the strategic management literature by scholars like Teece (2018b) and Battleson et al. (2016). The initiative's success hinged not on isolated efforts but on the collaborative dynamism of stakeholders, marrying domain-specific insights with a unified vision for national digitalisation.

The GPCL's strategic decision-making in partner selection and the integration of NDPAS into Ghana's digital infrastructure embodies the essence of seizing capabilities—capitalising identified opportunities to realise tangible outcomes through strategic investments. This aligns with Teece's (2007) discourse on the significance of resource mobilisation and investment in seizing opportunities. Similarly, HeFRA's rapid adoption and operational integration of addresses from the NDPAS underscore its adaptability and capacity to enhance regulatory processes through technological innovation, reflecting Pavlou and El Sawy's (2011) emphasis on organisational adaptability.

ConGas's operational agility, demonstrated through its hybrid service model, showcases a proactive adaptation to technological advancements, mirroring Teece's (2018) insights on business model adaptation. Vokacom's role, marked by innovation and strategic government collaboration, highlights the importance of leveraging core competencies and strategic partnerships, resonating with Helfat & Raubitschek's (2000) findings on innovation through collaboration.

The NDPAS initiative not only encapsulates the integration of seizing capabilities within operational and strategic frameworks but also aligns with the concept of responsible digitalisation as proposed by Pappas et al. (2023). This approach champions a collaborative model that yields shared value, addressing societal challenges and highlighting the project as a catalyst for societal upliftment.

Furthermore, Eriksson (2014) challenges traditional views by highlighting the significant role non-managerial individuals play in shaping dynamic capabilities, suggesting a broader perspective where every stakeholder, including citizens, contributes to a digitalisation initiative's success. The active engagement of Ghanaian citizens in utilising, providing

feedback on, and adapting the NDPAS exemplifies this broader involvement, showcasing a grassroots-level seizing capability that significantly influenced the project's evolution and success. This active participation underscores the potential for future research to explore how non-managerial inputs, especially in large-scale national projects like NDPAS, can further inform and shape the trajectory of digitalisation initiatives.

7.3.4 Transforming Capabilities

The implementation and ongoing enhancement of Ghana's NDPAS provide a vivid illustration of transforming capabilities in action, highlighting how organisations across various sectors can adapt and evolve in response to digitalisation. This analysis draws upon specific instances from the involvement of GPCL, Vokacom, HeFRA, and ConGas in the NDPAS project, aligning these insights with scholarly perspectives on dynamic capabilities and digitalisation.

The concept of transforming capabilities involves the strategic realignment and continuous renewal of organisational processes to sustain competitiveness (Teece, 2018a; Warner & Wäger, 2019). In the NDPAS initiative, this is manifested in GPCL's management, demonstrating a nuanced approach that includes staff training, technological upgrades, and a collaborative ethos with entities like NITA and Vokacom. This strategy not only aimed at the NDPAS's successful deployment but also its iterative improvement, ensuring the system's long-term resilience. Such an approach resonates with Ambrosini & Bowman's (2009) view that transformation involves embedding innovations into the organisational fabric, a sentiment echoed by Eisenhardt & Martin (2000) who argue that it is the business processes and strategic routines enabled by dynamic capabilities that offer a sustainable advantage.

Applying this to Ghana's NDPAS, the launching and iterative refinement of the system represent a dynamic capability. However, as per Eisenhardt & Martin (2000), the true value emerges from how the NDPAS is integrated into broader governmental and organisational routines. The effectiveness of integrating NDPAS across various state agencies exemplifies how dynamic capabilities, while crucial, derive their real advantage from the resultant optimised processes and strategic routines.

Vokacom's role in developing a user-friendly NDPAS interface and prioritising data integrity highlights transformative steps towards broadening system adoption and ensuring its credibility. The focus on user experience and offline functionality addresses socio-economic disparities and showcases the potential of technological innovations to tackle broader societal challenges. This aligns with literature emphasising the importance of user-centred design in technology adoption (Yunis et al., 2014) and the role of innovation in addressing societal needs (Eriksson, 2014).

HeFRA's integration of NDPAS into its regulatory operations exemplifies a significant operational transformation, enhancing regulatory efficiency and public engagement. This adaptation reflects literature findings on the necessity of leveraging digital technologies for organisational evolution and strategic renewal (Battleon et al., 2016).

ConGas's strategic adaptation of its service delivery model to include digital addressing data represents another example of transforming capabilities in action. This shift towards operational efficiency and enhanced customer service illustrates the need for organisations to continuously adapt their business models in response to technological advancements and market demands, as discussed in the literature.

The NDPAS project showcases a coherent application of transforming capabilities across various institutions and firms, emphasising the importance of adaptability, innovation, and stakeholder engagement in the national digitalisation efforts. This multifaceted approach to digitalisation, underpinned by continuous improvement and strategic alignment, sets a precedent for sustainable digitalisation in developing countries. It highlights that while digitalisation marks a significant step forward, its true value and potential advantages lie in how it is embraced, integrated, and utilised by various stakeholders. This distinction between the capability itself and the routines it facilitates is critical for understanding the broader impact of digitalisation efforts like NDPAS, offering valuable insights for both academic research and practical implementation in strategic management and digital innovation.

7.3.5 Institutionalising Capabilities

The integration and sustained development of Ghana's NDPAS point out the comprehensive institutionalising capabilities across various institutions and forms, demonstrating a collective push towards embracing technological innovations and adapting to evolving operational needs. These capabilities are manifested in the concerted efforts of the GPCL, Vokacom, HeFRA, and ConGas, each contributing to the establishment, adaptation, and enhancement of the NDPAS within their respective operational settings.

GPCL exemplified institutionalising capabilities by not only deploying the NDPAS but also embedding continuous system optimisation and a culture of innovation within its operations. This included facilitating staff training, ensuring technological readiness, and managing day-to-day administration and maintenance of the NDPAS. The introduction of an open API feature by GPCL represents a strategic move towards fostering technological innovation and

enhancing system interoperability, encouraging third-party developers to create applications that leverage the NDPAS platform. This approach underpins a broader commitment to operational excellence and collaborative innovation within Ghana's digital ecosystem, aligning with insights from Eisenhardt & Martin (2000) on the significance of embedding new practices and technologies into organisational routines to gain a sustainable advantage.

Vokacom's transformative contributions to the development of the NDPAS, marked by user-friendly design and stringent data integrity protocols, further illustrate the institutionalising capabilities within the project. By prioritising ease of use and security, Vokacom facilitated the widespread adoption of the system, addressing both technological needs and socio-economic disparities. The implementation of an offline version of the GhanaPostGPS app showcased Vokacom's adaptability and commitment to making the digital addressing system accessible and robust, emphasising the importance of user experience and trust in the acceptance and integration of public digital infrastructures.

HeFRA leveraged the addresses generated from the NDPAS to enhance regulatory oversight and improve the efficiency of healthcare facility inspections, embodying institutionalising capabilities through the adaptation of digital addresses into its regulatory processes. This transformation required updating regulatory guidelines and inspection processes, signifying a fundamental shift in operational procedures to incorporate digital capabilities, reflecting literature findings on the necessity of adjusting organisational frameworks to accommodate new technologies.

ConGas adeptly integrated digital addresses into its service delivery model, illustrating a strategic adaptation to technological advancements while catering to diverse customer preferences. By employing a hybrid model that combined traditional and digital methods,

ConGas institutionalised a flexible and customer-centric approach to service delivery. This dual-channel strategy not only improved operational efficiency and customer satisfaction but also prepared ConGas for a technology-driven future, showcasing the firm's capacity for strategic agility and innovation in response to technological opportunities.

These instances of institutionalising capabilities across the case institutions and firms underscore a collective effort towards the integration, adaptation, and continuous improvement of the NDPAS, highlighting the dynamic interplay between technology, organisational adaptation, and societal needs. The sustained commitment to embedding digital innovations within operational frameworks and embracing continuous renewal and strategic realignment exemplifies the broader implications and potential advantages of technological integration in developing countries. This approach to institutionalisation, grounded in adaptability, innovation, and stakeholder engagement, sets a precedent for sustainable digital transformation, offering valuable insights into the strategic management and digital innovation fields.

