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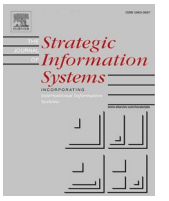

Government-Led digital transformation in FinTech ecosystems

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ABSTRACT

In this paper, we report on a qualitative exploratory case study of a national-level government-led digital transformation. We depart from most studies on government digital transformation that largely focus on improving existing services, bureaucratic processes, or adopting emerging digital technologies. Instead, we analyze the process of a government-led digital transformation aimed at addressing significant institutional voids within a resource-constrained context. Drawing from 60 interviews with stakeholders in the Ghanaian FinTech ecosystem, we theorize the concept of digital branching strategy as an alternative lens to envisage government-led digital transformation that considers the resource-constrained context and characteristics of governments. Our findings show that governments, especially those in resource-constrained contexts pursue digital transformation through exploring frugal innovations and leveraging established resources, structures, and relationships within an ecosystem. We subsequently develop a process model to explain the mechanisms of a national-level government-led digital transformation. Based on the findings and the model, our study offers critical insights to re-imagine government-led digital transformation in resource-constrained contexts by demonstrating how pursuing a digital branching strategy leads to planned and emergent outcomes because of the generative nature of the transformation.

Introduction

Most information systems (IS) research views digital transformation as "a process that aims to improve an entity by triggering significant changes to its properties through combinations of information, computing, communication, and connectivity technologies" (Vial, 2019, p. 118). This definition suggests an organization-centric perspective and follows that most IS research has tended to prioritize organizational digital transformation (e.g., Chanias et al, 2019; Baiyere et al., 2020). However, digital transformation can also be comprehended more holistically as a complex institutional or social change driven by digital technology (Faik et al., 2020). This is pertinent in the case of Global South countries, particularly in Africa, where there is increasing government investment in digital transformation projects. These projects do not just target the enhancement of current services and operational efficiencies, but also the bridging of voids left by the private sector in areas such as energy, utilities, and financial services.

Indeed, governments have embarked on digital transformation more broadly across various bureaucratic processes (Datta 2020) or

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as a strategy to mitigate the impact of major crises, such as the COVID-19 pandemic (Karanasios 2022). Yet, despite the large-scale social implications of this type of transformation, there is little research that illuminates how governments may undergo digital transformation at a national level. We argue that the process of government-led digital transformation may differ from organizational digital transformation and requires new theoretical perspectives for the following reasons. First, government-led digital transformation is often large in scope and scale because of the numerous stakeholders and services it may impact (Daub et al., 2020). This means that governments may take a more conservative approach to digital transformation than organizations. Second, the primary goal of digital transformation for organizations is often to generate more profit and increase market share through competitive advantage, improved efficiency, and effectiveness (Li, 2020), whereas governments are more concerned about generating value for citizens through improved public services, increased access, and availability. This drive for profit may lead organizations to pursue a never-ending search for improvement while governments may take a punctuated approach to digital transformation because of the complexity and numerous projects they undertake. Lastly, there are differences in risk appetite (Plekhanov., et al., 2022) for governments and organizations. Generally, governments are risk-averse because of the need to maintain public trust, and judicially use limited public resources. On the other hand, organizations have higher risk tolerance because of market competition and demands. Because of this, governments have a slower pace of innovation and digital transformation and are less open to risky experimentation due to the requirement for extensive testing, compliance checks, and approval processes.

These differences reinforce our argument for studies to understand government-led digital transformation. Indeed, scholars have recently called for research to consider changes that encompass entire sectors and society at large (Carroll et al. 2023; Majchrzak et al. 2016; Tana et al. 2023). Simultaneously, there is a growing demand for a more diverse range of theories to gain a more profound understanding of the digital transformation process (Rowe and Markus 2023). Following these demands, we move from the organizational dominant literature to focus on government-led digital transformation. Specifically, we draw inspiration from the digital transformation literature to develop a new concept of "digital branching strategy". To support our theorization, we undertook an exploratory, qualitative case study in Ghana to address the research question: *how do governments pursue digital transformation in resource-constrained contexts?* Specifically, we examine the implementation of Ghana's Quick Response Code (GhQR)—a national level[1] solution implemented by the government for the financial technology (FinTech) ecosystem to support merchants' digital payments. We draw on 60 interviews with multiple actors in the Ghanaian FinTech ecosystem, namely government agencies, banks, FinTech firms, mobile network providers, and merchants. Our study makes several contributions to the understanding of government-led digital transformation. First, we develop a model that explains how governments, especially those in resource-constrained contexts may pursue digital transformation. Second, we theorize digital branching strategy as an alternative lens to envisage government-led digital transformation. Lastly, we demonstrate how pursuing digital branching strategy results in planned and emergent outcomes that are further exploited by ecosystem actors.

The rest of the paper is outlined as follows. Section 2 outlines the theoretical background by discussing differences between government-led and organizational digital transformation and the theoretical inspiration of the study. Section 3 presents the research methodology by outlining our research design, case background, data collection, and analysis procedures. We follow with Section 4 by presenting the findings. Section 5 discusses the findings and presents the theoretical and practical contributions as well as limitations and future research directions. Finally, Section 6 concludes the study with a summary of key highlights.

Theoretical background

While there are some similarities between digital transformation led by the government and by the private sector, there are notable differences. This suggests that an understanding at the organizational level may not always be directly applicable to government-led digital transformations (see Table 1). A fundamental difference lies in the motivations and goals of the digital transformation. For government-led digital transformation, the overarching purpose is to offer improved, efficient, and effective public services to citizens (Aguerre & Bonina, 2023; Madan & Ashok, 2023), whereas organizations are more focused on improving productivity and competitive advantage to generate more profit (Li, 2020; Chanias, et al., 2019). This difference brings several consequences because governments face resource constraints, heightened scrutiny, public pressure, and accountability (Magnusson et al. 2020) in case of failure while organizations may often have access to flexible resource allocation because of the return-on-investment considerations (Plekhanov., et al., 2022). Thus, government-led digital transformation projects are more averse to risk, slow to innovation, and take longer as opposed to organizational transformation that has high-risk tolerance, is open to experimentation with innovation, and is rapid because of market demands and competition (Li, 2020). The beneficiaries of government-led digital transformation are also different, as are the methods of measuring its impact. This means that success in government-led digital transformation may be as simple as accessible and user-friendly public services – such as streamlining processes like filing taxes, renewing licenses, or accessing social services – as opposed to organizational digital transformation.

While there is growing research on digital transformation in general, relevant to our work are studies on how government-led digital transformation unfolds. However, the majority of current research is dominated by organizational-focused studies that emphasize digital transformation capability development (Warner & Wäger, 2019), strategy development (Chanias et al, 2019), business model innovation (Li, 2020), and business process management (Baiyere et al., 2020). Though these studies provide some

[1] We use 'national level' to signify an entire country context. In this research, the focus is on how the Government of Ghana digitally transform merchant payment in the country at the national level. Therefore, government-led digital transformation in this study is attributed to the national level.

Table 1
Differences between government and organizational-led digital transformation.

Attributes	Description	Government-Led	Organizational	Selected References
Motivations and Goals	The purpose of the digital transformation	To offer more effective and efficient public services to citizens. Emphasis is on citizen's satisfaction, access, and usability	To improve the organization(s) and/or its offerings to customers. Most often, the focus is on revenue generation and profit maximization	Aguerre & Bonina, 2023; Chanias, et al., 2019
Funding and Resources	Budget constraints and public accountability	Often face resource constraints because of the need to allocate resources effectively across several critical areas	May have flexible resource allocation because of return-on-investment considerations	Plekhanov et al.,2022; van Donge et al. 2022
Risk Appetite and Speed of Innovation	Risk tolerance and the rate of innovation	Low-risk tolerance and slow to experimenting with innovations due to the multiple levels of approvals, and compliance requirements	High risk appetite and are quick to innovate due to market demands	Li, 2020; Magnusson et al. 2020
Regulatory and Legal Requirements	The legal framework required for digital transformation	Operate under more stringent regulations and legal frameworks	Requires less strict legal requirements depending on the industry or nature of the organization	Eom and Lee 2022; Madan & Ashok, 2023
Scope, Scale, and Complexity	The magnitude and duration of digital transformation	Often impacts broader services, spans several years, involves multiple stakeholders, and may covers an entire country	May be limited to an individual organization, stakeholders, or market segment, and typically shorter in duration	Li, 2020; van Noordt & Tangi, 2023
Outcome	The benefits of the digital transformation	Citizens and society at large	Exclusive to the private organization(s), customers, and stakeholders/ shareholders	Datta 2020; Warner & Wäger, 2019

interesting insights, it is still unclear how these apply within the context of government-led digital transformation, especially in resource-constrained contexts. Largely, there are limited studies on theorizing the actual "process of undertaking" digital transformation (Carroll, 2020). Within the literature on government-led digital transformation, recent research pays attention to different aspects of digital transformation (Eom and Lee 2022). These include studies on the adoption, use and acceptance of new or "paradigm-shift" technologies (Eom and Lee 2022) – like social media to promote civic participation (Yuan et al., 2023), adoption of AI in government operation (Madan & Ashok, 2023), developing AI capability to enhance public value creation (van Noordt & Tangi, 2023), and analytics and data management to enhance public services, efficiency, and decision-making (van Donge et al. 2022). Another stream of research focuses on broader digital transformation as an element of service modernization. Examples include transformations of specific services, such as those related to open government and civic engagement (Aguerre & Bonina, 2023), or more comprehensive changes, like nationwide digital enhancements in public administration (Datta, 2020). Together, these research streams offer valuable perspectives on the strategies and methodologies of digital transformation. They also highlight that, like organizational transformation, the success of digital transformation hinges not just on technological and human-related factors, but also on socio-political considerations (e.g., Datta 2020; van Noordt and Tangi, 2023). Notwithstanding these contributions of prior research, there is a blind spot in the literature on unpacking the process of government-led digital transformation, especially in resource-constrained contexts where there are institutional voids and technology infrastructure deficits.

