

# Evaluation of a National Digital Location Infrastructure: Stakeholders' Perspectives in Ghana

*Completed Research*

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## Abstract

This paper seeks to understand how different stakeholder groups evaluate national digital location infrastructure in a developing country of Ghana. Information Systems literature has discussed the digital infrastructure phenomenon extensively, however, little is known about evaluating the performance of digital infrastructures. To address this gap, this paper employs a qualitative interpretive case study methodology to understand how different stakeholder groups evaluate performance of a national digital location infrastructure implemented in Ghana. Findings show how effective evaluation of digital infrastructure can be achieved through independent analysis of stakeholders' interests and their corresponding interpretation of the success or failure of national digital location infrastructures. The study also shows that meeting stakeholder groups' expectations is not enough grounds for national digital infrastructures to gain favorable evaluation. The findings have implication for policy, practice, and research.

**Keywords:** Digital infrastructures, evaluation, stakeholder groups, developing country, Ghana, interpretive study

## Introduction

The purpose of this paper is to understand how different stakeholder groups evaluate national digital location infrastructure based on the case study of the Ghana location addresses digitalization. In response to the competitive pressures arising from digitalization, many countries across the world are increasingly resorting to infrastructural strategies to realize maximum benefits from digital value propositions (Grisot and Vassilakopoulou 2015; Meso et al. 2009; Nguyen et al. 2015). Digital infrastructure denotes a shift in emphasis on discrete information systems (IS) towards "evolving assemblages of interconnected systems to support user work in everyday life" (Monteiro et al. 2014). Discrete IS involves different stakeholders with diverse perspectives, which makes their appraisal problematic because of the subjective evaluations of these stakeholders (Dwivedi et al. 2015). Digital infrastructures integrate widely dispersed IS (Constantinides and Barrett 2014) developed across an ever-expanding users base with diverse interests, expectations, and resources (Rodon and Silva 2015); this causes the problems associated with evaluating discrete IS more pronounced with digital infrastructures. Evaluation embodies the procedure of assessing how well an information system accomplishes its purposes (Platisa and Balaban 2009). It includes determining and synthesizing opinions of relevant stakeholder groups with the aim of establishing common judgement about the functionality of the evaluated IS (Beynon-Davies et al. 2004). IS research focusing on strategy, design and development of digital infrastructure is quite substantial (Ingram Bogusz and Morisse 2018; Nguyen et al. 2015; Rodon and Silva 2015), however, studies aiming at evaluation is lacking. Consequently, this paper draws on the stakeholder theory to understand the evaluation of national digital infrastructure from multiple stakeholders' perspectives. Thus, the research question we seek to address is "How do stakeholder groups evaluate national digital location infrastructure in Ghana?"

The next section reviews the literature on location addresses and digital infrastructures followed by a discussion on the stakeholder theory as the theoretical lens for data analysis. The next sections present the research methodology and case description. The case finding then follows with analysis based on the stakeholder theory. The paper concludes with a summary, contribution to knowledge and recommendation for further research.

## **Location Addresses and Digital Infrastructures**

Location address is one of the most basic techniques used by public and private sector institutions for service delivery. It facilitates the efficient collection of taxes, urgent dispatch of services such as ambulances, firefighters and law enforcement personnel and also enables utility agencies to manage their network and revenue collection more efficiently (Mennecke and West Jr 2001; Yildirim et al. 2014). For most developing countries, the non-existence of adequate location identification systems impacts adversely on the realization of broader socio-economic development goals (Meso and Duncan 2002). Nowadays, increased digitization and the wide use of mobile devices have opened up an avenue and architecture for innovation such that physical and digital components are now combined (Nylén and Holmström 2015). This phenomenon has given rise to the concept of digital location addresses which takes advantage of significant advances in technological tools to convert descriptive locational information such as postal addresses and named places into an absolute geographic reference (Goodchild 2009; Imieliński and Navas 1999; Roick and Heuser 2013). In light of this, authorities of both developed and developing countries continue to explore avenues for tackling problems associated with location addresses (Walsham and Sahay 1999). IS literature is populated with studies on digital location that bothers mainly on the application of location-based services (Koohikamali and Peak 2015; Lahza et al. 2016; Wang and Yan 2017), with less focus on the evaluation of digital location infrastructure, this study contributes to knowledge in that area.