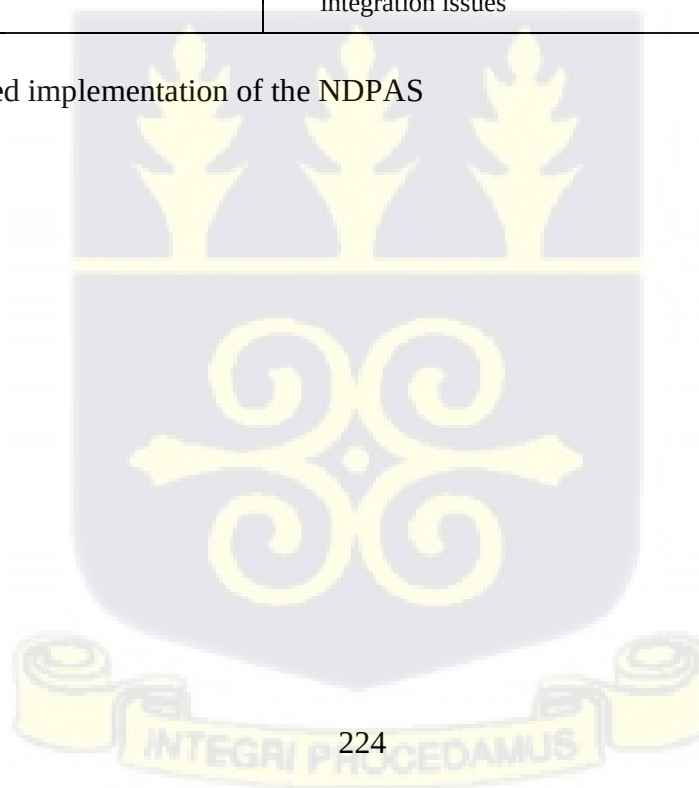


Dynamic Capabilities	Implementing Organisations		General steps involved
	GPCL	Vokacom	
Sensing	i. Recognised the drawbacks of traditional addressing, including delivery failures and increased costs. ii. identified the growing e-commerce sector's need for precise addressing to support courier service growth. iii. Identified the potential of a digital addressing system to enhance operational efficiency, customer satisfaction, enable new revenue streams, and adapt to digital economy demands.	i. Scanned the environment for public sentiment and societal debates to capture a comprehensive view of user feedback and broader societal discussions. ii. Learned from real-time insights gathered through active environmental scanning, ensuring an up-to-date understanding of user needs and societal expectations. iii. Analysed feedback and discussions to identify patterns, trends, and key concerns that may impact the perception and effectiveness of the NDPAS. iv. Interpreted the data collected to inform strategy adjustments, ensuring the NDPAS remained aligned with user expectations and societal norms.	• <i>Environmental Analysis</i> • <i>Need Identification.</i> • <i>Opportunity Recognition</i> • <i>Insight Gathering</i> • <i>Strategic Adjustment</i> • <i>Feedback Synthesis</i>
Legitimising	i. Received public acknowledgment from the Vice President ii. Gained public endorsement and legitimation from high-ranking government officials iii. Obtained financial and logistical support from the government	i. Established Track Record and Reputation ii. Adherence to Rigorous Procurement Process iii. Engagement of High-profile Stakeholders iv. Commitment to Continuous Improvement and User-Centric Design v. Proactive Approach to Sustainability and Technical Challenges	• <i>Public Endorsement / Strategic Validation</i> • <i>Government Support</i> • <i>Stakeholder Engagement</i> • <i>Trust Building</i>

	iv. Was empowered by the government to oversee the NDPAS implementation, including sourcing technological partners and integrating the system into national infrastructure. v. Involved various governmental bodies for approval and oversight, ensuring compliance with established legal and financial protocols.		• <i>Compliance and Oversight</i>
Seizing	Opportunities i. Alignment with National Priorities ii. Utilisation of Budgetary Support iii. Open API Integration (new revenue streams) Commitment iv. Meticulous Partner Selection v. Planning and Collaboration vi. Adaptation to Policy Changes	i. Innovation and Niche Expertise in GIS ii. Securing the NDPAS Contract iii. Stakeholder Engagement - Engaging with high-profile stakeholders, including government officials, to secure support and endorsement for the NDPAS, facilitating smoother implementation and adoption	• <i>Strategic alignment</i> • <i>Resource utilisation</i> • <i>Policy adaptability</i> • <i>Collaborative planning</i>
Transforming	i. Leveraged logistics expertise to ensure technological readiness and staff training for effective NDPAS deployment. ii. Worked closely with NITA and Vokacom to facilitate the system's seamless implementation and integration. iii. Instituted feedback loops and performance evaluations to refine the NDPAS according to evolving needs and challenges.	i. Developed an intuitive and easy-to-navigate interface, facilitating widespread adoption of the system. This approach transformed how end-users interact with digital location services, encouraging engagement from a broader demographic, including those less technologically adept. ii. Implemented robust encryption technologies along with regular audits and compliance checks to ensure the integrity of sensitive location data.	• <i>Technological preparedness</i> • <i>Adaptive enhancements</i>

	iv. Committed to continuous renewal, adaptation, and strategic realignment of the NDPAS, enhancing Ghana's digital location services.	iii. Implemented an offline version of the GhanaPost GPS app	
Institutionalising	i. Facilitating Integration with Existing Infrastructure ii. Day-to-Day Administration and Maintenance iii. Introduction of Open API Feature iv. Encouraging Development of Innovative Applications	i. Embedding the NDPAS into Daily Life ii. Commitment to regular monitoring, evaluation, and research and development for continuous monitoring iii. Proactive measures to tackle emerging challenges, such as user disengagement and technical integration issues	• <i>System integration</i> • <i>Continuous improvement</i> • <i>Challenge mitigation</i>

Table 7.1 - Dynamic Capabilities that enabled implementation of the NDPAS



7.4 Outcomes of Digitally Transforming Location Addressing

The implementation and use of the NDPAS in Ghana provides a detailed case study on the impacts of digital location systems in developing countries, reflecting the diverse outcomes and themes prevalent in the information systems discipline. This comprehensive examination reveals significant operational efficiencies, regulatory enhancements, and societal benefits stemming from the national digitalisation efforts. This section presents a discussion of the case findings in response to the third research question on the outcome of implementing and using digital location addressing for developing countries. As with many transformative initiatives, the NDPAS did not solely redefine the processes of a single organisation but brought about shifts across industry ecosystems and broader stakeholder engagements (Soltani Delgosha et al., 2020). ConGas's adoption of a hybrid service model, integrating traditional and digital methods, showcases operational efficiency and inclusivity, aligning with literature on leveraging digital technologies for market expansion, consistent with findings from reviewed literature which underscore the potential of digital initiatives to streamline processes and create novel avenues for growth (Baiyere et al., 2020; Liu et al., 2023; Vial, 2021). Similarly, HeFRA's profound operational transformation through NDPAS adoption highlights the potential of digital systems to streamline regulatory compliance and enhance public service delivery, echoing the significance of accurate location data in policy development and resource allocation.

Hunady et al. (2022) underscore the importance for organisations to re-evaluate their traditional operations through the lens of innovative digital technologies as a pathway to achieving genuine digitalisation. This perspective gains more depth when juxtaposed with the evolution of GPCL. GPCL experienced a profound recalibration in its role, emblematic of such

transformative shifts. Karimi and Walter (2015) further substantiate this narrative by suggesting that digital transitions often precipitate an organisational reimagining of roles, responsibilities, and relationships. GPCL's journey post-NDPAS transcended mere internal realignments. They ventured into external regulatory terrains, adopting a pivotal role as gatekeepers for NDPAS integrations, ensuring a stringent adherence to established standards. This strategic pivot, against the backdrop of Hunady et al.'s (2022) assertions, showcases the implications and depth of digitalisation. Such transformations are not just about technology adoption but pivot around a deeper organisational evolution, influencing both internal dynamics and broader stakeholder relationships.

Kim et al. (2022) emphasise the overarching goals of financial institutions undertaking digitalisation initiatives as leveraging advanced technologies for heightened productivity and market expansion while advocating for strategic flexibility, promoting innovation, creativity, and collaboration to generate holistic societal value. A specific instance of such transformation is illustrated in the findings of this research. The NDPAS initiative not only expanded the financial sector's reach to underserved communities but also significantly reshaped the way spatial information is perceived, utilised, and communicated in Ghana.

Digital transformation, as emphasised by Tarhini et al. (2022), exerts a profound influence on societies, reshaping interactions, processes, and outcomes across diverse domains. In alignment with this perspective, NDPAS stands out as a beacon of inclusivity. By furnishing underserved communities with location addresses, it not only facilitates access to financial services for previously unbanked citizens but also empowers individuals to own and effortlessly communicate their addresses.

The digitalisation of Ghana's location address, culminating in the NDPAS, embodies the innovative potential that APIs bring to the realm of digital endeavours. This mirrors the insights of Aguerre and Bonina (2023), who pinpoint APIs as central catalysts in digitalisation efforts. Reinforcing this notion, Ojeda et al. (2021) contend that APIs are instrumental in the current application-driven economy, intricately linking products with nuanced customer needs, crafting integrated experiences, and establishing secure and efficient connections within digital ecosystems. In the context of Ghana, the NDPAS's open API facilitates data access for vetted and approved public and private organisations, who, after obtaining the data act certificate, can leverage this data for a fee, while upholding data protection standards. This strategy underscores Ghana's commitment to capitalising on the transformative capabilities of APIs. The innovation and success attributed to NDPAS further emphasise the integral role of APIs in contemporary digitalisation stories.

However, the digitalisation journey is not devoid of challenges. Data privacy remains a central challenge amidst the surging tide of digital innovation. This concern mirrors a wider academic sentiment about the imperative to safeguard sensitive information in the growing digital age (Mendhurwar & Mishra (2021). Vial (2021) amplifies this viewpoint, delineating the recurring data privacy challenges encountered during digitalisation journeys. For instance, the implementation of the NDPAS exemplifies this intricate balance between harnessing technological potential and upholding privacy standards (Pappas et al., 2023). Post the NDPAS launch, the rising concerns about data security spotlighted the broader anxieties that often accompany large-scale digital initiatives (Russell et al., 2018; Vial, 2021). In response to such concerns, proactive measures, as demonstrated by the CEO of Vokacom's assurance, are pivotal. Assurances of stringent data security measures echo the sentiments of researchers who emphasise the necessity of preemptive security strategies in digital platforms (Enders et al.,

2022; Russell et al., 2018; Vial, 2021). Furthermore, the formation of specialised committees to guide and oversee data security underscores the collaborative approach championed by experts in the field (Ansari et al., 2022). Such committees, comprised of diverse stakeholders, exemplify best practices in managing and securing digital infrastructures. Hosting the data on secure servers, as proposed by the committee, aligns with recommendations that emphasise the importance of centralised, secure data storage in enhancing cybersecurity resilience (Xhafa, 2021).