In Global South countries, government-led digital transformation initiatives may be aimed not only at improving existing services or boosting efficiencies but also at branching into services typically covered by the private sector, such as in sectors like energy, utilities, and financial services to address various pressures, including social, economic, political, and development (Janowski 2015). This type of digital transformation differs from the typical digital government transformation reported in the literature (Eom and Lee 2022). Rather it speaks to a specific type of digital branching, where governments venture into new domains to address important developmental voids. This is similar to the COVID-19 pandemic scenario, where numerous governments accelerated their digital transformation efforts and adopted new services (e.g., contact tracing apps) to cope with the situation at hand, while simultaneously ensuring the uninterrupted functioning of regular services (Eom and Lee 2022; Karanasios 2022). However, this situation presents a challenge for governments as they need to balance two priorities: utilizing limited existing resources to maintain and enhance current services, and branching into new areas to address institutional voids. This can be problematic, because, unlike organizations in cutting-edge sectors like finance or technology, governments face a greater focus on efficiency and resource allocation and utilization, partly because of the need to show value for money (Magnusson et al. 2020). At the same time, by branching into new areas, there may be an opportunity to exploit other existing resources and balance emergent needs. This balancing act introduces a range of dilemmas, paradoxes, and ambiguities in practice, but also for theorizing government-led digital transformation. For us, this leads to a focus on examining how governments may manage to effectively maintain their services while also initiating new digital projects in resource-constrained environments. We draw inspiration from the concepts of exploration and exploitation from ambidexterity theory to theorize the multi-level blending act governments face.

Ambidexterity in organizational theory describes an organization's ability to explore new capabilities and exploit existing ones simultaneously (O'Reilly and Tushman 2013; Raisch et al. 2009). *Exploitation* refers to leveraging existing resources, knowledge and technologies, refining existing capabilities and making incremental improvements for efficiency and short-term performance (Raisch et al. 2009). *Exploration*, on the other hand, involves searching for new knowledge, capabilities, and technologies that can bring about innovation and help with adaptation to environmental changes that could potentially lead to long-term performance gains. This often

involves risk-taking, experimentation, and potential failures. Unlike exploitation, exploration focuses on learning what the organization doesn't currently know but might benefit from in the future (Lee et al. 2015). Raisch et al. (2009) argue that organizations that effectively balance and manage these seemingly contradictory processes (exploitation and exploration) tend to outperform organizations that overemphasize one over the other. To put it differently, "ambidextrous organizations" can simultaneously pursue efficiency in their existing operations (exploitation) while also investing in innovation and change (exploration).

In IS research, *ambidexterity theory* has gained prominence as organizations continuously strive to maintain and enhance value from existing information systems as well as explore new opportunities with emerging technologies and capabilities (Lee et al. 2015). Table 2 presents the dimensions of ambidexterity theory and their associated aspects, namely *practices, logics, and forms*. The two ambidextrous practices are exploration and exploitation. An example of exploratory practice could involve a deliberate search for new technologies to transform digital payment for merchants while exploitation could involve leveraging and reconfiguring existing digital technology platforms to support the implementation of the digital payment innovation. In line with these practices are two main logics: *blending* and *balancing*. The blending logic views exploration and exploitation practices as contradictory, but harmoniously combinable (Gregory et al. 2015) while the balancing logic views the practices as two devoted, yet conflicting processes (Raisch et al. 2009) to achieve ambidexterity. These logics serve as strategies to resolve tensions between the two practices. This is especially relevant in digital transformation research, where the focus is on navigating the balance between the risks and rewards of the transformation and ensuring stability and immediate value using existing information systems (Gregory et al. 2015; Montealegre et al. 2019; Salmela et al. 2022). Given that digital transformation is viewed as an ongoing process (Vial 2019), organizations and governments need to develop the capability to manage the inherent tensions between exploring new digital technologies and making the most of existing digital infrastructure (Montealegre et al. 2019). Failure to do so might lead to either stagnation due to excessive exploitation without sufficient exploration, or instability and resource wastage from excessive exploration without effective exploitation.

In terms of the approaches to achieving ambidexterity, the literature largely points to three forms: sequential, structural, and contextual (O'Reilly and Tushman 2013). The goal of these forms of ambidexterity is to reduce conflicts and balance the trade-off between exploration and exploitation practices. The *sequential approach* involves implementing one practice after the other (e.g., exploration before exploitation) while the *structural approach* suggests the simultaneous application of both practices using separate units. On the other hand, the *contextual approach* focuses on leveraging the behavioral capability and self-judgment of individuals to simultaneously align and adapt ambidexterity practices within an organization.

In *digital branching*—where governments venture into new domains to address important developmental voids—the traditional application of ambidextrous practices of continuous exploration and exploitation might differ because, unlike organizations, governments primarily explore and exploit in snapshots and subsequently move to other projects. Thus, exploration and exploitation practices in digital branching could be more punctuated, and sequential, as opposed to continuous, which limits the need for never-ending cycles of exploration and exploitation (O'Reilly and Tushman 2013). In addition, the complexity of governments, strict legislation, and their overarching emphasis on citizens' satisfaction, access, and usability of innovations make the traditional application of ambidexterity unsuitable. Exploration and exploitation practices in organizations are focused on incremental innovations that can lead to continuous profit, which is different from the motives of governments. Similarly, in terms of ambidexterity logics, digital branching may align more with the blending logic than balancing logic because governments have more authority to make unilateral decisions, as opposed to organizational settings where there is a need for more balancing of competing interests and relationships to ensure harmony. Digital branching may favor some forms of ambidexterity (e.g., sequential) more than others (e.g., contextual and simultaneous) due to the nature of their operations, resource limitations, and political interests (O'Reilly and Tushman 2013). In addition, governments venturing into new digital domains are likely to rely more on both external and internal resources. By that we mean, tackling national-level change—like mobile payments—cannot take place in a silo. Therefore, governments must devise strategies to exploit and orchestrate established infrastructure, resources (Mann et al., 2022), relationships and institutions. In the context of government-led digital transformation of merchant payments in Ghana, this includes several simultaneous tasks: tapping into the distinctive legal and regulatory environment as well as bureaucratic processes; managing severe resource constraints; and navigating the need to serve the public and a dynamic political landscape (Senyo et al., 2023). This approach of outward-looking exploitation (as opposed to exploiting internal resources) may also be necessary in resource-constrained environments. This presents an under-theorized aspect of both government transformation studies and how we consider the exploitation of resources to facilitate it.

Table 2
Summary of Ambidexterity Theory.

Dimensions	Descriptions	Aspects	References
Ambidexterity Practices	A set of practices comprising exploration and exploitation.	Exploration and Exploitation practices	Gregory et al. 2015; Montealegre et al. 2019; Salmela et al. 2022
Ambidexterity Logics	The act of either balancing or blending ambidexterity practices.	Balancing and blending logics	Gregory et al. 2015; Raisch et al. 2009
Ambidexterity Forms	The approach to achieving ambidexterity.	Sequential, Structural, and Contextual	Duncan, 1976;O'Reilly and Tushman 2013

Methodology

Research design

We conducted an exploratory qualitative investigation (Klein & Myers, 1999) on the Ghanaian government-led shift toward a digital merchant payment platform. In line with our goal of developing new theoretical insights, our qualitative approach allowed for deep exploration of an emerging and complex phenomenon (i.e., government-led digital transformation of merchant payment in our case) comprising different actors and interactions. This approach also supports the theorization of an under-explored phenomenon in a new context, which is different from other parts of the world (Davison & Martinsons, 2016). Moreover, we seek to provide deeper insights that reflect real-world practices instead of a descriptive representation of how government-led digital transformation unfolds, which aligns with the qualitative research approach. Given the fit between the qualitative approach and the focus of this study, we consider this research design suitable.

Case background

The setting of Ghana and FinTech is relevant to our theorizing because, like other African countries, Ghana is transitioning from largely cash-based payments to digital payments to digitalize the economy (Bank of Ghana., 2020). At the same time, access to emerging digital technologies and financial instruments is highly uneven and constrained by deeply-rooted historical challenges. As this suggests, the government's push for digital payments is aimed at addressing social inequities and development, yet is enmeshed in a complex social context that goes beyond existing studies of organizational or even sector-level transformation. Specifically, we focused on the government of Ghana's initiative to digitally transform merchant payment through the introduction of the national quick response payment technology, named GhQR.

The case of Ghana's GhQR is interesting because of the previous unsuccessful attempt at digitally transforming merchant payments. In 2008, the government introduced e-Zwich (see more at https://ghipss.net/contact/regional-support/18-e-zwich) as a digital solution for merchant payment. The e-Zwich solution comprises a biometric card for users and a point-of-sale (POS) device for merchants, which is like the traditional card payment solutions widely available in many Global North countries. However, e-Zwich was unsuccessful in Ghana due to several reasons. Most notably, the e-Zwich POS devices were expensive (added cost for merchants as the government was not offering them for free) and required reliable access to electricity and the internet to operate. These conditions at the time were not in line with the reality of many small businesses that sell in marketplaces, temporary shops, and open spaces. Moreover, the e-Zwich technology was not easy to operate and at the time of launch, many citizens were unbanked and did not have the necessary documentation to acquire the e-Zwich cards. These conditions also explain why entering the merchant payments space was not attractive to the private sector, as is successfully the case in many Global North countries.