Recently, the government of Ghana was faced with the daunting task of resolving a long-standing problem of location addresses by implementing the National Digital Property Address System (NDPAS). Different interpretations of events and constellations of social activities influence how a given information system is interpreted as digital infrastructure (Ingram Bogusz and Morisse 2018). Even though the NDPAS is casually referred to as an IS, this paper conceptualizes it as a digital infrastructure. The NDPAS proves to be a large-scale socio-technical system shared across multiple communities having different interests, expectations and uses. Moreover, it allows for scaling and interoperability if the different needs and expectations of these heterogeneous groups are to be met and accommodated (Hanseth and Bygstad 2015; Khanna 2018).

Digital infrastructure is a large socio-technical system comprising an installed base of IT capabilities, operations and design communities and is shared by an ever-expanding heterogeneous group of users whose dynamic expectations cause them to evolve (Hanseth and Lyytinen 2010; Lyytinen et al. 2017; Rodon and Silva 2015). They provide interconnectivity, as well as generic functionalities that can be used as shared services by an array of organizations (Borena and Negash 2016; Fraefel et al. 2013). Hanseth and Lyytinen (2010) affirm that a well-designed digital infrastructure holds considerable benefit for individuals, businesses and society at large, therefore making their evaluation easy. This however, does not come on a silver platter as the process of designing, implementing and maintaining digital infrastructure involves social, ethical and political choices and struggles (Bowker et al. 1996; Hanseth and Monteiro 1997). Thus, in evaluating digital infrastructures, the entire array of organizational forms, practices and institutions that accompany, make possible, and regulate the development of new technology, their related practices and their distributions must be thoroughly considered (Bowker et al. 2009).

## **Theoretical Foundation**

The stakeholder theory serves as the guiding lens for this study. Advanced from the business management discipline, this theory advocates addressing the concerns of individuals, organizations and communities, who may influence or may be influenced by the decisions made in an organization (Flak and Rose 2005; Zhang et al. 2005). Stakeholder refers to any group, individual or organization that have practical concerns for the effective application of an IS and can be impacted or impact how the system is used and why (Boddy and Buchanan 1986). The stakeholder theory is composed of three interrelated and mutually supportive elements: normative, descriptive, and instrumental (Flak and Rose 2005). The normative element of the theory assumes the existence of diverse stakeholder groups in the design and implementation of every IS

(Pouloudi et al. 2018). The descriptive element involves defining and identifying stakeholders and demonstrating their importance towards the performance evaluation of digital infrastructures (Mitchell et al. 1997). Stakeholder theory has been employed severally in IS literature about design, development, implementation and adoption of IS (Chan et al. 2003; Choudrie et al. 2003; Flak and Rose 2005; Hughes et al. 2004). This study maintains a practical focus on the implementation of a national digital location infrastructure involving heterogeneous stakeholder groups, such as banks, courier services and security agencies. The descriptive element of the stakeholder theory therefore offers a useful approach to evaluation, since it acknowledges the existence of multiple stakeholder groups and their diverse interests (Flak and Rose 2005; Rowley 2011).

## **Research Setting and Methodology**

Ghana is a developing country in West Africa with a population of about 29 million as of 2018. Being a democratic country with numerous political parties, elections are held every four years. The country for a long time lacked a good location address system. This posed several challenges to socio-economic development. To address these challenges, the government of Ghana launched a digital location infrastructure. This study presents an evaluation of this initiative from the perspective of three organizational stakeholder groups namely, banks, security agencies and courier services. We employ an interpretive paradigm to understand the evaluation of digital location infrastructure from multiple stakeholder group perspective in a developing country. This paradigm stance allows for IS researchers to “attempt to understand phenomena through the meanings that people assign to them” (Myers and Walsham 1998). Based on this, the qualitative method to knowledge inquiry was adopted, as it seeks to “understand the context of the IS, and the process whereby the IS influences and is influenced by the context” (Myers and Walsham 1998, p. 1). A case study was adopted as the strategy used in conducting this research as it tends to provide answers to “Why” and “How” questions posed when studying a contemporary phenomenon within its real-life contexts (Kaplan and Duchon 1988; Walsham 1995; Yin 2003). Consequently, we collected data from multiple sources including interviews, informal discussions, document analysis and media news analysis.