The integration of digital initiatives within socio-political contexts resonates in many scholarly discussions. Alsharo et al. (2020) pointed out that digital endeavours, especially those tied to governments, frequently merge with prevailing political dynamics. This suggests that political transitions or agenda shifts can substantially influence their sustainability. Similarly, Avgerou (2013) assert that the trajectory of digitalisation efforts can be moulded by political intentions and stakeholder support. Given this context, questions about NDPAS's durability amidst potential political alterations spotlight the significant challenge of creating steadfast digital projects that maintain their value despite political changes. This strategy isn't just about user uptake; it's a decisive move to insulate NDPAS from political fluctuations. By weaving it into the daily lives of Ghanaians, the goal is to establish its political resilience, irrespective of potential government transitions. This proactive approach echoes Avgerou (2013) advice on the foresight required to navigate political impediments in digital pursuits. Vokacom's forward-thinking dedication to innovation, evident in their plans for a Research and Development unit, is also in line with agile methodologies advocated by (Ditsela et al., 2011). They encourage adaptability and a user-centred iterative method, essential for digital projects in fluctuating landscapes. The research findings unveil a nuanced interplay between digitalisation objectives and the evolving perceptions of users, a reflection of the broader digitalisation landscape. While

NDPAS aims to promote digital inclusivity, it grapples with the challenge of maintaining ongoing relevance, as shown by some users ceasing its use due to perceived minimal benefits. This aligns with Iyanna et al.'s (2022) insights, emphasising that the barriers often revolve around users' daily challenges. Even with the prevailing wave of digitalisation, the success of digital tools hinges on their alignment with users' immediate needs. Iyanna et al.'s (2022) emphasis on user-centric, intuitive designs, which aren't reliant on fast internet and offer language versatility, stresses the need to adapt digital tools to varied user demographics. As the CEO of Vokacom indicates, repurposing NDPAS to be as integral as apps like WhatsApp might alleviate some adoption challenges. Post-launch of the NDPAS, Vokacom navigated a maze of challenges spanning both technical and socio-political spectrums. The controversies that enveloped NDPAS, specifically regarding its costs and the bidding process transparency, affected Vokacom's corporate image. This situation parallels academic observations that digitalisation trajectories can be profoundly shaped by socio-political considerations and stakeholder sentiment. Vokacom's experience exemplifies the multifaceted nature of such initiatives, where beyond mere technical execution, there lies the intricate task of steering through politically charged narratives.

These outcomes contribute significantly to the discourse on national-level digitalisation, providing valuable insights for policymakers, industry leaders, and communities navigating digitalisation in developing contexts. The NDPAS initiative exemplifies the dynamic capabilities and strategic adaptability necessary for successful digitalisation, underscoring the impacts of digital location addressing systems in operational improvements, regulatory advancements, and societal benefits. Through this lens, the NDPAS project not only marks a significant step towards digital inclusivity in Ghana but also offers a model for understanding

the complexities and opportunities inherent in digital transformation initiatives within socio-political and operational spectra.

7.5 Reflections on the use of the Extended Dynamic Capabilities Theory

This section presents a reflection of the application of the extended DCT as the underpinning theory for this study. It evaluates both the strengths and limitations of employing DCT as an analytical framework ensuring a balanced view of its applicability and impact. Historically, DCT has been pivotal for scholars in understanding how organisations navigate, adapt, and strategically reorient themselves in response to volatile environments (Teece, 2007; Teece et al., 1997). At a national scale, the challenge becomes even more intricate, with the need to manage not just organisational but also societal, economic, and political complexities. DCT, adapted for broader application thus revolves around a cyclical process of sensing opportunities and threats, legitimising new paradigms, seizing strategic initiatives, transforming organisational structures, and finally, institutionalising new practices and innovations.

The study of Ghana's national-level digitalisation of location addressing systems through the lens of the extended dynamic capabilities theory offers insightful reflections on how countries, especially developing ones, can leverage digitalisation for socio-economic development, operational efficiency, and greater inclusivity. The extended dynamic capabilities framework, as adapted from Teece (2007), provides a robust theoretical backdrop for understanding the multifaceted impacts and strategies involved in the digitalisation of location addressing systems at a national level.

Firstly, the institutions and firms' perception of digital location addressing systems as transformative agents highlights the critical role of sensing capabilities. These entities demonstrated the ability to identify and seize opportunities presented by digital technologies

for socio-economic growth. This aligns with the theory's emphasis on sensing as a vital capability for recognizing external opportunities and threats, highlighting the importance of a strategic vision in driving technological innovation and adoption.

The analysis of Ghana's NDPAS project highlights legitimising capabilities that played a critical role of establishing support, credibility, and acceptance for the successful national-level digitalisation of location addressing systems. The endorsement from high political offices, strategic partnerships between public and private sectors, extensive stakeholder engagement, and addressing data privacy concerns were pivotal in legitimising the NDPAS. These efforts not only built a supportive ecosystem that facilitated regulatory approvals and aligned various interests but also fostered public trust and confidence in the digital initiative. By navigating political, social, and regulatory landscapes effectively, legitimising capabilities ensured the project's alignment with national priorities, encouraged widespread adoption, and demonstrated the importance of creating a conducive environment for the sustainable implementation of digital innovations, underlining the significance of fostering trust, credibility, and acceptance as foundational to the success of technological transformations in a developing country context.

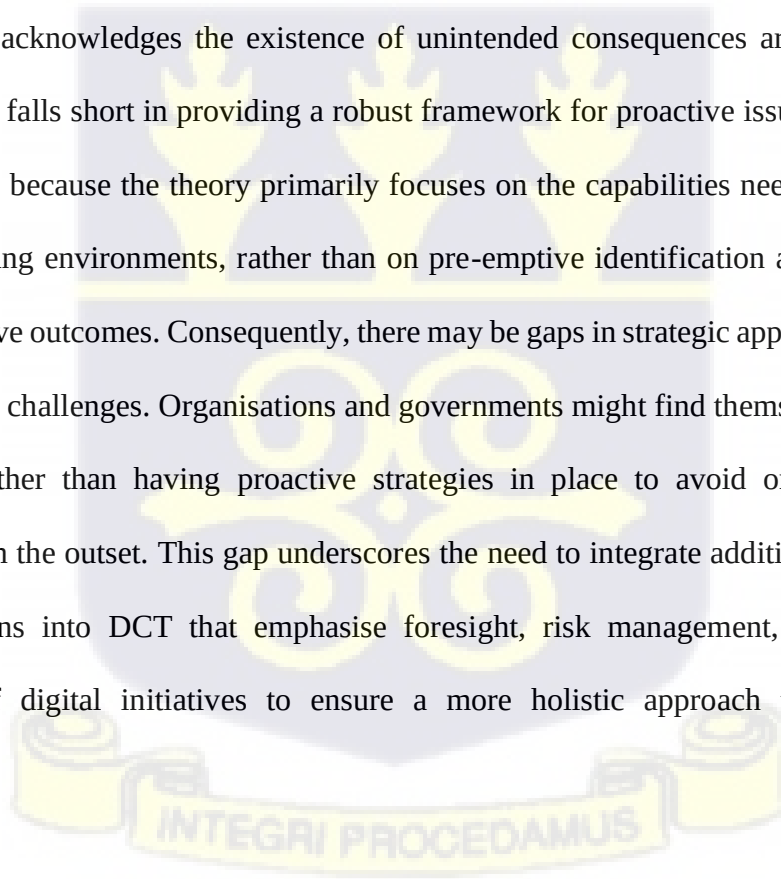
The catalytic role of the NDPAS in enhancing operational efficiency, socio-economic development, and inclusivity further illustrates the application of seizing and transforming capabilities. These capabilities were manifested in how the case institutions and firms leveraged the NDPAS to improve service delivery, extend their reach to underserved areas, and optimise operations. The successful implementation and utilisation of the NDPAS by these entities reflect the strategic deployment of resources and the ability to align digital transformation with organisational and national development goals.

Moreover, the study underscores the significance of institutionalising capabilities in embedding digital innovations within operational frameworks and societal norms. The integration of the NDPAS into Ghana's socio-economic fabric showcases the efforts to normalise and sustain digital advancements. This involves continuous improvement, stakeholder engagement, and the alignment of digital initiatives with broader societal and economic objectives, ensuring that nationally digitalisation efforts are not transient but become ingrained in the country's developmental trajectory.

Additionally, the reflection on the NDPAS project through the dynamic capabilities lens highlights the outcomes of digital transformation, including operational efficiencies, regulatory enhancements, and societal benefits. These outcomes not only demonstrate the tangible benefits of national-level digitalisation but also the strategic adaptability required to navigate the challenges and opportunities presented by such initiatives. The NDPAS project, therefore, serves as a model for examining the impacts of digital location addressing systems on improving accessibility, efficiency, and inclusivity in service delivery.

The extended DCT facilitated a nuanced understanding of how Ghana's approach to overcoming the complexities of digitalising its location addressing system, especially highlighting the need for strategic agility and adaptability necessary in the face of technological advancements and global trends. The inclusion of legitimising and institutionalising capabilities within DCT highlights the critical roles of societal acceptance and the embedding of digital innovations within national infrastructures, which are essential for the success of digitalisation efforts on a national scale. The extended DCT also provides strategic insights into the effective implementation and scaling of digital projects, a crucial aspect for developing countries characterised by resource limitations and digital divides.