In recent times, the Ghanaian government, acting through the Ghana Interbank Payment and Settlement Systems (GhIPSS), has completed several digital transformation projects in the FinTech ecosystem – such as building payment interoperability across mobile money, card, and bank accounts instantly across different service providers. Having provided this infrastructure to facilitate payment, the next line of digital transformation was to enable seamless merchant payment using the interoperability platform, to move the country toward a cash-lite economy agenda. This initiative then led to the implementation of GhQR, which is the focus of this research. GhQR was launched by GhIPSS, a subsidiary of the Central Bank of Ghana in March 2020. GhIPSS is responsible for the development,

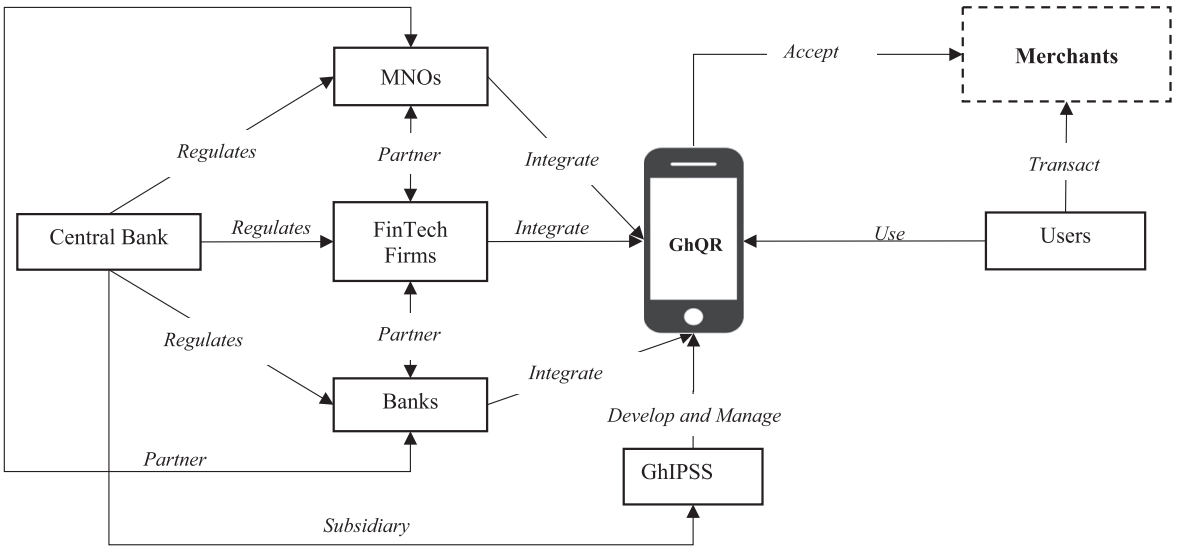

Fig. 1. GhQR in the Ghanaian FinTech Ecosystem (Adapted from Senyo et al., 2023).

management, and promotion of various electronic payment systems and infrastructure in Ghana. The introduction of the GhQR by GhIPSS was in line with the National Payments Systems Strategic Plan (2019 – 2024) under the sub-section of the Financial Technologies Strategy Pillar of the Bank of Ghana (Government of Ghana, 2020). The GHQR system allows customers and merchants to make and receive digital payments respectively. To receive payment through GhQR, merchants must register for the service through a payment services provider such as a bank, mobile network operator (MNO), or FinTech firm. After the registration, merchants are provided with a unique GhQR sticker and a 10-digit merchant identification (ID) number. Customers can either scan the QR code or dial a short code to make payment to merchants either using their bank accounts, mobile money, or card.

To comprehend the diffusion and use of GhQR within the Ghanaian FinTech ecosystem—a collection of interdependent actors that collaborate and compete simultaneously (Senyo et. al, 2022), an understanding of the various stakeholders and their interactions was needed (see Fig. 1). These ecosystem actors are the merchants (i.e., the enterprises that accept payment through GhQR), users (i.e., citizens who use GhQR to make payment), mobile network operators (MNOs), FinTech firms and banks (service providers of mobile money services that are integrated into the GhQR technology to enable users to make payment) (Senyo et. al, 2022). While the Central Bank regulates the service providers (Senyo et al., 2023), its subsidiary develops and manages the GhQR technology.

According to Statistics from the Central Bank of Ghana (see https://www.bog.gov.gh/fintech-innovation/fintech-statistics/), as of November 2023, there were 64,945,361 registered electronic money (e-money) customers (i.e., customers having access to mobile money services), which is double the population of Ghana which is about 34 million. This is not surprising since many people have two or more mobile phones and accounts. Similarly, the total value of e-money transactions was 185,860,756,739 Ghana Cedis, which is equivalent to £12,390,717,115.94. These figures demonstrate the high penetration of e-money in Ghana and support the reasons why the government deemed the digital transformation of merchant payment critical to support its digital economy agenda.

Data collection

Data was collected between March 2022 and April 2023. Our data collection was centered on the main government actor, GhIPSS, which is responsible for innovation and digital transformation of the Ghanaian FinTech ecosystem. During data collection, it became clear that GhIPSS relied heavily on a wider network of actors. In line with this, we expanded our sample to include various other actors, such as MNOs, FinTech firms, and commercial banks to understand their roles and interactions. Our data collection followed a theoretical sampling approach, whereby we were driven by our research focus, our past interactions with organizations in the FinTech ecosystem, and most significantly the initial and ongoing analysis. Access to interviewees was made possible through our longstanding program of research in Ghana and through our industry interactions. Interviews followed a semi-structured guide (see Appendix), that we adapted throughout the research and were tailored to each participant. For GhIPSS, interviewees typically occupied positions such as chief executive officer, managers, and head and deputy heads of units. The primary focus of these interviews was understanding the rationale, conceptualization, implementation, and operationalization of the GhQR.

Table 3
Data Sources.

Primary Data		
Organization Type	Number of Interviews	Focus
FinTech Firms (FT)	6	To understand how they deploy GhQR and leverage it for new innovations
Banks (BK)	4	To understand how they deploy GhQR and leverage it for new innovations
Mobile Network Operators (MNO)	3	To understand how they deploy GhQR and leverage it for new innovations
Government (GV)	7	To understand the rationale, conceptualization, and implementation GhQR
Merchants (MC)	40	To understand how they use GhQR for business transactions and verify the impact of the innovation.
Secondary Data		
Data Type	Number of Documents	Sources
Reports	2	https://www.bog.gov.gh/wp-content/uploads/2020/03/Governors-Speech-GHQR-Launch-Ceremony.pdf https://www.bog.gov.gh/wp-content/uploads/2020/01/National-Payment-Systems-Strategic-Plan-2019-to-2024.pdf
Business Cases and Process Maps	8	Provided by GhIPSS
News Articles	5	https://thebftonline.com/2021/07/27/ghqr-code-the-game-changer/ https://www.ghanaweb.com/GhanaHomePage/business/Use-of-GhQR-to-see-significant-growth-as-15-institutions-go-live-1184266 https://www.gbcghanaonline.com/news/business/nearly-42000-merchants-offer-ghqr-in-accra-and-kumasi/2021/ https://citinewsroom.com/2021/10/take-advantage-of-free-ghqr-code-service-ghipss-boss-urges-public/ https://citinewsroom.com/2021/09/persuade-your-customers-to-pay-electronically-ghipss-boss-tells-shop-owners/
GHQR Official Website	2	https://ghipss.net/index.php/services/ghana-s-universal-qr-code https://myghqr.com/what-is-ghqr

For the other actors, the interviewees held the position of managing directors, founders, supervisors, and shop attendants. The primary focus of these interviews was on understanding how they use GhQR and/or leverage it to develop innovations, their engagement with GhIPSS, and related activities. Significantly – within FinTech firms, banks, MNOs, and merchant organizations – we conducted interviews with multiple individuals, which enabled us to pose similar questions to different respondents within the same organization, enhancing the richness of our data. It also provided triangulation and reinforced the validity and robustness of our findings. To ensure rigor and trustworthiness, during the initial interviews, we adopted an insider/outsider approach. This approach combined contextual knowledge with a drive for deeper knowledge and the ability to ask critical questions during our frequent meetings (Gioia et al. 2010). In total, 60 interviews were conducted, which lasted on average for 40 min. Out of the 60 interviews, 40 were with merchants because of our goal to determine if GhQR is indeed successful given the previous unsuccessful attempts. In addition, there are several merchants in Ghana so our goal to verify the impact and success of GhQR required many interviews with merchants.

Table 3 summarizes our primary and secondary data sources, including the details on the organizations and interviewees involved in the study. The closing of our data collection was determined by the point at which new data did not spark new theoretical insights or add properties to our theoretical categories. All interviews were conducted in English, digitally recorded (with the permission of the interviewees), and later transcribed. Interviews took place at the interviewee's offices or over video conferencing most often by the lead author. We documented our observations and interviews in field notes totaling hundreds of handwritten and typed pages. Importantly, much of what we learned came from being in the field, as often interviewees would demonstrate the GhQR technology and its applications. Secondary data in the form of GhQR operating manuals, process maps, product information and frequently-asked-questions documents were also provided by the study participants. We also collected secondary data from other multiple sources such as publicly available documents of archival records, news articles, and reports (17 sources). These data provided valuable contextual meaning and supported data triangulation.