Interviews were conducted between 30<sup>th</sup> May 2018 and 20<sup>th</sup> January 2019. Participants for the interviews included employees of four different banks, three security agencies and four courier services. In all, eleven respondents were interviewed and these happened at times convenient for the respondents with sessions recorded upon gaining consent. The periods of the interviews lasted 20 minutes to 1 hour. Interviews were transcribed and notes were arranged to make logical meanings. We read transcribed data several times to gain broad understanding of responses and how they contribute to the research purpose. These were then coded into themes found in relevant literature. Data analysis was conducted iteratively, between interview data and relevant literature findings in order to seek data confirmation and validation. Where necessary, interview participants were followed up to verify emerging findings according to the principle of hermeneutics (Klein and Myers 1999). Analysis of research finding concluded when no new and relevant insights were further yielded.

## **Case Description**

### ***Background***

Before the digitalization of location addresses, Ghana lacked adequate location identification systems, hence citizens resorted to the use of landmarks to give directions and locate property, which was inefficient and often erroneous as there was no way of verifying the authenticity of addresses. This problem also manifested in business settings, as service deliveries were poor. For instance, parcels were often delivered to wrong destinations and it usually took a considerable amount of time to rectify such mistakes, which tend to adversely affect productivity and also customer loyalty and trust. A large chunk of the Ghanaian populace had little or no access to certain financial services because of poor location address identification such that banks and financial houses were reluctant to deal with persons who could potentially become untraceable in future. Majority of the banked few however, did not attain that stride without a generous amount of effort and even with that, customers who wished to access loan facilities were charged higher risk premiums. Countless number of properties and lives destroyed in fire outbreaks could have been avoided if there were an existing accurate database of location addresses because it would have been easier for firefighters and

ambulances to easily locate and navigate to disaster sites to remedy the situation in time. In the event of disasters, appropriate agencies were unable to allocate adequate resources to affected persons due to insufficient basis, in terms of statistics for the distribution of resources and dissemination of required personnel (health and security) for effective management. Evil perpetrators easily got away with crimes because law enforcement and security agencies could not track them down to their addresses. These challenges have impeded the socio-economic development of the nation. In essence, the government of Ghana sanctioned the implementation of the digital location address platform (NDPAS) to transform and formalize the economy.

### ***The National Digital Location Infrastructure (NDPAS)***

In 2017, the Ghana Post Company Limited (GPCL) was tasked with the responsibility to oversee the implementation of the NDPAS. The implementation of the initiative was carried out in collaboration with several agencies both public and private. The NDPAS is Ghana's official digital infrastructure that covers every inch of the country and ensures that all locations in the country are uniquely addressed digitally. It divides Ghana into grids of 5m x 5m squares and assigns each one a unique address, known as a digital address with the use of the Global Positioning System (GPS) technology. The digital address is a composite of the postcode (region, district and area code) and a unique address translated from a GPS location to a user-friendly format. The platform comes with an open application programming interface (API) to allow third-party application developers to integrate with the system to be able to translate and use the digital addresses to help facilitate transactions. The implementation of the NDPAS saw the birth of a mobile app called GhanaPostGPS, a tool that relies on an open API of the NDPAS to enable citizens retrieve location addresses across the country.