However, the extended DCT is limited in evaluating the direct impacts of specific capabilities on the success of digitalisation initiatives, making it challenging to extract concrete policy recommendations. This challenge arises from the difficulty in pinpointing how changes in capabilities directly affect the success of digitalisation efforts in a way that yields direct policy implications. Though this limitation aligns with the interpretivist researchers' strengths, by offering a rich terrain for exploration, it also presents opportunities for positivists to measure the impact specific capabilities on the successful implementation of national-level digital projects. Interpretivists can leverage the extended DCT to explore the subtleties of how capabilities are developed, enacted, and contribute to digitalisation within various contexts, thus providing deep insights that transcend simple causal relationships. Furthermore, while the extended DCT acknowledges the existence of unintended consequences arising from rapid digitalisation, it falls short in providing a robust framework for proactive issues management. This shortfall is because the theory primarily focuses on the capabilities needed to adapt and thrive in changing environments, rather than on pre-emptive identification and mitigation of potential negative outcomes. Consequently, there may be gaps in strategic approaches designed to address these challenges. Organisations and governments might find themselves reacting to these issues rather than having proactive strategies in place to avoid or minimise their occurrence from the outset. This gap underscores the need to integrate additional frameworks or considerations into DCT that emphasise foresight, risk management, and the ethical implications of digital initiatives to ensure a more holistic approach to national-level digitalisation.



7.6 Chapter Summary

This chapter discussed findings from the study and related literature on national level digitalisation. Insights into the reasons behind Ghana's decision to transform its location systems digitally were provided. The analysis, anchored in an extended DCT, particularly emphasised the five core capabilities: sensing the need, legitimising, seizing, transforming, and institutionalizing. The broader implications of these shifts for Ghana were also explored. Concluding this chapter, reflections on the use of the extended DCT as the guiding framework for this study were presented. The subsequent chapter offers a summary of the study, highlights contributions to existing knowledge, and delivers concluding remarks.



CHAPTER EIGHT

SUMMARY AND CONCLUSION

8.1 Introduction

The previous chapter discussed the research findings based on the research questions and the literature review. It also presented the researcher's reflections on the use of the extended DCT as the analytical lens. This final chapter presents the summary of the thesis regarding research contributions, evaluation, limitations, and recommendations for future study. First, the chapter begins by reviewing the research questions as outlined in Chapter 1 and how they were addressed by the study. Second, the chapter outlines this study's contributions to knowledge in terms of theory, research, practice, and policy. Third, the chapter evaluates the study based on the set of criteria for assessing interpretive case study as outlined in Chapter 4. In the end, the chapter presents limitations for the study and offers recommendations for further research.

8.2 Review of Research Purpose and Questions

This study began with the purpose of understanding how developing countries implement and use digital location addressing systems. To address this purpose, the study set out to fill three research gaps identified in the literature. The first gap is the scarcely explored area of digital location addressing systems within the IS discipline, particularly their socio-economic impacts, policy implications, and strategic importance for national-scale implementation. Despite their critical role in various sectors, these systems have received limited attention, highlighting the need for a comprehensive study that goes beyond technological development to include socio-economic and policy dimensions. The second gap concerns the lack of research focused on the

broader implications, challenges, and potential impacts of these systems, especially in developing countries. There is a crucial need for IS-focused research that addresses adoption, implementation, utilisation, and the overarching impacts of digital location addressing systems to inform strategic implementation and policy formulation. Lastly, the literature reveals a gap in theoretical underpinnings, where studies often lack robust theoretical frameworks to analyse the socio-technical complexities of digitalising location addressing systems. Additionally, there's a need to understand how nations can adaptively manage the complexities of digitalisation, ensuring agility and responsiveness in their digitalisation efforts. Addressing these gaps is essential for advancing knowledge and facilitating informed decisions in the strategic deployment of digital location addressing systems, particularly in the context of developing countries where they hold significant potential for socio-economic development.

The research questions that guided the study were:

1. What meanings do institutions and firms associate with the digital location addressing systems in a developing country?
2. What capabilities enable the implementation and use of digital location addressing systems among institutions and firms in a developing country?
3. What are the outcomes of the implementation and use of digital location addressing system among institutions and firms in a developing country?

These questions were addressed through the various chapters of the study.

Chapter 2 reviewed existing literature on national-level digitalisation and location addressing systems, with a focus on their significance and implementation challenges in developing countries. It highlighted the critical role of digital location addressing systems in providing

essential services and identified a notable research gap within the IS discipline. The chapter identified three critical gaps: the under-exploration of digital location addressing systems within the IS discipline, the lack of IS-focused research on the broader implications, challenges, and impacts of these systems in developing countries, and the absence of robust theoretical frameworks to analyse the socio-technical and economic complexities of digitalising location addressing systems, alongside a need for understanding adaptive management in national digitalisation efforts.

Chapter three presented DCT as the theoretical foundation for this research, emphasising its central concepts of sensing, seizing, and transforming capabilities and their role in enabling organisations to navigate rapidly changing environments. It explored DCT's application in IS digitalisation research, highlighting its significance in understanding organisational adaptability and strategic response in the digital age. Recognising DCT's limitations, such as its primary focus on organisational contexts and limited consideration of the broader socio-political and cultural intricacies of national digitalisation efforts, the chapter proposed an extension of DCT to include legitimising and institutionalising capabilities. This expanded framework aimed to provide a holistic view of the digitalisation of location addressing systems at the national level, stressing the importance of government support, stakeholder engagement, and the embedding of digital initiatives within national strategies for future sustainability.

Chapter 4 delved into the research methodologies and provided a rationale for selecting the interpretive case study methodology for this investigation. This chapter encompassed an overview of prevalent paradigms, methodologies, and methods in IS research. It detailed the research process, including the researcher's approach to accessing field sites, data collection, and analysis. Additionally, the chapter outlined the evaluative principles pertinent to interpretive studies and discussed the ethical guidelines that underpin research activities.

Chapter 5 presented the case description of Ghana's digitalisation of its location addressing through the implementation and use of the NDPAS. The chapter described four case studies from both public and private sector institutions and firms, illustrating the challenges before digitalisation, the implementation and utilisation of NDPAS, and the post-digitalisation era. It highlights the transformative effects of NDPAS on operational efficiency and service delivery across sectors, demonstrating the significant impact of digitalisation on Ghana's socio-economic development.

Chapter 6 presented both within-case and cross-case analyses of the four case institutions and firms using the extended DCT. Each case description was analysed to examine how the dynamic capabilities framework facilitated the effective implementation and utilisation of Ghana's NDPAS. The cross-case analysis examined the relationality, similarities, and differences among the institutions and firms involved in the digitalisation of Ghana's location addressing system. This analysis highlighted the pivotal role of concepts within the extended DCT in enabling successful national-level digitalisation across various sectors.

Chapter 7 addressed the research questions stated in the introduction chapter by discussing and interpreting the findings from this study in relation to the IS literature on national-level digitalisation, as presented in Chapter 2. Additionally, the chapter provided reflections on the use of the extended DCT for this study.

Findings from the study show that institutions and firms in developing countries interpret digital location addressing systems as catalysts for enhancing operational efficiency, socio-economic development, and inclusivity, serving as pivotal enablers that bridge the gap in service delivery to underserved populations, thus fostering socio-economic growth. These systems play a crucial role in improving the quality of life by making essential services more accessible and

simplifying daily tasks. Beyond individual benefits, digital addressing systems strengthen state agencies by enhancing their operational capabilities and ensuring they can meet the demands of an increasingly digital economy. The adoption of these systems reflects a government's political commitment to national progress, showcasing the strategic use of digitalisation to drive development. Furthermore, the impact of digitalisation transcends sectoral boundaries, with improvements noted in operational efficiency, financial inclusion, governance, and the overall enhancement of citizen lives, marking a comprehensive transformation across various facets of society.

Findings from the study also revealed five (5) capabilities that enable institutions and firms in developing countries to implement and use digital location addressing systems. The capabilities of sensing, legitimising, seizing, transforming, and institutionalising play crucial roles in navigating and capitalising on the opportunities presented by digitalisation in developing countries. In Ghana, these capabilities were demonstrated through the government identifying the need for an improved addressing system, GPCL addressing service delivery challenges, and Vokacom leveraging its technical expertise. Legitimising efforts involved government endorsement of the National Digital Property Addressing System (NDPAS), GPCL's empowerment through legal frameworks, and ConGas adhering to safety regulations, all building credibility and trust essential for digital initiatives. The seizing capability was evident in GPCL's strategic investments, HeFRA's rapid adoption of digital solutions, and ConGas's operational agility to capitalise on new opportunities. Transforming and institutionalising were showcased through GPCL's deployment and continual improvement of NDPAS, Vokacom's development of a user-friendly interface, and HeFRA integrating digital addresses to enhance healthcare oversight. These efforts underpin a culture of innovation and optimisation, with a

focus on meeting evolving operational needs and setting standards for a user-friendly and secure digital addressing system.

Finding from the study further underscore the multifaceted impacts of implementing digital location addressing systems in developing countries, revealing substantial improvements in operational efficiency, regulatory compliance, societal benefits, and innovative potential while also acknowledging significant challenges. These systems streamline processes, enhance service delivery, and promote socio-economic development, with precise location data bolstering policy development and resource allocation. Societal gains are notable, with simplified navigation, improved access to services, and empowerment of previously underserved communities. The innovative use of APIs catalyses integrated service experiences, encouraging collaboration across sectors and driving the digital economy. However, the digitalisation journey faces hurdles like data privacy concerns and sustainability issues, particularly in political transitions, underscoring the necessity for robust security, adaptability, and comprehensive stakeholder involvement to safeguard the initiatives' success and relevance.

A summary of how the research questions of this study were addressed are provided in Tables 8.1, 8.2, and 8.3.