Data analysis

We draw on established grounded theory principles (Corbin & Strauss, 1990; Gioia et al., 2013) and our theoretical foundation as the guiding references for the data analysis. To ensure rigor, we followed three stages of open, axial, and selective coding processes

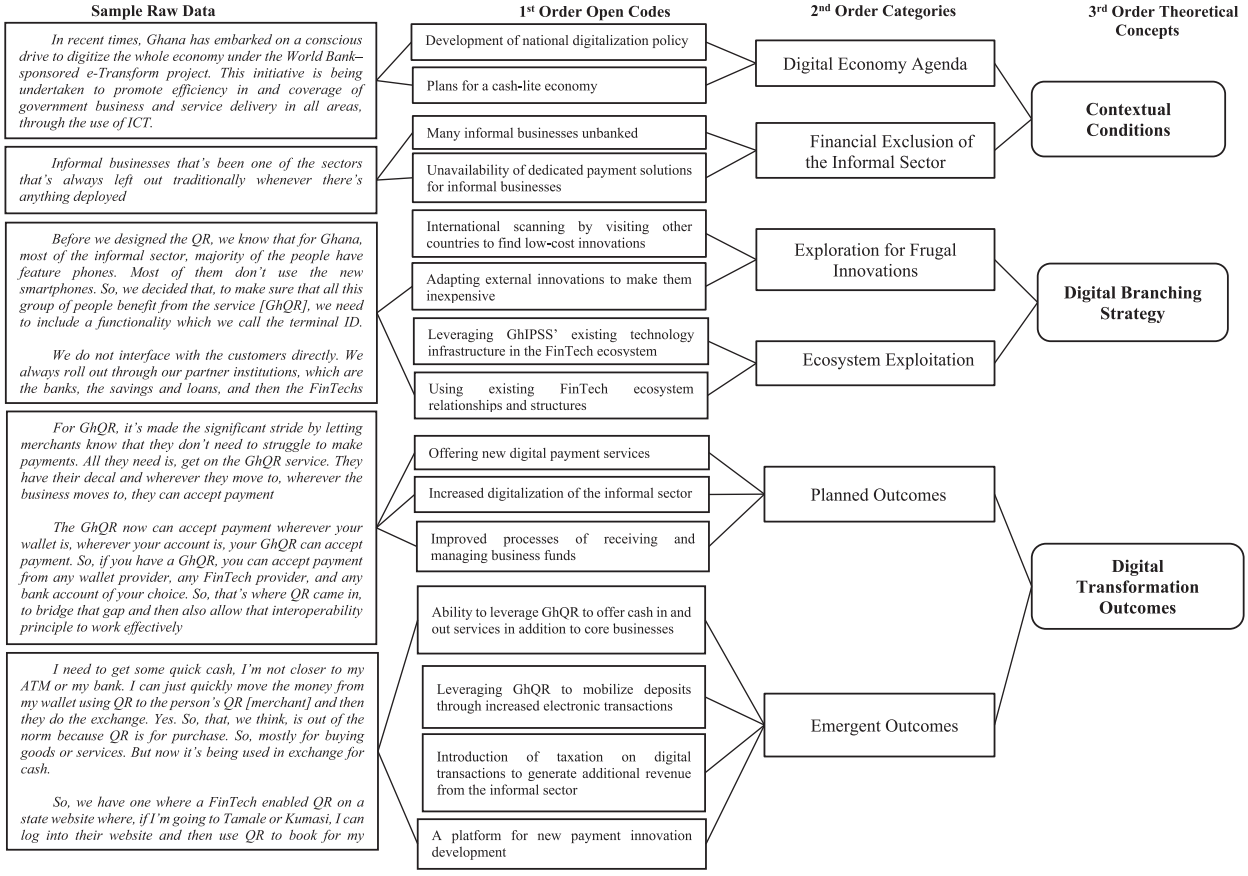

Fig. 2. Coding process and data structure.

(Corbin & Strauss, 1990). Guided by our research question and our goal to discover new knowledge on government-led digital transformation in resource-constrained contexts, we began the analysis by reviewing interview transcripts and field notes to have a general understanding of the data.

We developed common themes through open coding to identify first-order codes (Corbin & Strauss, 1990). Based on these codes, we were able to develop concepts in line with events associated with government-led digital transformation. To bridge the gap between coding and theoretical analysis, we wrote memos about concepts and their relationships (e.g., GhQR initiation, design, and deployment, international scanning, innovation adaptation and contextualization, etc.). The outcome of this step was an assemblage of codes about the triggers, strategies, and outcomes of the digital transformation. To ensure the derived concepts are valid, we drew on evidence from at least two sources: e.g., data from two interviewees providing the same answers or insights from secondary data such as news articles or government policy documents for triangulation purposes (Eisenhardt, 1989). Instead of only looking for confirmation of established positions in the literature on digital transformation and ambidexterity, we also looked for alternative and opposing insights to enrich our findings.

Next, we conducted axial coding through iterative mapping, as well as combining and refining the open codes to generate second-order categories that are sound and theoretically grounded. Through this step, we were able to derive second-order categories such as financial exclusion of the informal sector, digital economy agenda, exploration of frugal innovations, ecosystem exploitation, as well as planned and emergent outcomes of digital transformation. Lastly, we conducted selective coding by aggregating the second-order categories into higher theoretical constructs. This was an important part of the data analysis to establish the overarching understanding of how government-led digital transformation in resource-constrained contexts unfolds to address our research question. From this analysis, we were able to derive theoretical concepts such as contextual conditions, digital branching strategy, and digital transformation outcomes. We summarize the data analysis process and the final data structure in Fig. 2.

Findings

From our findings, we uncovered three main concepts that contribute to answering the research question: *contextual conditions*, *digital branching strategy*, and *digital transformation outcomes*. Table 4 presents these main concepts, their dimensions, descriptions, and characteristics. We discuss these concepts in the following subsections.

Contextual conditions

Contextual conditions represent the triggers for government-led digital transformation. They entail country-level exigencies that spearhead initiatives for government-led digital transformation. In our case, two contextual conditions were triggers responsible for the digital transformation: (1) *Government of Ghana's digital economy agenda*; and (2) *financial exclusion of the informal sector*. Regarding the first condition, the *government's digital economy agenda* outlined a national policy for the digital transformation of the economy (Government of Ghana, 2020), including the traditional financial sector. In practice, this involved transitioning into a "cash lite society"— where financial transactions are conducted predominantly through digital payments with minimal use of cash. This is captured by a government official as follows:

> *"… the vision is to transform Ghana into a digitized society where the status quo would change. For most people, the first instance is to use either their card or whatever means to pay without using cash."* **(GV)**

Numerous consumer-focused digital financial innovations were implemented such as GhIPSS mobile money interoperability, instant payment, 2-hour cheque clearing, GhLink (ATM interoperability), card, and online payment. However, there remained a void in terms of solutions for merchants. In 2020, the government implemented the GhQR payment platform for merchants. Acknowledging the need to change, a mobile network operator concurred:

"The world is changing so the majority of countries are now abreast with technology. If we [Ghana] don't go with technology, we have to pay highly" **(MNO)**.

A bank added:

> *"… you know Ghana is going the digital way and we have decided to tap into that opportunity to be able to enroll a lot of customers to make transactions convenient for our customers."* **(BK)**

The second major contextual condition we uncovered as a trigger for government-led digital transformation is the *financial exclusion of informal businesses*. Over the years, there have been attempts to digitally transform merchant payments in Ghana. However, these attempts have not materialized due to issues such as limited internet infrastructure and expensive POS devices, etc. This has led to the financial exclusion of many businesses, especially informal ones. Thus, addressing the financial exclusion of the informal sector is a core pillar of the government's digital economy agenda. Despite the efforts to achieve a digital economy, this agenda has not yet materialized fully. Overall, there has been improvement in access, adoption, and use of digital services as well as financial services for individuals. However, there remains a limitation for merchants, especially informal businesses. A merchant explained:

> *"Previously, the only way to accept payment was cash or through personal mobile money account, … but you know once you mix business money with personal money, it becomes difficult to have proper account …"* **(MC)**

The financial exclusion of informal businesses demanded a contextually relevant solution, as explained by GhiPSS.

Table 4
Main Concepts.