Since the launch of the NDPAS in 2017, it has been widely used across the nation by citizens and businesses to generate digital addresses. The digital location address platform which is expected to help formalize and transform the Ghanaian economy and improve the operations of business activities in the country is now embedded with the national location registry to enable individuals and organizations to validate their home and business addresses. Citizens are now required to supply their digital addresses as part of the information needed to complete the filling of forms for official purposes. For example, applicants seeking government sector jobs are required to provide their digital addresses as part of the form-filling process. Citizens, dispatch riders, courier and security agencies now with the help of the GhanaPostGPS app easily locate and navigate their way around unfamiliar cities without the need to use notable landmarks for description.

The national digital location infrastructure met some implementation challenges. Citizens initially expressed concerns about the privacy and security of their data and were assured by appropriate authorities of how their concerns have been addressed. The cost of the project advanced political aggravations from members of the opposition party who in turn accused the government of amassing wealth from public coffers. These political debates and arguments generated further concerns about the continuity and the sustainability of the NDPAS if there occurred a change in political power. This was because politics in Ghana had been such that over the years, unfinished projects by a ruling government or projects that do not gain favorable attention by opposition party were usually discarded when an opposition party eventually comes into power.

#### **Use for Banks**

As a national regulation, banks are mandated to accept the digital address as this will enable them to confirm the addresses of customers through the NDPAS for registered users as well as extend their services to the unbanked, thereby expanding their reach. Most Ghanaian banks however, do not enforce the supply of the digital address claiming that the NDPAS have no significant impact on their operations, as it does not support the kind of location verification that they expected. This assertion is evident in a respondent's response:

*"...because we are an investment bank, we do not need to know where our customers live. Even though it is a regulatory requirement and an anti-money laundering measure, we still open accounts for customers who cannot supply their digital address. ...the app should be enhanced so that it can provide a picture*

*view of a given digital address that we can compare with to the description a customer is giving for [real-time] verification.”*

With the implementation of the NDPAS, citizens are expected to have easy access to bank loans; however, with the interests of the bank regarding location verification not met, there has been no improvement in loan accessibility by citizens. A respondent from a different bank also indicated that even though official forms of her bank have not been updated to include fields for digital address, it is solicited and taken where available and she considers it effective.

*“...instead of making customers sketch the directions to their homes, we now request for their digital address which I think is faster and accurate but we still do not verify them, but we hope to in future.”*

### **Use for Courier Services**

The implementation of the digital location infrastructure is expected to enable courier agencies to reduce the cost of operations and increase operational efficiencies. Three out of four courier agents interviewed for this study affirmed that they do not use the GhanaPostGPS app because they were already accustomed to the google map which has proven to be effective thus far. A respondent indicated that most of the time, their clients do not supply or are not in the position to supply the digital address, as they have not been able to memorize it, hence not encouraging its usage. However, the one (1) respondent who use the app, does so because he thinks it is a right and patriotic thing to do even though he sometimes reverts to the use of the google map either from within the app or outside it. The respondent was quick to point out that the app is effective but expressed concern about its sustainability, considering its political nature.

*“...the app has helped me a lot to save some few cedis because I do not have to call my clients several times just to confirm and verify their locations. Once they send me their digital address, I just punch it into the app and in no time, I am at their doorstep. I only hope that it will not be thrown away [discarded] when the opposition political party comes to power.... That is when I can say that it is successful.”*

### **Use for Security Agencies**

The NDPAS is expected to facilitate the smooth operations of security agencies in providing security for citizens and tracking down miscreants. A discussion with a respondent from a private security agency indicated that the NDPAS is effective in identifying a given location but does not help much in tracking down evil perpetrators when they are on the run. The respondent therefore suggested that the infrastructure is extended to automatically capture and record the location of persons covertly anytime they are in new vicinities. He believes that this functionality can be a value-added service to the software developers who earn a little more upon request of such data by security agencies.

## **Case Analysis**

Based on the stakeholder theory, this section provides an understanding of the evaluation of the national location digital infrastructure from multiple stakeholder perspectives. This section enlists and describes some stakeholder groups of the NDPAS and points out the interests and evaluations of each stakeholder group.