Meanings Associated by Institutions and Firms	Description
1. Catalyst for operational efficiency, socio-economic development, and inclusivity	Digital location addressing systems are viewed as key enablers of socio-economic development and inclusivity. They bridge service delivery gaps, making essential services accessible to underserved populations and driving socio-economic growth (Hafselde et al., 2021; Ramadani et al., 2022; Xiao et al., 2023).
2. Tool for enhancing quality of life	Institutions and firms recognise the digital addressing system's role in significantly improving the quality of life for citizens by streamlining access to crucial services and enhancing daily conveniences (Ditsela et al., 2011; Kitsios et al., 2023; Molelekoa et al., 2017; Toth et al., 2022).
3. Vehicle for strengthening state agencies	The digital addressing system is seen as instrumental in bolstering the capabilities of state agencies, enhancing their operational efficiency, and ensuring their services meet the demands of a digital economy (Xiao et al., 2023).
4. Reflections of political commitment to national progress	The adoption and use of digital location addressing systems reflect a political commitment to leveraging digital technology for national development, illustrating the government's dedication to using digitalisation as a strategic tool for advancement (Chatfield et al., 2016; Luna-Reyes et al., 2012; Medaglia et al., 2017b).
5. Broad impacts across sectors	The impact of digitalisation extends across various sectors, improving operational efficiency, promoting financial inclusion, streamlining governance, and enhancing citizens' lives (Schirmacher et al., 2019; Toth et al., 2022).

Table 8.1 - Summary of the meanings institutions and firms associate with digital location addressing systems in a developing country.

Capability	Description	Application
Sensing	Identifying, interpreting, and responding to external environmental changes to navigate the complexities of digitalisation (Eisenhardt & Martin, 2000; Ghosh et al., 2022; Jonathan et al., 2022; Luna-Reyes et al., 2012).	Ghanaian government identifying the gap in the addressing system; GPCL recognising service delivery challenges; Vokacom leveraging technical expertise.
Legitimising	Building credibility and trust through government endorsement, adherence to legal and regulatory frameworks, and stakeholder engagement to enable digital initiatives (Avgerou, 2013; Hinings et al., 2018).	Government endorsement of the NDPAS; GPCL's legal empowerment; ConGas's adherence to safety regulations.
Seizing	Capitalising on identified opportunities by reconfiguring resources and strategic alliances for tangible outcomes (Warner & Wäger, 2019; Yeow et al., 2018).	GPCL's strategic decision-making and investment in NDPAS; HeFRA's rapid adoption; ConGas's operational agility.
Transforming	Strategic realignment and continuous renewal of organisational processes to sustain competitiveness. Involves adopting new technologies and adapting business models in response to digital innovations (Ambrosini & Bowman, 2009; Kaushik et al., 2023; van de Wetering, 2021).	GPCL managing NDPAS deployment and improvements; Vokacom developing user-friendly interface; HeFRA integrating digital addresses. GPCL integrating NDPAS into its operations and continually seeking improvements; Vokacom developing the NDPAS with a focus on user experience and security; HeFRA leveraging NDPAS to enhance healthcare oversight.
Institutionalising	Embedding continuous system optimisation and innovation within operations and adapting to evolving operational needs through technology (Lopes & de Sá-Soares, 2014; Tolbert & Zucker, 1996; Wahid & Sein, 2014).	GPCL fostering a culture of continuous optimisation and innovation; Vokacom's emphasis on creating a user-friendly and secure digital addressing system as the standard; HeFRA updating its regulatory framework to incorporate digital addresses systematically.

Table 8.2 - Summary of the capabilities that enable the implementation and use of digital location addressing systems among institutions and firms in developing countries.

Outcome	Description
Operational Efficiency	The study reveals that the implementation of digital location addressing systems enhances operational efficiency across various sectors. This transformation is characterised by streamlined processes, improved service delivery, and operational inclusivity, supporting market expansion and socio-economic development (Hunady et al., 2022; Jernbeck, 2018; Karimi & Walter, 2015; Kim et al., 2022; Kotze, 2020; Muinde, 2017).
Regulatory Enhancements	The findings indicate that digital location addressing systems significantly improve regulatory compliance and oversight. By providing precise location data, these systems enable more effective policy development, resource allocation, and public service delivery, contributing to a more regulated and equitable service landscape (Baiyere et al., 2020; Frimpong et al., 2023; Muinde, 2017).
Societal Benefits	The study emphasises the societal benefits of digitalisation, showing how digital location systems facilitate the generation and ownership of addresses, simplify navigation, enhance access to essential services, improve public health and safety, and empower communities previously underserved (Ditsela et al., 2011; Frimpong et al., 2023; Jernbeck, 2018; Kotze, 2020; Molelekoa et al., 2017; Muinde, 2017; Tarhini et al., 2022).
Innovative Potential	The findings underscore the innovative potential of digital location systems in developing countries, particularly through the use of APIs (Aguerre & Bonina, 2023; Ojeda et al., 2021). These systems enable the creation of integrated service experiences, foster public and private sector collaboration, and drive the digital economy forward by connecting services with users' needs efficiently.
Challenges	The study identifies significant challenges associated with the digitalisation process, including data privacy concerns (Mendhurwar & Mishra, 2021; Pappas et al., 2023; Russell et al., 2018; Vial, 2021) and the sustainability of digital projects amid political transitions highlighting the need for robust security measures (Ansari et al., 2022; Enders et al., 2022; Xhafa, 2021), flexible adaptation strategies,

	and broad stakeholder engagement to ensure the long-term success and relevance of digital initiatives (Addo & Senyo, 2020; Alsharo et al., 2020; Bednar & Welch, 2020; Iyanna et al., 2022).

Table 8.3 - Summary of the outcomes of the implementation and use of the digital location addressing system among institutions and firms in a developing country.



8.3 Contribution to Knowledge

Consistent with IS studies adhering to the interpretive tradition, knowledge contribution is achieved through four types of generalisations: concept development, theory generation, specific implications, and rich insights derived from the study (Walsham, 1995b). Concept development involves the creation of new concepts within a domain. Theory generation refers to research outcomes that contribute a new theory. However, generating new theories isn't the sole means of contributing theoretically to knowledge. Other forms of theoretical contribution include theory extension and theory refinement (Snow, 2004). Theory extension involves broadening existing theories to cover different groups, empirical contexts, or sociocultural domains (Snow, 2004), and can also entail introducing a new construct (Presthus & Munkvold, 2016) or contesting an established perspective (Knopf, 2006). Theory refinement, on the other hand, entails the modification of existing theories by incorporating new case material.

Specific implications are findings that could be useful for related research in similar contexts. Rich insights imply understandings beyond concept development, theory generation and specific implications that are gained from reading reports and the case study. This research contributes to knowledge in the areas of theory extension, specific implications, and rich insights. These contributions are further explored and detailed in the following subsections.

8.3.1 Contribution to Theory

This research expands the application of DCT, focused on profit-oriented firms, to encompass public sector organisations and national-level digitalisation initiatives. Drawing on insights from Senshaw and Twinomurinzi (2018), who underscored the potential of dynamic

capabilities in public sector innovation, as well as Warner and Wäger (2019), and Ellström et al. (2021), who examined firm-level applications, this study enriches DCT by integrating concepts of legitimising and institutionalising. It then applies this enhanced theoretical framework to the context of national digitalisation efforts in a developing country. This approach shed light on how institutions and firms employ sensing, legitimising, seizing, transforming, and institutionalising capabilities to navigate and harness digital opportunities effectively. This innovative application of the extended DCT provides a refined analytical lens for understanding the complex dynamics of digitalisation in developing economies, thus significantly enriching the discourse on national digitalisation strategies.

By shifting the focus to a national level, the study makes a significant theoretical contribution, illustrating how dynamic capabilities, often investigated within the confines of individual business scenarios, can be effectively adapted, and applied to large-scale, national digitalisation projects. This expansion not only fills a significant research gap but also enriches the understanding of dynamic capabilities application in a larger digitalisation effort, that encompass various governance levels and societal impacts, setting a new direction for future research in information systems and digitalisation.

Furthermore, the application of DCT to the digitalisation of location addressing systems marks a significant theoretical advancement by extending the theory's traditional business-centric focus to a crucial public sector function. This extension significantly augments the original DCT, highlighting the theory's versatility and relevance in guiding digitalisation efforts beyond the commercial domain and highlighting its potential to contribute to complex national-level and public sector digitalisation challenges.

8.3.2 Contribution to Research

This study contributes significantly to the body of research on digitalisation, particularly within the context of developing countries. By focusing on the implementation and use of digital location addressing systems, it sheds light on the intricate processes and challenges associated with national digitalisation initiatives. The utilisation of the extended DCT as a theoretical lens enriches the understanding of the organisational and strategic dimensions vital for navigating national digitalisation initiatives. This approach not only highlights the complex interplay of capabilities necessary for the successful adoption of digital technologies but also emphasises the broader societal implications of such initiatives.

Through an in-depth exploration of case institutions and firms involved in Ghana's NDPAS, the study unveiled the nuanced ways in which national-level digitalisation can enhance operational efficiency, regulatory oversight, and societal welfare. These insights are particularly valuable in illuminating the pathways through which developing countries can leverage digital technologies to address long-standing challenges and harness new opportunities for socio-economic development.

Moreover, the study's findings underscore the significance of contextual factors in shaping the outcomes of digitalisation efforts, thereby contributing to the discourse on the variability of digitalisation impacts across different settings. By providing a detailed examination of the Ghanaian context, the study offered a template that can inform similar initiatives in other developing countries, while also identifying areas where contextual differences may necessitate adapted approaches.

In sum, this research enriches the academic discussion on digitalisation by providing a comprehensive analysis of its implementation and impacts within a developing country

context. It bridges theoretical concepts with practical insights, offering a valuable resource for scholars interested in the dynamics of national digitalisation and digital location addressing research.