Themes	Dimensions	Descriptions	Characteristics
Contextual Conditions	Digital economy agenda	A government policy to digitally transform the Ghanaian economy	High cash-driven economy with limited digitalization of business transactions
	Large informal sector	A large collection of unregistered merchants that operate without formal structures (e.g., petty trading).	Inability to access formal financial services, limited technical capability, and lack of resources
Digital Branching Strategy	Exploration for frugal innovations	Involves scanning the environment to find low-cost innovations that are contextually appropriate	International scanning, replication, and adaptation of innovations
	Ecosystem exploitation	Making effective use of existing resources	Leveraging existing technologies, institutional arrangements, actors, and structures
Digital Transformation Outcomes	New digital payment channel to transact **(Planned)**	GhQR offers a new payment channel to transact with merchants	New and cost-effective payment options that allows cross-platform payment
	Improved processes of receiving and managing business funds **(Planned)**	Receiving payment more effectively, instantly and accounting for these funds more efficiently	Instant payment into bank accounts or merchant accounts, ability to generate transaction summaries and statements
	Improved digitalization of the informal sector **(Planned)**	Offering more efficient payment channels for informal businesses to receive payment	More business transactions are digital instead of cash, improved economic data on transactions in the informal sector
	A platform for new payment innovation development **(Emergent)**	Ability to develop other payment innovations on the base GhQR technology	Developing new solutions on GhQR
	Improved deposit mobilization **(Emergent)**	Ability to effective collect deposit from customers	Enabling customers to electronically credit funds into their account instead of cash pickups or queening at banks
	Ability to leverage GhQR to offer cash in and out services in addition to core businesses **(Emergent)**	GhQR enabled merchants to offer cash conversion services as an additional service for a commission	Easy, instant, and secured process of cash conversion to e-money

> *"So, the whole idea [addressing the financial exclusion of the informal sector] from the CEO was for us to be able to work on how we can bridge the gap. Because the gap is so wide that until you enter into big-tier merchants, like go to a fuel station and all that, but the informal sector, still, they are not used to accepting any means of payment other than cash."* **(GV)**

While private sector organizations have spearheaded digital transformation initiatives globally (e.g., Apple Pay, Alipay, Google Pay, etc.), we noted that in the case of Ghana, major digital transformation within the FinTech ecosystem has been led by the government and specifically through GhIPSS. National-level digital transformation requires substantial costs for infrastructure development, mass education, and maintenance – all with little financial returns. Moreover, the Ghanaian economy is dominated by informal businesses that are considered unattractive revenue markets because informal businesses are unregistered, are difficult to reach, and do not have formal business structures required by the private sector. This makes national-level digital transformation targeted at informal businesses unattractive to private-sector organizations even though this sector employs the majority of people. A government official provided an example of how private sector organizations are not keen on national-level digital transformation projects that do not have high economic returns:

> *"… there was a disconnect between the developmental agenda of the central bank and the fact that the banks wanted to make money. And the banks were asked to put a lot of money into infrastructure to drive this system. You needed to put in a lot of money to change people's minds and banks did not have time for all that."* **(GV)**

Thus, it becomes imperative that the only actor who could invest in the transformation of the informal sector is the government. This means that for contextual conditions to trigger the government-led digital transformation, there is a need for a country-level problem with national importance, which is unattractive for the private sector to spearhead.

In a nutshell, we observe that, for contextual conditions to trigger government-led digital transformation, there is a need for an intrinsic link between the outcomes and achievement of a national level agenda. For instance, in our case, we witnessed a link between Ghana's digital economy agenda and the financial exclusion of the informal sector—which means addressing the latter supports the realization of the former.

Digital branching strategy

As contextual conditions trigger the government-led digital transformation, there is a need to respond with appropriate strategies. We find that the government pursues a strategy we conceptualized as a *digital branching strategy* to fill institutional voids and respond to contextual conditions. Digital branching strategy is a process of digital transformation where governments venture into new domains to address important developmental voids through exploration for contextually relevant solutions and exploitation of existing resources. A unique aspect of this strategy involves exploration for frugal innovations and exploiting the FinTech ecosystem, which is different to the traditional ambidexterity theory. In addition, the digital branching strategy takes a sequential approach (Duncan, 1976; O'Reilly and Tushman 2013) while traditional ambidexterity involves simultaneous and continuous exploration and exploitation of existing internal resources, which can lead to tensions. Furthermore, pursuing a digital branching strategy may lead to both planned and emergent outcomes through the generative nature of the digital transformation. These practices influenced the resources needed for the government-led digital transformation. We elaborate on these practices in the following subsections.

Exploration for frugal innovations

The practice of exploring the external environment (i.e., learning from other countries) has been consistent in the Ghanaian government's approach to innovation and development. This is evident in the case of the digital transformation of merchant payment. As presented in Fig. 3, we witnessed two cycles of exploration in the digital branching strategy, which resulted in failure, learning, and

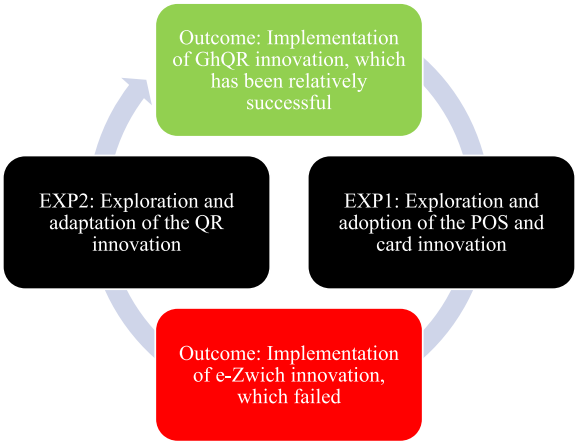

Fig. 3. Cycles of exploration.

ultimately a successful pathway. In the first cycle (EXP1), the government explored the payment systems of Global North countries and adopted their POS and card payment technology. This innovation was implemented but failed because it required costly POS devices, which required reliable electricity which was not common in many marketplaces at the time of implementation.

Given this unsuccessful attempt, there was a need to find a contextually relevant solution. Thus, in the second exploration cycle (EXP2), there was a deliberate attempt to explore more frugal innovations, turning more to Global South countries (e.g., China, and Malaysia) instead of Global North countries, even though the QR was being used in both regions. There was also a more deliberate attempt to adapt technology to fit the local context, which was absent from the first exploration cycle.

Many merchants in Ghana operate in the informal sector and have limited resources to invest in technology. The government is also constrained by limited resources to offer expensive technology solutions for free. Constrained by these conditions, there was a need to explore innovations that are inexpensive, fit with the context, but were also effective. The government explored the external environment (e.g., other countries and their solutions) for appropriate innovative solutions. The exploration involved seeking practices from other countries that were leaders in mobile payments and considering ways to adapt these innovations to meet the Ghanaian context. It also involved experimenting, creative problem-solving, and a willingness to embrace new approaches in pursuit of a new government-led digital transformation. A government official explained how GhiPSS' exploration practice led them to Singapore's innovative use of QR codes:

> *"So, they [GhiPSS CEO and some government officials] went to Singapore and then they realized that in Singapore, most of the transactions are accepted by QR payments. So, we thought of implementing the idea or replicating the idea here. And we also realized that it will be very beneficial because there is* ***basically no cost involved****. It's just the paper that you would print the QR on, you paste it at the merchant's location and then people come to scan it. Because for most of these merchants today, especially in the informal sector,* ***they don't have the money to buy POS, which are quite expensive****. So, then we realized the QR would be a more suitable product to introduce into the market. And so far, in fact, the lower-tier merchants, which is the informal sector, they have really bought into it, even more than the high-end merchants."*

Another senior government official explained the need to explore frugal innovation:

> *"If you go to the UK there is POS everywhere but, in this country, [Ghana]* ***who will take a $4,000 POS and give it to someone in the marketplace?*** *Who would do that?* ***So, we needed something cheaper****."* (GV)

As observed in the quotes above, the use of QR codes inspired by Singapore was well-suited to Ghana, especially the informal sector, because, unlike the costly POS systems, merchants only needed an A4 paper printed with a QR code bitmap to receive payments. This is illustrated by one of the businesses that use the GhQR:

> *"So, you just take your phone, you put on your QR code scanner, and then you scan the GhQR codes there [on the A4 paper], and then you proceed from there to make your payments."* **(MC)**

By using an A4 paper with the GhQR bitmap, the digital transformation was able to effectively overcome institutional voids such as limited internet connectivity, financial resources, and electricity shortages. For instance, there is no need for sophisticated electronic devices—like POS systems—that require technical expertise to operate and constant internet connectivity. Nor was there the need for a high level of digital literacy because customers could simply scan the bitmap or enter the terminal ID to make payment. For the government, this also means that there are minimal setup costs involved to complete their digital transformation. By exploring and selecting a frugal innovation, it ensured a fit between the contextual conditions and the selected technology. Indeed, the use of QR technology helped address the resource-constrained issues merchants faced previously when the POS device was introduced. Moreover, there is no need for sophisticated electronic devices that require technical expertise to operate. One of the government actors explained:

> *"On the GhQR, we have two options for the GhQR, we have the static option, and we also have the dynamic option. When I say static option, whenever you go to a merchant point or a pay point to make payments, all you need to do is, scan the QR and then enter an amount and then make payment. So that's the static option."* **(GV)**

We also noted that because of the frugal nature of GhQR, there was a deliberate action of the government to make the technology widely available to every merchant. This means lowering banking identity regulatory requirements, setup costs, and any other requirements. Unlike POS systems that are widely used in Global North countries, the use of GhQR relaxed regulatory requirements, which was tied to the goal of breaking away from the primacy of cash and digitalizing the economy: "… *for QR, it's mainly for all businesses, tabletop businesses, low-tier merchants where there is minimum know your customer (KYC) requirement"* **(GV)**. The frugal nature and the low KYC requirement resulted in high adoption and use of the GhQR compared to the previous solutions implemented by the government. With a national identification card (i.e., Ghana Card), merchants can register for GhQR instead of providing multiple identification documentation as the case with other digital payment innovations.