### ***Banks***

Banks are a stakeholder group whose interest in the NDPAS is a real-time verification of customers' location with the aid of a street view functionality. For most banks, addresses of customers are still captured using notable landmarks, home addresses and postal addresses as their application forms have not been updated to request for the digital address, while a few allow customers to sketch directions to their home on paper in addition to supplied textual addresses. The expectations of the banks have not been met by the NDPAS, hence its low application in bank settings.

### ***Security Agencies***

In addition to identifying a given location based on the data retrieved from the application, security agencies also expect that information retrieved from the NDPAS should be adequate to track down and locate an

individual, thereby granting them operational efficiency. The case description shows how security agencies expect more from the digital location infrastructure than it offers now and therefore argues for its enhancement to accommodate their expectations.

### ***Courier Services***

Even though courier services already have alternative applications to the GhanaPostGPS app, it is evident from the case description that the digital location infrastructure meets the expectations of those who use it. Courier services needed to be able to accurately deliver packages to their destinations and on time as this boosts customer loyalty and trust. While courier service agencies profess to be happy with the impact of the digital location infrastructure on their business, they are still hoping for better innovative ways to maximize their benefits from its usage in the foreseeable future.

## **Discussion of Findings**

Based on the research questions of understanding how stakeholder groups evaluate national location digital infrastructure in Ghana, the literature reviewed and the findings from the analysis, some conclusions were drawn.

While prior knowledge of stakeholder groups and their interests and expectations are relevant for the effective evaluation of digital infrastructures, this study suggests that meeting stakeholders' interests and expectations alone is not a guarantee for marking a national digital location infrastructure as successful. From the case analysis, it is evident that even though some stakeholder groups confirmed the useful application of the national digital location infrastructure in their daily operations, there is still skepticism about its successful implementation. This is attributed to the political nature of the initiative and the long-standing history of abandonment of political projects once a new political party assumes the position. This finding reemphasizes the assertion of Bowker et al. (2009) that evaluating digital infrastructures require the consideration of the whole array of institutions and practices that accompany, make possible, and deflect the development of new technology.

Again, partial fulfillment of expectations of national digital infrastructures for stakeholder groups can also complicate evaluation, as is the case of the security agencies. Whereas some stakeholder groups will give an honest opinion on the performance of the initiative by indicating where and how a digital infrastructure has been successful and where not, others are likely to lump everything together and just conclude that the implementation has failed thereby causing the evaluation to be complex and contended (Dwivedi et al. 2015).

This study also throws light on the need to separate the promised benefit of national digital infrastructure to stakeholder groups from the actual interests and expectations of the stakeholder groups. In the case of the banks, for instance, the widely professed interests and expectations of banks from the national digital location infrastructure turned out not to be the actual expectations of banks. There seem not to be any interest in the infrastructure by the banks, even though the media houses and proponents of the digital infrastructure had joyfully proclaimed its usefulness and benefits to the banks. Therefore, being able to distinguish between general assertions and the reality of how impactful or not a digital infrastructure is, contributes to undebated evaluation.

## **Conclusion and Implications**

This research set out to understand how different stakeholder groups evaluate a national location digital infrastructure in Ghana. The originality of the paper lies in its focus on evaluating digital infrastructures from multiple stakeholder perspectives considering that less has been published in IS literature on this issue. Several findings emerged from this study, which has implications for research, practice, and policy. Notable among them is that meeting the expectations of stakeholder groups is not enough grounds for a national digital infrastructure to be considered successful as this hinges on several other factors including politics and history of the context (Bowker et al. 2009). For research, the stakeholder theory is considered useful for studying phenomena that involves ever-expanding heterogeneous stakeholder groups. For practice, identifying the stakeholder groups that can affect and can be affected by digitalization and setting clear and unambiguous objectives can significantly help to evaluate digital infrastructures. For policy, this research provides policy makers with useful feedbacks that will enable them to make policies that will drive

the effective evaluation of national digital infrastructures. This multiple stakeholder analysis studies focused on a single digitalization process in Ghana to understand the evaluation of a national digital location infrastructure using the stakeholder theory, which is a limitation; however, with the principles of interpretive study, findings apply to contexts with common characteristics. Future studies can focus on evaluating digital infrastructures from a public value perspective.

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