8.3.3 Contribution to Practice

The research findings offer pivotal implications for practice, providing strategic recommendations essential for policymakers, practitioners, and stakeholders in the digitalisation domain. By examining the implementation and use of digital location addressing systems, this study significantly enriches the practical discourse on digitalisation, delivering actionable insights and strategic directions particularly beneficial for developing countries. It lays out a practical framework for understanding the complexities of implementing digital location addressing systems, thereby aiding policymakers in creating supportive legislative and infrastructural environments. The findings suggest that government endorsement and involvement are crucial in legitimising and propelling national digitalisation efforts forward. Moreover, the study's exploration of the extended DCT provided a framework for understanding the necessary capabilities that organisations can employ to effectively implement digital initiatives. This is particularly relevant for developing countries seeking to navigate the complexities of digitalisation in a way that maximises socio-economic benefits.

Industry leaders and digitalisation practitioners can draw valuable lessons from the study's case analyses. For example, the examination of GPCL, Vokacom, HeFRA, and ConGas offers insights into how different organisations have harnessed digital technologies to improve operational efficiency, expand service delivery, and enhance customer satisfaction. These case

studies illuminate the strategies that can be employed to leverage digitalisation for competitive advantage and societal impact.

Furthermore, the study highlights the need for a proactive approach to managing the potential unintended consequences of rapid digitalisation, such as data privacy concerns and the risk of digital exclusion. This calls attention to the importance of incorporating ethical considerations and risk management strategies into digitalisation planning and execution.

In essence, this research provides a comprehensive overview of the practical considerations and strategic imperatives associated with digitalisation initiatives in developing countries. It contributes to practice by offering evidence-based insights that can inform the design, implementation, and management of digitalisation projects, ensuring they are strategically aligned with national goals, organisational goals, and broader socio-economic objectives.

8.3.4 Contribution to Policy

This study provides a comprehensive contribution to policy by highlighting the pivotal role of government actions and policies in facilitating the successful implementation and utilisation of digital location addressing systems, especially in developing countries. It underscores the need for an enabling environment that promotes digitalisation through supportive policies, strategic partnerships, and significant investments in technological infrastructure, emphasising the transformative impact of digital location systems on service delivery, operational efficiency, and socio-economic inclusivity. A crucial policy implication derived from the study is the necessity of adaptability in technology-driven development strategies to local conditions and needs. The findings advocate for customising digital initiatives, such as Ghana's NDPAS, to

meet diverse socio-economic, cultural, and infrastructural contexts across different regions. This entails ensuring technological compatibility with local infrastructures, language adaptability, and usability for varying technological literacy levels, thereby enhancing essential services' effectiveness, such as healthcare. Policymakers are encouraged to design digital initiatives that are inherently flexible and responsive to the distinct contexts of various communities within their jurisdiction.

Moreover, the study calls for the integration of macro-level strategies with micro-level actions, stressing the importance of aligning national strategies with practical, local implementations to ensure the effective execution of digital initiatives. This approach advocates for policies that not only aim to achieve overarching national goals but also take into account the realities of ground-level implementation, ensuring that digitalisation initiatives are both strategic and practical. Policymakers are thus advised to adopt a holistic approach in formulating and executing digitalisation policies, ensuring that they cater to both the broad national objectives and the specific needs and conditions of local communities for the successful and sustainable adoption of digital technologies.

Based on these insights, the research offers several recommendations for policymakers:

Policies should encourage collaborations between government bodies and private entities to leverage collective expertise, resources, and innovation potential in digital initiatives.

Policymakers should prioritise investments in both physical and digital infrastructure and focus on improving digital literacy among the population to lay a strong foundation for successful digital transformation.

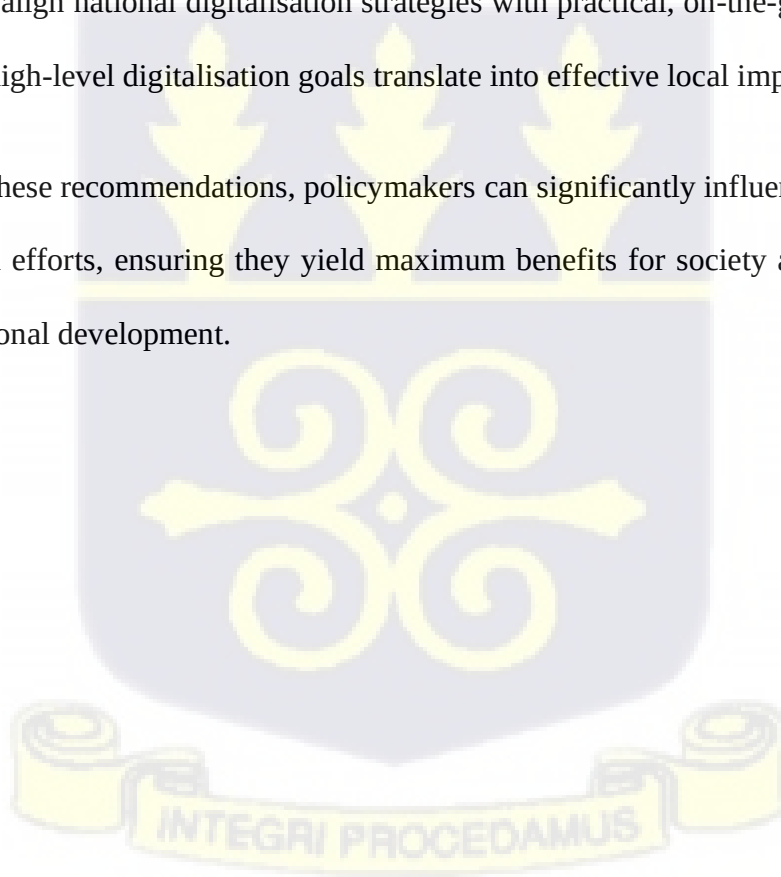
Policy makers should design digitalisation strategies that are flexible and responsive to the local needs and conditions of different communities, ensuring technological initiatives are inclusive and accessible to all citizens.

Policymakers should develop and enforce stringent data protection laws and practices to safeguard personal information and build public trust in digital systems.

Policymakers should ensure ongoing political support for digitalisation projects, striving for policy consistency and strategic alignment across successive administrations to guarantee the sustainability and long-term success of these initiatives.

Policies should align national digitalisation strategies with practical, on-the-ground actions to guarantee that high-level digitalisation goals translate into effective local implementations.

By addressing these recommendations, policymakers can significantly influence the trajectory of digitalisation efforts, ensuring they yield maximum benefits for society and contribute to sustainable national development.



8.4 Evaluation of the Research

This section details the study's evaluation, adhering to the seven established criteria by (Klein and Myers, (1999) for conducting and evaluating IS interpretive case studies. As specified in Chapter 4, these evaluation criteria include hermeneutic circle, contextualisation, interaction between the researcher and the participants, abstraction and generalisation, dialogical reasoning, multiple interpretations, and suspicion. Additionally, this section provides an evaluation of the study based on the ethical standards for IS interpretive studies, as described in Chapter 4. Table 8.4 provides a succinct summary of the evaluation of this study, in accordance with the principles of interpretive studies.

Table 8.4 Summary of Evaluation of this Study Using Interpretive Principles

Principles	Application in this Study
Hermeneutic circle: The process of understanding a phenomenon by iteratively examining its individual parts and the whole, thereby gaining a deeper comprehension through this continuous interplay (Gadamer, 1976).	The study navigated the hermeneutic circle, iteratively refining its understanding of the digitalisation process within the dynamic capabilities' framework. It began with initial preconceptions about the impact of national-level digitalisation, which were subsequently challenged and enriched by empirical findings from various case studies. Each case was examined to comprehend how entities leveraged digitalisation opportunities through sensing, seizing, legitimising, transforming, and institutionalising capabilities. The detailed analysis of each case was continuously related back to the extended theory of dynamic capabilities, enhancing the understanding of how these capabilities manifest at a macro level in the context of

	digitalisation. This iterative process between the specific instances of dynamic capability utilisation in the case studies and the overarching theoretical framework facilitated a deeper understanding of the digitalisation of the location addressing system in Ghana.
Contextualisation: Reality is understood within a context, which constitutes the social and historical backdrop of the research phenomenon.	The principle of contextualisation was utilised in the data collection process by gathering information about the social, political, and historical context of Ghana's digitalisation initiatives for location addressing systems, as derived from research participants and various media/document sources.
Interaction Between the Researcher and Subjects: Requires the researcher's thoughtful consideration of how interactions with interview participants contribute to the social construction of data.	Throughout this study, participant interactions were integral and ongoing, starting from initial face-to-face interviews and continuing through follow-up communications via email and phone calls. These interactions also included seeking participant feedback on transcribed interviews and preliminary case descriptions. For additional context and to address any gaps in the participants' accounts, document sources were referred to, as indicated in Sections 4.5 and 4.6 of Chapter 4.
Abstraction and Generalisation: The use of theoretical concepts to understand social action and abstraction to generalise to other similar settings.	The study applied the principle of Abstraction and Generalisation by leveraging the extended DCT to explore the broader impacts of digitalisation. By analysing the specific experiences of case institutions and firms, the study abstracted key insights into the transformative potential of digital location systems. These insights were then generalised to offer a framework applicable to similar digitalisation initiatives in other developing countries. For example, it highlighted the critical role of sensing capabilities in enabling institutions and firms to navigate the complexities of digitalisation. This was generalised to suggest that developing a keen sense of market and technological trends is essential for any organisation in a developing country aiming to leverage digital technologies for operational efficiency, regulatory enhancements, and broader societal benefits.