Ecosystem exploitation

In addition to exploring and deciding to pursue a contextually relevant innovation, as part of the digital branching strategy, the government exploited technologies and institutional arrangements within the Ghanaian FinTech ecosystem. During the design and deployment of GhQR, we observed that the government capitalized on the already successful innovations within the FinTech ecosystem. For example, unstructured supplementary service data (USSD) technology, which is widely used in mobile money wallets and FinTech payment platforms for transactions, was incorporated into the GhQR system to meet the specific requirements of the local

context. USSD is a real-time interactive text-messaging service that enables users to receive and respond to text message prompts on their smart or feature phones. The significant advantage of using USSD is that it aligns with the resource-constrained context because there is no need for individuals to have a smartphone or a bank account to perform financial transactions through GhQR. This is because of USSD's ability to work with any feature phone. As shown in Fig. 4, with GhQR, a unique terminal ID was added to the QR bitmap to ensure support for both smart and feature phones. This enables GhQR to work seamlessly for both cheap and high-end phones. This makes Ghana's GhQR different from other countries (e.g., Singapore) where QR can only be used through smartphones.

> *"… [with] GhQR when anybody pays for a good or a service, they pay using USSD or by scanning the QR bitmap, and then their funds are settled into their mobile money account or bank account."* **(FT)**

Additionally, the government exploited established technology platforms in the FinTech ecosystem such as GhIPSS's payment interoperability platform. This platform enables instant digital payment and money transfer across different channels and providers. For instance, with the interoperability platform, customers can transfer money across cards, online banking, and mobile money wallets instantly. Customers are also able to send and receive money from people using the services of different providers, which was impossible some years ago. The exploitation of the interoperability platform enabled seamless transactions between GhQR and other payment methods, including cards, banks, and mobile money services. By doing so, the practice of leveraging established infrastructure reduced the expense associated with integrating GhQR into each of these services separately. For consumers, this allowed convenient payments to merchants using GhQR via various payment channels.

The deployment of GhQR also demonstrated strategic leveraging of institutional agreements within Ghana's FinTech ecosystem. This was important to maintain harmony and uphold, rather than disrupt, the current social structures and relationships. For example, rather than directly providing GhQR to merchants, the government gave access to the GhQR platform to key ecosystem actors such as banks, MNOs, and FinTech companies. These entities then extended the service to merchants. This approach alleviated potential conflicts within the ecosystem by avoiding direct competition with these entities for merchant customers and ensured fair treatment of all the top-tier actors. A bank confirmed this strategy, stating:

> *"…. opening the platform [GhQR] so that there is equal access and drive competition among actors within the ecosystem towards improved services."* **(BK)**.

Additionally, we noted that leveraging existing institutional arrangements enabled other actors to promote and deploy GhQR to their existing merchant customers. This strategy helped the rapid adoption of the GhQR technology among merchants since marketing, rollout and first-line support were managed by other ecosystem actors who already had a substantial existing customer base. An MNO explained:

> *"… you know we have a lot of products where we interact with customers. Most of our services are for payment, customers come here to make payments, buy products, and pay their bills. So, since the GhQR is in the market, it's a way for us to use it to get our revenue. So, we use it as a form of payment on our platforms."* **(MNO)**

A bank corroborated this by stating:

> *"… you know people walk without money on them. They don't carry any money. And then they come and ask, what do you accept? What are your modes of payment? So, we try to incorporate all modes of payment. We link ATM, Visa, MasterCard, mobile money, and GhQR. We try to put GhQR in everything so that everyone has all the options for payment. When we open an account, we ask if would like to tap into that opportunity [linking all the payment channels], thus we create an account, then we register them [merchants] for GHQR, which is linked to your account, and then we give you the bitmap stand, so you either paste it somewhere in your shop or you put it on*

Fig. 4. Vice President of Ghana making payment using GhQR (Source: Vice President of Ghana).

your table with this GHQR when someone makes a payment, they just scan it. … this option is linked to your account such that anytime someone scans and makes payment, we are able to push the funds into your account directly. **(BK)**

In sum, we find that government-led digital transformation through a digital branching strategy requires efficient exploitation of existing resources, including technology infrastructure and institutional arrangements.

Outcomes of government-led digital transformation

The government's digital branching strategy produced outcomes that were both planned and emergent. The emergent outcomes are generative because the transformation was exploited by actors within the FinTech ecosystem in ways which could not be anticipated by the government. Table 5 presents a summary of the outcomes of the digital transformation, the actors, and examples.

First, for merchants, the planned outcome of the digital transformation is improved efficiency and management of financial transactions. With GhQR, it is more effective, quick, and less risky to transact because customers can simply use their phones to make payments, eliminating the need for cash and reducing the risk of theft for merchants. Its effectiveness is demonstrated by the increase in transaction volumes. Merchants highlighted some of the key outcomes of the digital transformation, as follows:

"It [GhQR] has increased numbers, the fact that people feel, they can just have the QR code, scan, you can even have it on your phone, we have made it so easy to access. You can have it on your phone … it makes payment easier and faster. I mean it brings about efficiency and simplicity. So far, it's a good initiative since we started, and it has made a lot of impacts". **(MC)**
"Maybe I will see something that I want to buy, but I don't have cash on me. But once I have my mobile phone with me and I have cash in my wallet, I can easily scan and make payments. It's making things much easier nowadays." **(MC)**

While GhQR was purposely designed for payment processing, its integration with the existing interoperability platform enabled merchants to offer "cash-in" and "cash-out" services for a commission. This means that customers holding cash and looking to convert it to e-money could perform this with merchants, bypassing the need for sparsely located mobile money agents. This emergent capability enables merchants to exploit the money transfer services, which was previously impossible before the digital transformation.

Second, the main benefit for the ecosystem actors such as FinTech firms, MNOs, and Banks was the introduction of a new payment channel. With the implementation of GhQR, these actors extended this payment channel to their customers, offering the benefits of convenience, faster payments, and security that the GhQR platform offers. Thus, integrating GhQR with existing payment systems broadens the payment channels available to businesses and individuals, ensuring that if one system is down, there are other payment options to prevent businesses from losing out on sales. A government official explains:

"So, these companies are given integration or APIs for them to integrate into the QR scheme. Once they integrate, then they can now acquire merchants on their own and make the QR solution available on their channels. So, today they have mobile apps, and they also have USSD platforms. Each bank or each payment service provider will have to develop their own channel that customers can use to make payments at those merchant locations where they have enabled the QR to function." **(GV)**

We also found emergent outcomes of the GhQR platform for these actors. For banks and MNOs, GhQR became a medium to mobilize deposits by linking merchants' accounts to the GhQR bitmaps. A merchant explains this benefit:

"… you offer them [customers] the opportunity to use the QR code to pay because the convenience for me as a business owner is that the money is transferred directly to my bank account without me doing any banking at all." **(MC)**.

Table 5
Outcomes of government-led digital transformation.

Actors	Planned Outcomes	Emergent Outcomes	Examples(Planned / Emergent)
Merchants	Improved financial transaction processing and management	Ability to leverage GhQR to offer cash in and out services in addition to core businesses	Efficient and more effective digital payment processes and the ability to keep proper financial records because business funds go directly into business accounts, making it easy for accounting purposes Some merchants are leveraging the capabilities of GhQR to offer cash deposit and withdrawal services for their customers (like services of mobile money agents), which has created new revenue streams for them.
Banks and MNOs	Offering new digital payment services	Leveraging GhQR to mobilize deposits through increased electronic transactions	Customers can make payment across multiple channels Linking business account to GhQR for payments to automatically be credited to bank account or mobile money account, which service providers can leverage
Government	Increased digitalization and improved data on informal sector transactions	Introduction of taxation on digital transactions to generate additional revenue from the informal sector	The government's cash lite agenda has improved significantly because of increased digital payment in Ghana The government introduced e-levy on e-money transactions to expand the tax net.
FinTech Firms	Offering new digital payment services	Platform for developing new innovations	Customers can make payment across multiple channels FinTech firms leverage GhQR to develop "susu"-daily saving collection applications on GhQR platform

Before GhQR, merchants needed to physically visit bank branches or mobile money agents to convert cash to e-money. GhQR automates this process, eliminating the need to queue at banks. A bank confirmed this benefit:

> *"It's [exploiting GhQR] is an opportunity for us to mobilize the deposit, it is an opportunity for us to mobilize and achieve the deposit … our target base will be our SME traders, those who I mean do sales on regular basis, let's say every day. Especially those who have shops and sell everyday goods, I mean they receive cash every day and therefore wouldn't want to inconvenience our customers. So, we see that time is of the essence to the customer. You don't have to leave your shop and come and deposit because you've collected a lot of cash. So, with the GHQR, you are able to I mean channel all your funds to your account at your shop, you don't have to come to the branch."* **(BK)**

For FinTech firms, the GhQR platform's capacity for innovation-led emergent opportunities enables them to develop new services. For instance, FinTech firms leverage GhQR to design unique financial solutions, such as "susu" applications for daily saving collections and applications tailored for payment disbursements to farmers. Because GhiPSS offers GhQR, it enables access to a large source of e-money, which FinTech firms can access to settle transactions instantly. A FinTech firm referenced these significant outcomes, stemming from the government's digital branching efforts:

> *"The reason why we use it [GhQR] is that it provides access to a large source of funding for transactions. It provides a simplified way of doing cashless transactions. The advantage you get with it is that because it comes from GhiPSS, it provides access to almost all the sources of funding required by people to do transactions online. That is bank accounts and mobile money wallets. So that's why we adopted it.* **(FT)**

The government recognizes these extensions of the GhQR platform and views it as a way to increase adoption and use. A government officials explained:

> *"We are aware that other companies are building other apps on GhQR, we are not against this so far as there is no illegality because we want GhQR to have high adoption in Ghana. … we also noticed that mobile money agents are using GhQR for cash withdrawals while the main focus of GhQR is for electronic merchant payment"* **(GV)**
>
> *"So, some institutions or some payment service providers, when I say payment service providers, I'm talking about the FinTechs, savings and loans, and banks. Some of them have seen the smartness in it. For some of them, it's more of a way to get a cheap float. They make it [GhQR] free for these merchants. There is no setup cost. And then also, if you're a customer from these payment service providers, there's no transaction cost. It makes it attractive for both the customer and for the merchants."* **(GV)**

Lastly, we also found that, for the government, the digital transformation of merchant payment enabled it to make significant progress towards its cash-lite agenda and ultimate digital economy. With the implementation of GhQR, there was an increase in digital payment. This enabled the government to have a better understanding of the volume of transactions from the informal sector. As reported by a government official:

> *"…aside from the number of merchants we've been able to set up, we've also been able to see significant transactions in volumes and value. The individual count of transactions has really gone up. We are now over 1 million transactions since 2020. And that's individual transactions. Then also, in value, we have seen about a trillion transactions in terms of value. So, the service is really catching up and we*

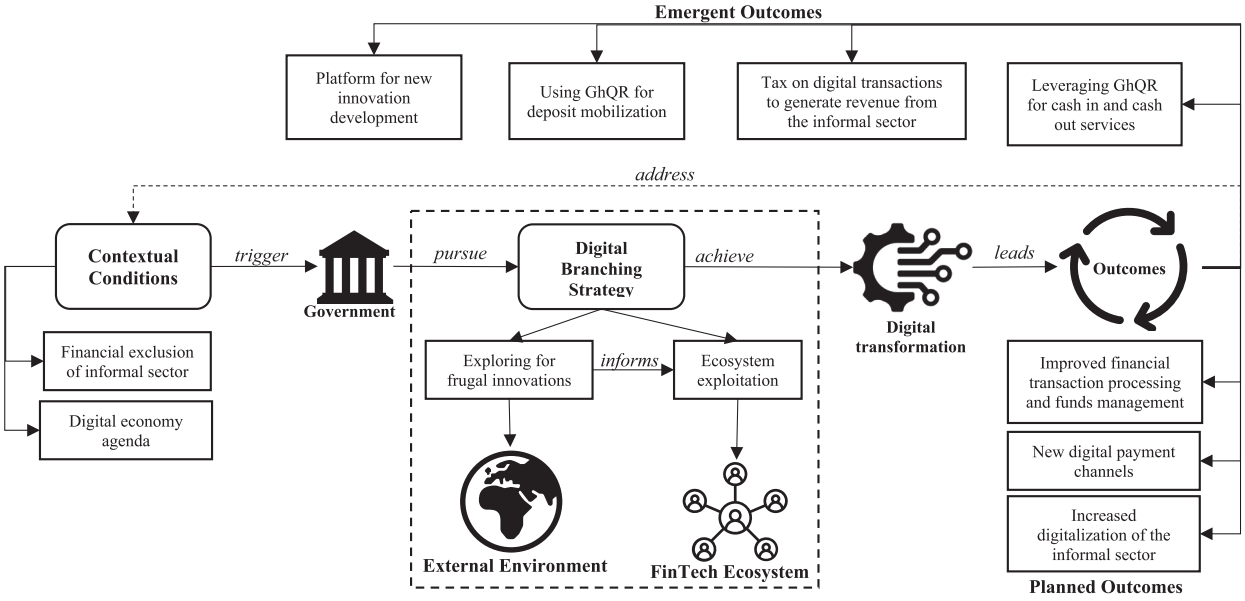

Fig. 5. A process model of government-led digital transformation.

are making progress by the day. This service came in just two years ago and as we speak, we've been able to acquire over 170,000 merchants who are currently accepting QR for payment." **(GV)**

Based on the significant success of GhQR in terms of adoption, transaction volumes, and value, we found an emergent outcome where the government introduced the electronic transaction levy (e-levy)—a 1 % tax on instant payment transactions to generate revenue. The government's justification was that the e-levy would ensure the informal sector pays appropriate taxes on their profit since governments over the years have been unable to tax the informal sector. According to the government, as of February 2024, the e-levy has generated about GH¢ 1.19 billion in 2023, equivalent to £75 million in tax revenue (CitiNewsroom, 2024).

Discussion

In this study, we explain how governments pursue digital transformation in a resource-constrained context. A distinctive aspect of our study, in comparison to others on digital transformation (e.g., Aguerre & Bonina, 2023; Datta, 2020; Pelletier & Taymond, 2020) in the public sector, is the concept of a digital branching strategy. We focused on how governments, through their agencies, exploit existing digital capabilities, to develop innovation in an uncharted area. We explored the delicate balance governments must strike and the difficulties to overcome to effectively launch new digital initiatives, especially where there are limited resources and infrastructure. As we show in these settings, "paradigm shifting" technologies may not align with the local context, emphasizing the nuanced dynamics of digital transformation in some environments with scarce resources or where the intended beneficiaries may not adopt such technologies. Based on our findings, we articulate a process model (see Fig. 5), which illustrates how a government-led digital transformation may unfold. Our model suggests that such transformation is triggered by specific country-level and political conditions. In our study, the triggers were the national development strategy and the digital economy agenda, which aim to address societal issues like inequality, financial exclusion, and difficulties faced by informal small businesses. This approach was also a response to both previous unsuccessful attempts and the absence of solutions from the private sector, which created an institutional void. Responding to this environment, the government pursued a strategy that balanced frugal innovation with exploiting existing resources within the FinTech ecosystem.

While the combination of exploring successful external initiatives, exploiting available digital resources in the FinTech ecosystem, and frugality may seem paradoxical, our study indicates that these practices are not only interconnected but also mutually reinforcing. For instance, when exploring suitable QR solutions that are successful in other countries, the specific contextual limitations required prioritizing frugality through exploiting resources in the FinTech ecosystem as well as fitting the solution to the realities faced by merchants and their customers. This does not mean "cheap", "low-cost", or "low-quality", rather it embodies a set of principles focused on utilizing resources efficiently. This strategy was a notable shift in approach following a failed attempt by the government to implement expensive POS systems, which were not suitable for the local context. This experience led the government to embrace a more frugal strategy, opting for cost-effective solutions like using A4 paper for GhQR.

In our case, ecosystem exploitation was exhibited through the utilization of existing digital technology resources such as the payment interoperability infrastructure and the instant payment technology as well as leveraging existing institutional structures and relationships within the FinTech ecosystems. For instance, leveraging existing relationships, the government permitted banks and FinTech firms to offer GhQR to merchants, instead of directly offering the service to businesses. By doing so, it enabled the government to judiciously exploit existing resources and make savings in terms of customer relationship management, advertisement, and onboarding. Again, by exploiting the existing technology solutions (e.g., interoperability infrastructure), the government made financial savings by not introducing new technologies to perform the same roles being undertaken by existing infrastructure. Given that both the search for frugal innovation and leveraging of the existing ecosystem emphasize the simplicity, cost-effectiveness, and judicious use of resources, these principles provide a solid ground to understand our digital branching strategy for government-led digital transformation in resource-constrained contexts. This strategy was instrumental in navigating institutional voids, such as infrastructure and financial constraints, thereby addressing the specific challenges and contextual conditions.

Theoretical contributions

Our study makes several key theoretical contributions to digital transformation research. First, we extend existing digital transformation literature by explaining the "process" of government-led digital transformation (Carroll, 2020). Prior research on digital transformation has largely focused on capability development (Warner and Wäger, 2019; van Noordt & Tangi, 2023), strategy development (Chanias et al, 2019), business model innovation (Li, 2020), and business process management (Baiyere et al., 2020). Relatedly, the literature on digital transformation in government has also largely focused on the adoption and use of "paradigm-shift" technologies (Eom and Lee 2022), such as social media (Yuan et al., 2023), AI (Madan & Ashok, 2023), capability development (van Noordt & Tangi, 2023), and public value enhancement (Aguerre & Bonina, 2023; Datta, 2020; van Donge et al. 2022). Studies that have attempted to explain the process of digital transformation have largely focused on the allocation, saturation, and coordination of information technology to explain how the transformation occurs (e.g., Pelletier & Taymond, 2020). In contrast, our study develops a process model (Fig. 3) that unpacks how government-led digital transformation unfolds. Since understanding the process of government-led digital transformation remains under-theorized and critical to successful transformation (Carroll et al. 2023; Tana et al. 2023; Rowe and Markus 2023), we consider our process model an important theoretical contribution.

Second, rather than simply borrowing and applying concepts from ambidexterity and frugality, we engaged in conceptual blending by theorizing how their interaction forms the pillar of government-led digital transformation in resource-constrained contexts. While

ambidexterity and frugality have been used in the prior literature (e.g., Lee et al, 2015; Montealegre et al., 2019, Raisch, et al., 2009), our study progresses further by explaining how their combination may be inseparable in government-led digital transformation in some Global South countries. We theorize how their combination creates a new strategy—a *digital branching strategy*. The digital branching strategy posits that the interaction between exploration and exploitation is critical to finding low-cost innovations and effective utilization of local innovation and contextually suitable resources for digital transformation. This strategy also demonstrates how government-led digital transformation is punctuated and often follows a sequential exploratory and exploitation process as opposed to organizational processes that are more structural and simultaneous (Duncan, 1976; O'Reilly and Tushman 2013). In addition, we contribute by demonstrating that pursuing a digital branching strategy in government-led digital transformation leads to both planned and emergent outcomes. The emergent outcomes are obtained through further exploitation by other ecosystem actors because of the generative nature of the digital branching strategy. Together, these new insights from the theorizing of the digital branching strategy advance the strategy literature on ambidexterity, frugality, and digital transformation.