Dialogical Reasoning: Involves the researcher's awareness of possible contradictions between the initial theoretical assumptions that guided the research design and the actual study findings, which are arrived at through several iterations.	Dialogical reasoning was featured in the study through its dynamic engagement with both the existing literature and the empirical findings from the case studies, which involved a continuous reflection on and re-evaluation of the researcher's preconceptions and theoretical frameworks. This iterative process of analysis facilitated a meaningful dialogue between theoretical concepts (dynamic capabilities) and practical applications (the implementation and utilisation of the NDPAS). By navigating the interplay between theory and practice, the study effectively reasoned through contrasts and parallels, ensuring that discrepancies between initial assumptions and observed data were not merely acknowledged but rigorously examined and integrated into the analysis.
Multiple Interpretations: Considers the possible different viewpoints of the phenomenon and advises researchers to be attentive to the potential variations in interpretations among research participants.	Given the interpretive nature of the study, it embraced multiple interpretations of national-level digitalisation in a developing economy, highlighting the varied impacts and experiences associated with the digital location addressing system. To capture this diversity, the study utilised a combination of interviews and documentary sources to gather insights from a broad range of participants selected through snowball and purposive sampling.
Suspicion: Being sensitive to potential "biases" and systematic "distortions" in participants' narratives.	In the study, moments of bias in participant accounts were encountered, reflecting the principle of suspicion, which emphasises questioning underlying assumptions and critically examining taken-for-granted truths. This principle was applied by critically analysing the proclaimed benefits of the NDPAS, juxtaposed against the challenges encountered in its implementation and usage. An illustrative example of this critical examination can be seen in the case of GPCL. Despite the anticipated additional revenue stream from API integration, GPCL was unable to realise this potential due to the government's directive for free integration of organisations into the NDPAS. This directive, aimed at encouraging widespread adoption and utilisation of the digital address system, inadvertently impacted GPCL's revenue generation plans.

8.5 Ethical Considerations

Ethical guidelines are in place to protect the interests and reputations of the researcher, participants, and the University (Myers, 2013). These guidelines are founded on principles such as honesty, avoiding plagiarism, obtaining informed consent, securing permission to publish (Myers, 2013), and maintaining confidentiality and anonymity (Walsham, 2006). In this study, adherence to these principles began with the submission of an introductory letter and a research proposal to the case organisation. The contents of these documents were in alignment with the University's ethical standards and were rigorously followed throughout the study.

Table 8.5 Summary of Evaluation of this Study Using Ethical Standards

Ethical Standard	Application in Research
1. Ensuring confidentiality and anonymity	The study protected participants' identities by anonymising any information that could lead to their identification. This was achieved by referencing participants by general titles rather than names, and in instances where a participant's quotation was deemed sensitive or controversial, they were referred to with a general designation such as "a participant." All identifiable information was carefully managed and anonymised in the research findings, upholding the privacy of those involved.
2. Informed consent	Although no formal consent forms were signed, participants were fully informed about the purpose of the study, the nature of their involvement, and how the data collected from them would be used. This information was provided to ensure that they had a clear understanding of the research, thereby securing their informed verbal consent and willingness to voluntarily participate in the study.

3. Permission to Tape-Record Interviews	Before conducting interviews, explicit permission was obtained from each participant to tape-record the conversations. This measure was to ensure transparency and consent for the recording of the interviews.
4. Verification of Interview Transcripts	To maintain the accuracy and reliability of the data, each participant was given the opportunity to review and confirm the accuracy of their interview transcripts. Subsequently, the initial drafts of the case descriptions were also sent for verification of accuracy, although not much feedback was received. This process allowed participants to ensure their views were accurately represented.
5. Plagiarism	The study rigorously adhered to academic standards to avoid plagiarism. All sources and references were properly credited, and original thought and research were emphasised to maintain the academic integrity of the thesis. Additionally, the researcher utilised the University's plagiarism detection software, Turnitin, to verify the thesis' compliance with these standards.
6. Use of Information for Academic Purposes	All information gathered during the research was protected and used solely for academic purposes. The data was handled responsibly, ensuring that its use was in line with the ethical guidelines of academic research.
7. Review by the Case Organisation	In adherence to ethical standards, the initial draft of the thesis was shared with the case institutions and firms involved in the study for review. This procedure was undertaken to verify the accuracy of the information presented and to offer these entities an opportunity to contribute their insights on the findings pertaining to them. This approach was designed to ensure that the portrayal of the institutions and firms was both accurate and respectful of their confidentiality, avoiding the disclosure of sensitive or proprietary information without their explicit consent. Despite this effort, no feedback was received from these entities on the initial draft. Consequently, the researcher decided not to submit any subsequent drafts for their review, maintaining the integrity of the research process while respecting the autonomy and communication preferences of the case institutions and firms involved.

8.6 Limitations of the Research

This study offers valuable insights but is constrained by its focus, theoretical framework, and methodology. Specifically, its emphasis on the implementation and use of digital location addressing systems in developing countries narrows its scope, making the findings particularly relevant to similar socio-economic and technological contexts. This focus limits the applicability of the insights to dissimilar environments, such as developed nations, where digitalisation presents different challenges and opportunities. Moreover, the interplay between digital location systems and other digital innovations within the broader digital ecosystem remains underexplored.

The use of the extended DCT as a theoretical lens effectively captures the organisational and strategic aspects of national digitalisation initiatives. However, the extended DCT's broad focus on capabilities rather than quantifiable outcomes presents a constraint. It excellently captures the processes and strategies countries employ to navigate digitalisation efforts; but it falls short in precisely measuring the direct impacts of specific capabilities on the success of digitalisation projects. This limitation, intertwined with the study's interpretive approach and the theory's qualitative emphasis, makes it difficult to establish direct cause-and-effect relationships between dynamic capabilities and concrete digitalisation outcomes, such as increased revenue, enhanced service delivery, or improved customer satisfaction. While the extended DCT provides deep insights into the strategic behaviours underlying successful digitalisation efforts, it may not directly inform policy recommendations or offer clear metrics for evaluating the effectiveness of these initiatives.

Additionally, the extended DCT does not offer a comprehensive framework for managing the unintended consequences of rapid digitalisation. This limitation arises from the theory's

primary focus on the capabilities required for adaptation and success in dynamic environments, rather than on the pre-emptive identification and mitigation of potential negative impacts.

The study's interpretivist approach provides rich, context-specific insights into digitalisation in developing countries but limits the generalisability of its findings across broader contexts. Focused on understanding phenomena through the meanings assigned by case institutions and firms, this approach, while offering valuable depth, faces challenges in quantifying the impact of specific capabilities on digitalisation success and deriving direct policy implications. The reliance on case studies enhances the depth of understanding but restricts broad generalisation, a common constraint in interpretivist research highlighted by scholars like Klein and Myers (1999) and Walsham (1995a). Consequently, while interpretivist methods illuminate the nuanced dynamics of national-level digitalisation of location addressing systems in developing countries, they also underscore a methodological trade-off between the richness of contextual insights and the ability to generalise findings or quantify impacts in a way that positivist or quantitative methodologies might more directly address.

8.7 Recommendations for Future Research

The limitations identified in this study open avenues for future research in several key areas. Firstly, adopting a mixed-methods approach could offer a richer evaluation of digital location systems by combining the depth of qualitative insights with the breadth of quantitative analysis. This would enable a more comprehensive evaluation of the impacts of digital location systems and facilitate the generation of more nuanced policy recommendations. Additionally, exploring the implementation and use of digital location systems in a variety of socio-economic and cultural contexts, including developed countries, could offer comparative insights that enrich

the global understanding of digitalisation's impacts. Future research might also delve into the integration of digital location systems with other digital initiatives, examining synergies and potential for holistic national digital strategies. Furthermore, there is a need for research focusing on the development of frameworks that not only capture the dynamic capabilities essential for digitalisation but also address proactive issue management, risk mitigation, and the ethical implications of rapid technological adoption. Lastly, investigating the long-term sustainability of digital initiatives amidst political changes and exploring strategies to insulate these initiatives from fluctuating political agendas could provide valuable strategies for maintaining momentum in national digitalisation efforts. These directions not only address the limitations of the current study but also contribute to a broader discourse on national digitalisation initiatives, offering a pathway to more resilient, inclusive, and comprehensive digital ecosystems.

8.8 Conclusion

This research investigated the implementation and utilisation of digital location addressing systems in developing countries, with a focus on Ghana's NDPAS. It employed an interpretivist approach and qualitative research methods, leveraging an extended version of the DCT to explore the perspectives, strategies, and challenges associated with nation-level digitalisation. Through comprehensive case studies of key institutions and firms engaged with NDPAS, it provided an in-depth look at the experiences, obstacles, and outcomes of digitalisation within the specific socio-economic backdrop of a developing nation.

The research outlined the essential dynamic capabilities—sensing, legitimising, seizing, transforming, and institutionalising—necessary for the effective implementation and adoption

of digital addressing systems. These capabilities underpin the ability of organisations to adapt to and capitalise on digital opportunities, illustrating the complex interaction between technology and organisational strategy in the context of developing countries. It assessed how selected institutions and firms navigated the intricacies of national-level digitalisation, using the DCT to derive and generalise insights on the wider implications of digital initiatives. This method enables a profound, contextual comprehension of the strategic, organisational, political, cultural, and technological facets of implementing and using digital addressing systems.

Key discoveries indicate the significant transformative impact of digital addressing systems, like Ghana's NDPAS, across diverse sectors, enhancing operational efficiency, regulatory capabilities, and societal benefits. The findings emphasise the importance of enabling policies, strategic alliances, and substantial technological investments to create a conducive environment for digitalisation. They highlight the critical role of adaptability in digital initiatives to local contexts and the necessity of marrying macro-level strategies with micro-level actions for the successful deployment of digital projects.

From a policy standpoint, the research underscores the vital need for continuous political support, adaptability to local requirements, and the formulation of integrated strategies for effective national-level digitalisation. It suggests several recommendations for policymakers, including fostering a supportive atmosphere for digital initiatives, ensuring technological adaptability to various local conditions, and aligning national objectives with practical local implementations.

This research contributes to the scholarly dialogue by providing a framework to understand the role of digital technologies in developing countries and offers actionable insights for

policymakers, industry leaders, and practitioners on how to effectively navigate national digitalisation's complexities. It aids in strategic planning and implementation of digital initiatives that aim to bolster national development and promote socio-economic inclusivity.



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APPENDICES

Appendix A – Publications from the study

Bibi, D., Effah, J., & Boateng, R. (2019). Evaluation of a National Digital Location Infrastructure: Stakeholders' Perspectives in Ghana. *AMCIS 2019 Proceedings*.

Bibi, D. T., Effah, J., & Boateng, R. (2020). Sustaining a National Digital Location Platform in an African Country: The Case of Ghana. In B. B. Anderson, J. Thatcher, R. D. Meservy, K. Chudoba, K. J. Fadel, & S. Brown (Eds.), *26th Americas Conference on Information Systems, AMCIS 2020, Virtual Conference, August 15-17, 2020*. Association for Information Systems. https://aisel.aisnet.org/amcis2020/global_dev/global_dev/16



APPENDIX B – INTERVIEW GUIDE

DIGITAL PLATFORMIZATION AND USE OF A NATIONAL ADDRESSING SYSTEM IN A DEVELOPING COUNTRY: THE CASE STUDY OF GHANA

Interview Guide

Participants: Persons involved in the decisions, design and implementation of the NDPAS, users and individuals whose organizations make use of the digital address platform and/or its peripherals.

Investigator: Miss. Dzifa Tomiwa Bibi

Interview – the interview will be largely unstructured in order to understand individual views of the digital address platform and its use. However, the following themes will guide the kind of questions and the issues to be investigated and observed.

Purpose:

My study is in digital physical location addresses with particular focus on the National Digital Property and Address System (NDPAS) of Ghana. **The purpose of this research is to understand the digital platformisation of a national addressing system in a developing country context.** The overall goal is to study the processes and consequences that confront a developing country in the digital platformisation and use of location addresses and how they are addressed. Ghana was selected because a digital location platform was recently implemented to tackle the inadequate location addressing system that had existed for a long time.

The research questions:

1. Why would a developing country platformise their location addresses?
2. How can platformisation of location addresses be applied to the alleviation of societal challenges in a developing country?
3. What are the consequences of using a digital location address platform in a developing country?

Assurance:

You have the assurance of the University of Ghana that all information gathered will be protected and used solely for academic purpose. Findings from the study will be presented to management before any final publication.

The interview should last about 45 minutes – it should not go beyond an hour. I will be taking some notes during the session as well as recording the session. The recordings will be transcribed and you will have the opportunity to add or subtract before any analysis is made with other submissions.

If you have any questions about your rights as a research participant in this study you may contact the Administrator of the Ethics Committee for Humanities, ISSER, University of Ghana at ech@isser.edu.gh / ech@ug.edu.gh or 00233- 303-933-866.

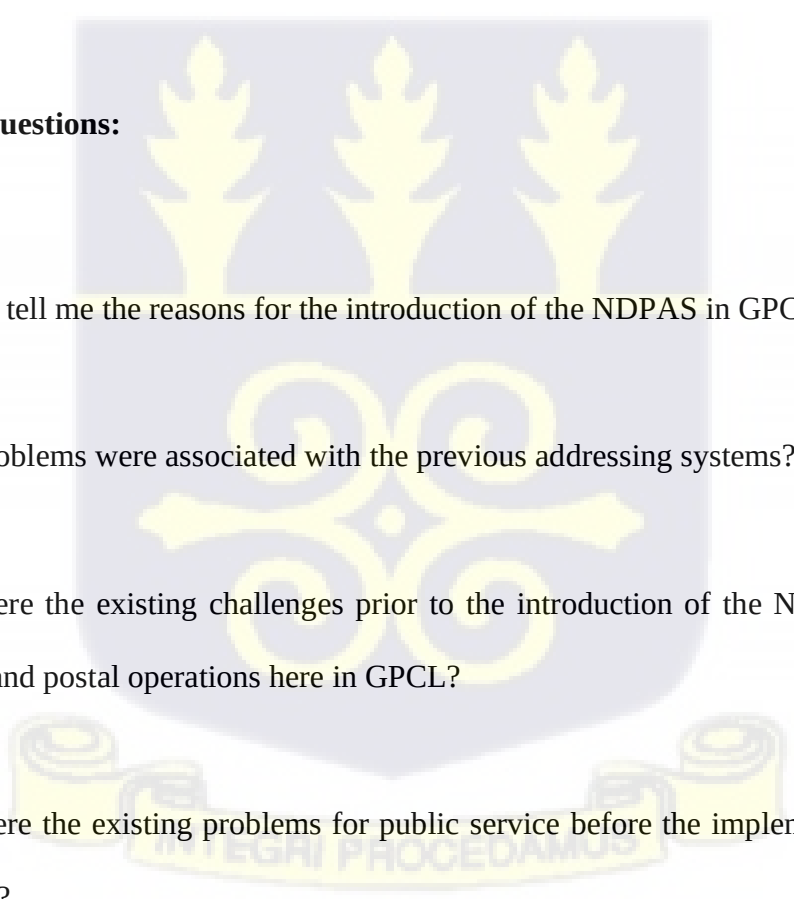
Are there any questions you may have about the interview?

General

General information about interviewee and setting: *Full name, profession, position, department, years with organisation, phone, email, knowledge about the digital address platform.*

RQ1: Why would a developing country digitalise location addresses?

Interview questions:

- 
- a) Can you tell me the reasons for the introduction of the NDPAS in GPCL?
 - b) What problems were associated with the previous addressing systems?
 - c) What were the existing challenges prior to the introduction of the NDPAS for your courier and postal operations here in GPCL?
 - d) What were the existing problems for public service before the implementation of the NDPAS?
 - e) What major factors triggered the introduction of a digital address system?

- f) Were there any power players, politics, technology, social, organisational, legal, organisational culture, national culture issues that influenced the introduction of the digital system? If so, how did they?
- g) How has the digital address platform help to address the challenges previously encountered?
- h) What major navigation and location challenges been resolved by the NDPAS?
- i) Would you say that the reasons for implementing the NDPAS has been realised?
- j) What recommendations will you give for the effective use of the NDPAS and its peripherals?

RQ2: How can platformisation of the location address be applied to the alleviation of societal challenges in a developing country?

Interview questions:

- a) What steps were involved in the implementation of the NDPAS?
- b) Were there difficulties encountered during the project implementation and how were they resolved?

- c) What key lessons can be learnt from the platformisation process of Ghana's location addressing systems?
- d) What major problems do you think has been created by implementing the NDPAS and Why?
- e) How has the NDPAS affected stakeholders, declaration, verification, issue and updates, support and system availability?
- f) What were some of your personal experiences in the eras before digital addresses?
- g) In terms of compliance, what were the major incidences worth sharing and how they were resolved?

RQ3: What are the consequences of using a digital location address platform in a developing country?

- a) How has the use of the digital location address platform influenced your organisation's processes and activities?

- b) How do you feel about strategies used for the introduction of the digital address platform to improve productivity in your organisation?
- c) Can you describe the attitudes and approach to work of the other people working with you at the time?
- d) How has the digital address platform affected working relationship among your peers?
- e) Tell me about your experiences working since the introduction of the digital location platform.
- f) What are some ways people dealt with challenges associated with inadequate addressing systems prior to the digital address platform?
- g) How did political, technology, social, legal, financial and cultural issues affect the successful implementation/application of the digital location platform? How were they resolved?
- h) How will political, social, legal, operational, financial, etc issues affect the successful sustenance of the digital address platform?
- i) Any other information that will be helpful in understanding your experiences in terms of the NDPAS?

Closing remarks

Thank you for all that valuable information, is there anything else you'd like to add before we end

Thank you for your time. I may get in touch again for clarification when the needed.



Appendix C – Ethical Clearance



UNIVERSITY OF GHANA

ETHICS COMMITTEE FOR THE HUMANITIES (ECH)

P. O. Box LG 74, Legon, Accra, Ghana

My Ref. No... ECH 057/ 20-21 ...

November 06, 2020

Bibi Dzifa Tomiwa
Department of Operations and MIS
University of Ghana
Legon

ETHICAL CLEARANCE (ECH 057/ 20-21)

The protocol title below has been reviewed and approved by the ECH Committee.

TITLE OF PROTOCOL: DIGITAL PLATFORMIZATION AND USED OF A NATIONAL ADDRESSING SYSTEM IN A DEVELOPING COUNTRY: THE CASE FOR GHANA.

PRINCIPAL INVESTIGATOR: BIBI DZIFA TOMIWA

Please note that the final review report must be submitted to the Committee at the completion of the study. Your research records may be audited at any time during or after the implementation. Any modification of this research project must be submitted to ECH for review and approval prior to implementation.

Please report all serious adverse events related to this study to ECH within seven (7) days verbally and in writing within fourteen (14) days.

This certificate is valid till November 05, 2021. You are to submit annual reports for continuing review.

Please accept my congratulations.

Yours Sincerely,

Professor C. Charles Mate-Kole
ECH Chair

Cc: Prof. John Effah, Department of Operations and MIS, UG

Tel: +233-303933866

Email: ech@ug.edu.gh