Lastly, our study offers new insights regarding recipes for successful government-led digital transformation, and in particular digital branching. We suggest that government-led digital transformation requires the customization of innovations to align with the demands of the local environment. We also uncover that for a successful government-led digital transformation, there is a need for an intrinsic link between the triggers. In our case, we witnessed a link between Ghana's digital economy agenda and the financial exclusion of the informal sector as triggers for digital transformation. This means addressing financial exclusion in the informal sector can support achieving the digital economy agenda and vice-versa. Given that the government-led digital transformation in the literature is still emerging, we consider our recipe an important theoretical contribution. Moreover, our research shows how government-led digital transformation can be a solution to address long-standing institutional voids.

Practical contributions

In addition to theoretical insights, our research also provides practical contributions for governments and practitioners supporting government digital transformation initiatives. First, our research indicates that governments aiming to leverage digital transformation to address service gaps do not need to rely heavily on vast resources or high-end technology. Instead, we propose a hybrid strategy that integrates local practices (Slavova and Karanasios, 2018) and exploitation of existing resources to achieve inclusive and cost-effective digital transformation at a national scale. For instance, integrating traditional paper-based processes with technologies like GhQR can significantly reduce the costs tied to implementing advanced, national-level innovations that typically require substantial infrastructure expenditures. This approach challenges the conventional expectations of what a digital transformation should look like and demonstrates that successful digital transformation does not solely depend on massive resource investments or cutting-edge technology. For government agencies involved in digital transformation, fostering such a strategy – i.e., blending the exploration of frugal innovations with the exploitation of existing digital infrastructures – is crucial. This blending ensures that digital transformation efforts are both forward-looking and grounded in current capabilities (Senyo et al. 2021), enabling more sustainable and impactful outcomes.

Second, we contribute by explicating how pursuing a digital branching strategy for digital transformation can generate both planned and emergent outcomes that can be further exploited by the ecosystem. We show that pursuing a digital innovation is fundamentally based on frugal innovation and ecosystem exploitation can result in emerging outcomes with generativity capabilities. For instance, in this study, we demonstrate that pursuing a digital branching strategy which led to the development of GhQR offered emerging outcomes that enabled FinTech firms to develop new applications such as payment disbursement and susu saving solutions. We also show how merchants were able to exploit the generativity of GhQR to offer cash conversion as an additional service for more income. The generativity of the emergent outcomes demonstrates that a government-led digital transformation that pursues digital branching strategy may benefit from other emergent outcomes that are unplanned and could be for the benefit of other actors and not only the initiator of the transformation.

Last, this study contributes by underscoring the importance of government-backed digital initiatives that cater specifically to the informal sector (Senyo et al. 2023). Considering that the informal sector constitutes a large portion of the businesses in Global South countries, the research suggests that policymakers and practitioners should develop digital solutions that are custom fit for the informal sector. This tailored approach ensures that digital transformation benefits extend to this critical sector, promoting broader economic inclusivity and digital development. For instance, our research shows that developing tailor-made solutions for the informal sector such as GhQR can enable inclusivity and concurrently open new avenues for government revenue generation. This means that the informal sector should not be seen as a problem but instead, as a potential avenue for untapped opportunities. Therefore, policymakers should consider developing favorable policy direction for other under-served sectors.

Limitations and future research

Our research has some limitations and those open areas for future enquiry. First, we focused on a single case of Ghana. We recognized that countries have different levels of development so our findings might not be wholly applicable in other contexts globally. However, many Global South countries share similar traits such as underdeveloped technology infrastructure, large informal sector, and limited financial resources, which are similar to the case of Ghana. Therefore, our findings could still be applicable in countries with similar contextual characteristics like Ghana. Future studies may consider validating our findings and process model in other contexts to ensure wider generalization.

Second, our study focused solely on government-led digital transformation within a FinTech ecosystem. This focus does not erode the positive impact of FinTech, especially in reducing exclusion and supporting development. Since government-led digital

transformation is vital in other ecosystems that provide public value such as health, education, and energy, we believe that our model and the concept of digital branching strategy may be relevant to their transformation efforts. For instance, following our model, government-led digital transformation within the energy ecosystem could first start with identifying the triggers, then adopt a digital branching strategy comprising exploration for frugal innovations and ecosystem exploitation to ensure a fit-for-purpose digital transformation. Therefore, future studies that seek to investigate government-led digital transformation in other sectors would not only build on our work but also rely on it as a repository of evidence for government decision-makers to draw on.

Finally, future studies may consider a longitudinal approach to trace and explain the evolution of government-led digital transformation projects to determine their usefulness and understand the changes required to ensure they remain relevant over the long run. This can be done by revisiting the context periodically and interacting with relevant actors.

Conclusion

Despite the growing research on digital transformation, there has been limited research on the dynamics of government-led digital transformation. This limitation is especially pronounced where governments seek to address market gaps by digitally branching. Our analysis introduces a unique perspective on accomplishing digital transformation by bringing together the strategies of ambidexterity and frugality. We offer several contributions to the theory and practice of digital transformation, in particular on digital transformation efforts where governments venture into new domains to address important developmental voids—which we refer to as digital branching. Our findings align with an approach that privileges local practices with emphases on the efficient use of existing resources with an inclusive and frugal strategy. This includes exploring and adapting external successful innovations with existing digital infrastructures to ensure efforts are innovative and practical, and lead to sustainable success. Additionally, adopting such a strategy can produce anticipated and emergent outcomes. The development of GhQR not only fulfilled its initial goals but also spurred FinTech firms to create new services that can be further exploited, demonstrating the value of the exploitation of ecosystem resources. Our process model captures these dynamics and offers unique insights as meaningful contributions to both scholarly research and practice.

CRediT authorship contribution statement

P.K Senyo: Writing – review & editing, Writing – original draft, Validation, Resources, Project administration, Methodology, Investigation, Funding acquisition, Formal analysis, Data curation, Conceptualization. **Stan Karanasios:** Writing – review & editing, Writing – original draft, Validation, Methodology, Investigation, Formal analysis, Data curation, Conceptualization. **Elikplimi Komla Agbloyor:** Writing – review & editing, Writing – original draft, Resources, Methodology, Funding acquisition. **Jyoti Choudrie:** Writing – review & editing, Writing – original draft, Methodology, Formal analysis, Conceptualization.

Declaration of competing interest

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

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Appendix

Interview guide

Merchants

About the business

- Please tell us about the business and its core operations (what products or services do you offer?)
- How long has the business been in operation and it is registered?
  - If registered, is it as a sole proprietor, company, partnership, etc.)
- Who makes strategic decisions and who is responsible for the day-to-day operations?
- What is your role and how long you have been in this position?
- Who is your target market and what areas do you serve?
- Does your business operate online? (If yes, can you describe how it operates and the platforms used)?

Use of GHQR

- Why did you register for the GhQR payment channel?
- How did you register for GhQR and what requirements did you have to fulfil (e.g., document, bank account, etc.)?
- Can you describe to us how you use GhQR for your business (please give examples)?
- How were you receiving and making payment before GhQR?
- What other payment channels do you use in addition to GhQR and why do use them?
- When you had any challenges with GhQR, how do address them (any examples)?
- What impact has GhQR had on your business (please give examples)?
- How would you compare using GhQR and other payment channels (any examples)?
- Can you describe some benefits of GhQR to your business?
- What more can you add about your experience of using GhQR?
- How differently do you use GhQR in addition to receiving payments?

Interview guide for (FinTech Firms, MNOs, and Banks)

- Can you kindly describe your role within your organization and how long you have been in this position?
- Can you describe your organization in terms of its size, history, vision, and mission, private or public?
- Can you describe why your organization uses GhQR?
- How does your organization use GhQR?
- What strategies informed the use of GHQR?
- Can you explain how your organization develops GhQR-based innovations?
- How does your organization go about innovation development?
- Who are your targeted users and how do they use your GhQR-based solutions?
- Can you describe how GhQR has contributed to merchant payments in Ghana?
- How does your organization obtain support from ecosystem actors for GhQR?
- How difficult has it been to break down the old ways of thinking about merchant payment and banking in Ghana?
- What are the main challenges of achieving the vision of migrating “Ghana to an electronic payments society”?
- What are the next steps for migrating “Ghana to a fully cashless payment society”?

GhIPSS

- Can you kindly describe your role within your organization and how long you have been in this position?
- Can you describe your organization in terms of its size, history, vision, and mission, private or public?
- Can you describe Ghana’s FinTech ecosystem journey?
- What do you think has changed over recent years in the FinTech ecosystem?
- Can you please provide us with a brief historical account of why and how GhQR was introduced?
- When you were developing GhQR, did you look at other countries and did you use some inspiration from them?
- What makes GhQR different from other innovations implemented previously?
- What sort of strategies informed the design and the rollout of GhQR?
- What was the strategy and the thinking process to make GhQR different?
- How have you been able to bring the informal sector in? Especially where the majority of them are not registered and there are KYC issues. How did you overcome that?
- Did you have to acquire any new organizational capabilities so that you could be able to implement GhQR?
- How does GhIPSS go about obtaining support from other ecosystem actors?
- Have you noticed that people have been using QR in unforeseen ways?
- What are the distinguishing characteristics of GhQR compared to other QR code systems that are out there?
- What do you think are the main challenges of achieving the vision of migrating Ghana to a cashless society?

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